

20 years of Canadian Stroke Best Practice Recommendations:

Improving care, saving lives and promoting recovery

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How it started: The Canadian Stroke Strategy

Just a few decades ago stroke could be diagnosed but there were no treatments and very little recovery support. A major turning point occurred when the clot-busting intravenous drug (alteplase) was provisionally approved as treatment for ischemic stroke (the most common type, caused by a blood clot) by Health Canada in 1999 and fully approved in 2005. Around the same time, the Canadian Stroke Strategy was initiated under the leadership of the Canadian Stroke Network and the Heart and Stroke Foundation of Canada (Heart & Stroke).

The Canadian Stroke Strategy brought together stakeholders and partners to work toward a common vision of optimal access to integrated, high quality, and efficient services in stroke prevention, treatment, rehabilitation and community participation across the country. Although there were pockets of excellent stroke care developing across the country, the quality of care varied – in many areas there were significant gaps between what should be done and what was being done. One key goal of the Canadian Stroke Strategy was to provide a framework to develop and disseminate evidence-based best practices for stroke care across the country. This would ensure research findings were reaching the people who could use them: health care professionals, hospital administrators, and health systems leaders.

The launch of the Canadian Stroke Best Practice Recommendations

The first set of Canadian Stroke Best Practice Recommendations were released 20 years ago, in 2006 by the Canadian Stroke Network and Heart & Stroke as part of the Canadian Stroke Strategy. Stroke clinical practice guidelines already existed in the United States and in Europe but there was a need for recommendations that addressed the Canadian healthcare system and reflected the Canadian context including a vast geography, and a mix of urban, and rural and remote communities. These guidelines started to formalize and standardize how stroke care should be organized and delivered in Canada with an embedded methodology for measurement – a critical and novel element.

In 2013 Heart & Stroke assumed operational management of the stroke best practices, working in partnership with the Canadian Stroke Consortium, Canadian Neurological

Sciences Federation, and CanStroke Recovery Trials Platform Network.

The stroke best practices provide up-to-date, evidence-based clinical practice guidelines across the continuum of care from public awareness to emergency diagnosis and treatment, rehabilitation and recovery, and prevention of a subsequent stroke. Over the years they have evolved to cover the different sub-types and contexts for stroke that have their own unique recommendations for care. Their aim is to make stroke care more consistent across the country and promote the rapid application of new knowledge and evidence in practice, to improve care, reduce death and disability, promote recovery and community participation for individuals with stroke, support families and caregivers, and save healthcare costs.



The Canadian Stroke Best Practice Recommendations

improve care, save lives and promote recovery.

Where possible and appropriate, the recommendations are aligned with other related Canadian clinical practice guidelines, for example for the management of hypertension, diabetes, heart issues and cholesterol. Peer-reviewed and published in journals, they are free, bilingual, easy to access and searchable on the [website](#). They are promoted and disseminated across the country.

“The stroke best practices have really helped to provide a national framework for the entire continuum of stroke care from emergency care to rehabilitation and recovery,” says Dr. Anita Mountain, physiatrist, Nova Scotia Rehabilitation and Arthritis Centre, QEII HSC.

Behind the stroke best practices

Used by front-line professionals and health system leaders across the healthcare system, the stroke best practices provide evidence-based recommendations to guide stroke care organization and delivery. They describe the infrastructure needed and outline the clinical protocols and processes to provide integrated, high-quality, and efficient stroke services in Canada, acknowledging that not all recommendations will apply to all patients in all settings and decisions can be impacted by available resources, individual circumstances and clinician judgement. **Clinical considerations** provide practical advice around specific issues that lack research evidence.

The **Canadian Stroke Best Practices Advisory Committee**, comprised of experts from across the country representing prevention through to rehabilitation and recovery, has overall responsibility for the development and update process. The **Stroke Quality Committee** reviews draft recommendations and develops quality indicators, targets and benchmarks. The **quality indicators** are designed to inform and standardize measurement and monitoring activities to drive improvement in care and patient outcomes. These indicators range from outcome indicators (for example, mortality), process indicators (for example, time to treatment), system indicators (for example, staffing indicators), or patient-oriented measures (for example, quality of life).



Almost 1 million
Canadians are
living with the
effects of stroke.

An expert **writing group** is convened for each module to review, draft, and revise the recommendation statements. A final review is carried out before publication by an **expert external review group** of healthcare professionals. The **Community Consultation and Review Panel**, made up of people who have experienced a stroke and their families and caregivers, is an essential part of the stroke best practices development process, ensuring the final recommendations are grounded in real-life experience and reflect real values and preferences.

Updates to the modules in each edition are scheduled every few years. However, as research for stroke care is dynamic and evolving, there is a protocol to address **late-breaking evidence** in a timely way, through a rigorous review process. In those cases, an interim update is released and later incorporated into the next full module release.



1 stroke happens in
Canada approximately
every 5 minutes.

Optimizing stroke care

Organized care is better care

The stroke best practices stress the need for coordination of patient care among all hospital departments and between different healthcare facilities and programs, and the strength of organized stroke teams to provide effective care and efficiently use resources. Organized and integrated care means the required systems, protocols and infrastructure are in place and are supported by dedicated budgets and resources. A Canadian study showed that implementing integrated systems of stroke care (2004–2013) was associated with more than a 20% decrease in stroke death.ⁱ Receiving care on a stroke unit (a specialized unit with a dedicated interdisciplinary stroke team) increases the odds that a patient will survive, return home and regain independence.^{ii,iii} As a direct result of the stroke best practices alongside stroke system development efforts, the number of designated stroke units in Canada increased from 58 to 95 between 2009 and 2022.

“Before the best practices, we had a stroke system of care that didn’t exist as a system. It was fragmented and depended on what your individual provider knew. The best practices bring the best stroke expertise to every doctor in Canada. They have led to better care, more lives saved, and better outcomes,” says Dr. Eric Smith, stroke neurologist, Calgary Stroke Program.

Moving research into practice

The stroke best practices include descriptions of processes and activities for front-line staff to deliver optimal stroke care, synthesized from the published research evidence. Where evidence is less clear, clinical considerations are provided to guide clinical decision making. A summary of the evidence, rationale for implementation, potential implications or considerations for health systems, and guidance on measuring system performance are also provided.

“When intravenous thrombolytics [clot-busting drugs] were approved it changed how people thought about stroke – that it was in fact treatable and we could actually do something. The stroke best practices furthered and promoted that concept, so they are both the result of the evolution of stroke treatment, but they also promote the need for continued evolution of stroke research and care,” says Dr. Michael Hill, stroke neurologist, Calgary Stroke Program. “And when we published the ESCAPE trial for EVT [physically removing clots] it was immediately available at the 11 Canadian sites involved in the trial but getting it into the best practices facilitated getting it into other sites. There are now 27 centres across the country providing this treatment.”



Stroke is on the rise – but **more people survive.**

The guideline development process helps overcome the often-long delay between generating research and translating it into practice through both scheduled reviews and a rapid review process. For example, the first guidelines in 2006 recommended a maximum 3-hour time window from stroke symptom onset to receiving a clot-busting drug. Based on additional studies, the window was extended to 4.5 hours in a later edition, although diagnosis and treatment should always happen as quickly as possible. With evolving research, the current guidelines now also include an additional clot-busting drug that has been shown to be equally effective, but easier to administer which helps to expand access.

“The best practices really push the idea that ‘time is brain’ that stroke is urgent,” says Dr. Dar Dowlatshahi, stroke neurologist, Ottawa Hospital. “They highlight the need to speed up processes and to ensure the system is in place to achieve specific targets. They have had a massive impact on how we consistently treat stroke.”

Measuring performance

A novel but essential part of the stroke best practices was embedding metrics into the process, to provide a clear understanding of how to measure progress, evaluate implementation and drive quality improvement. The Guidelines International Network (GIN) recognized the Canadian Stroke Best Practice Recommendations in 2008 for the world-leading decision to embed performance measures within the guidelines.



Stroke can happen at **any age.**

“Because performance measures are included in the best practices, when they are published as a package they demonstrate: Here’s what you’re supposed to do, here’s how to do it and here’s how to know whether you’re doing it and how well you’re doing it,” says Dr. Patrice Lindsay, past senior editor, Canadian Stroke Best Practice Recommendations.

Advocating for stroke system improvement

The first edition of the stroke best practices included chapters on public awareness, prevention, acute stroke management and rehabilitation. Over the past 20 years modules have been added around hyperacute stroke management, managing transitions, telestroke, pediatrics, pregnancy, vascular cognitive impairment, intracerebral hemorrhage and cerebral venous thrombosis. The guidelines provide the evidence and framework for clinicians and system leaders to advocate for investments to build staff skills and capacity, improve the system and provide better care.

“Having the best practice recommendations encourages all of us to look across the system, from public awareness to acute care, prevention and rehabilitation to end-of-life and identify all of the partners and the players, including patient partners and community resources. From a systems perspective they provide us with important evidence that can help guide ongoing decisions about system improvements and resource allocation to ensure we are able to deliver high-quality patient care,” says Sacha Arsenaault, provincial director, Stroke Services BC. “They are the foundation of everything we do and give us the confidence that we are doing the right things.”

Public awareness

Since the first edition the stroke best practices have stressed the importance of ensuring the general public understands that stroke is a medical emergency, is able to recognize the signs and takes appropriate action. Recognizing the signs of stroke and acting quickly can mean the difference between

life and death, or the difference between a better recovery and a lasting disability. In 2014 Heart & Stroke launched the FAST campaign (heartandstroke.ca/FAST).

The number of Canadians who can name at least two FAST signs of stroke has more than doubled over the past 12 years from two in 10 (21%) to almost half (47%).

Know the signs of STROKE

F **Face**
is it drooping? **A** **Arms**
can you raise both? **S** **Speech**
is it slurred or jumbled? **T** **Time**
to call 9-1-1

Beat stroke, call 9-1-1 FAST

20 years of Canadian Stroke Best Practice Recommendations: The highlights

Seven editions of the stroke best practices have been published (the seventh edition is in progress), with significant progress over the past 20 years. Initially, each edition was updated every two years, but with the increasing volume of evidence over time, the number of guideline modules has expanded with new modules released every one to two years. The stroke best practices are used by healthcare professionals and system leaders across the country and have influenced stroke care around the world.

2005

Clot-busting intravenous drug (alteplase) to treat ischemic stroke receives final approval by Health Canada based on the CASES study, supported by Heart & Stroke funding.

2006

First edition of the Canadian Stroke Best Practice Recommendations is released as a single document with six chapters: public awareness and responsiveness, patient and family, prevention, acute stroke management, rehabilitation, and follow-up and community reintegration.

2008

Second edition of the Canadian Stroke Best Practice Recommendations is published in the *Canadian Medical Association Journal* with new recommendations addressing emergency medical services, management of transient ischemic attack and minor stroke, acute inpatient care and vascular cognitive impairment.

2010

Third edition of the Canadian Stroke Best Practice Recommendations is released with a section on transitions of care to help patients, families and caregivers access the right type of care in the right settings at the right time.

2010

A dedicated website (strokebestpractices.ca) is launched to provide easy access to the latest stroke best practices and to allow for timely updates.

2010

Accreditation Canada in partnership with the Canadian Stroke Network and Heart & Stroke, create a Stroke Services Distinction program based on the Canadian Stroke Best Practice Recommendations, the first ever disease specific accreditation program.

2011

The Quality of Stroke Care in Canada is published, based on data from hospitals across the country and national health databases. The report compared the state of stroke care against the Canadian Stroke Best Practice Recommendations and provided recommendations for improvement.

2013

Fourth edition of the Canadian Stroke Best Practice Recommendations is released including a module on mood, cognition and depression recommending depression screening for all individuals living with stroke and their caregivers. This marked a new emphasis on psychological care and was revolutionary for national stroke guidelines.

2013

A new module is added on telestroke – using technology to link referring and consulting healthcare sites together for assessment and management of stroke patients, including administering clot-busting drugs as well as secondary prevention, rehabilitation, and recovery. Telestroke is an effective way to deliver care to stroke patients anywhere in the country. Between 2009 and 2022 telestroke capacity increased from 71 to 307 hospitals for acute stroke management.

2014

First module of the fifth edition of the Canadian Stroke Best Practice Recommendations on secondary prevention is released in the *International Journal of Stroke*. It includes an aggressive new recommendation that patients who present within 48 hours of a suspected transient ischemic attack (TIA) or ischemic stroke with face, arm or leg weakness, or speech disturbance are considered at highest risk of recurrent stroke and should be immediately sent for advanced stroke care and urgent imaging.

2015

Dramatic results from the ESCAPE trial, which was supported by Heart & Stroke funding, reveal that endovascular thrombectomy (EVT) improves outcomes and can cut in half the death rate from major ischemic strokes. Because 11 Canadian sites were involved in the research, the treatment

is immediately available in those hospitals. The results were rapidly included in the stroke best practices, making Canada one of the first countries in the world to incorporate this treatment into the healthcare system and facilitating uptake in other centres across the country.

2016

A significant addition to the newly released rehabilitation guidelines is the inclusion of patients and caregivers as an important part of the rehabilitation team.

2017

Canadian Stroke Best Practice Consensus Statement: *Secondary Stroke Prevention during Pregnancy*, provides the first broad-based, stroke-specific guidance around secondary stroke prevention in pregnancy in the world. It focuses on unique aspects of secondary stroke prevention in a woman with a prior history of stroke or transient ischemic attack who is, or is planning to become, pregnant.

2018

Canadian Stroke Best Practice Consensus Statement: *Acute Stroke Management during Pregnancy*, the first of its kind in Canada, reveals that although relatively rare, stroke in women during pregnancy is three times higher than stroke in non-pregnant woman of the same age. According to a Canadian study, which was supported by Heart & Stroke funding, roughly 30 out of 100,000 women will experience a stroke during the pregnancy period and the highest risk occurs during the periods just before or following birth.

2020

A new guideline recommends against taking ASA (acetylsalicylic acid) as a preventive measure for those who do not have a history of stroke or heart or vascular disease, a change to a decades-old common practice. It was based on strong new evidence indicating taking ASA (brand names include Aspirin, Entrophen, Novasen) daily could potentially do more harm than good, by causing serious side effects such as internal bleeding. At the time of this guideline release 5.3 million Canadian adults were taking ASA to prevent heart disease or stroke, of whom 2.4 million were doing so without being directed to by their doctor. Anyone with a history of stroke, or heart or vascular disease was advised to continue to take low-dose, daily ASA to prevent another event from occurring if they have been advised to do so by a health professional.

2020

To address the enormous challenges facing the healthcare system as a result of the COVID-19 pandemic, guidance is published to ensure continued implementation of evidence-based stroke care. The update spans the continuum of care from prevention through to rehabilitation and included a telestroke (virtual care) toolkit to support the rapid uptake of technology for assessment, diagnosis, and management of individuals with new and ongoing health issues that do not require in-person care or where care is not available.

2020

Sex and gender must now be considered by all stroke best practice writing groups when reviewing evidence including the ratio of male to female participants in trials and if significant sex-based differences are noted in the outcomes.

2022

Based on the largest acute stroke trial ever run in Canada (AcT Trial) and supported by Heart & Stroke funding, new recommendations are released for the use of tenecteplase (TNKase™) which is easier to administer than alteplase for dissolving clots. This is a significant improvement in acute stroke management resulting in faster treatment. By 2025

tenecteplase had been approved by Health Canada, the US Food and Drug Administration and the European Medical Agency.

2024

A new module provides guidance around cerebral venous thrombosis (CVT), a rare but potentially life-threatening type of stroke that is not well understood. The risk of CVT is higher in women and often associated with oral contraceptive use and with pregnancy.

2024

Vascular cognitive impairment (VCI) is elevated to a stand-alone, expanded module. A new infographic and unique journey map developed in collaboration with people with VCI and their families is also included.

2025

The module for rehabilitation, recovery and community participation is reorganized to better align with a World Health Organization (WHO) framework and, due to the broad scope of topics, is presented in three parts covering rehabilitation planning, delivery, and activity and community participation.

Canadian Stroke Best Practice Recommendations by the numbers

- Since 2006, **7 editions** of the stroke best practices have been published.
- The first edition (2006) is **1 document** with **6 chapters**, **24 topic areas** and **97 recommendations**.
- The second edition (2008) is **1 document** with **6 chapters** and **220 recommendations**.
- The fourth edition (2012–13) includes **6 separate modules** with **1 toolkit**, **825 recommendations** and **23 clinical considerations**.
- The seventh edition (2020–in progress) includes **11 modules**, **2 interim updates**, with more than **1336 recommendations** and **469 clinical considerations**.
- There were over **318,000 visitors** to the stroke best practices website in 2025.
- The stroke best practices have been published in **5 peer-reviewed journals**: *Canadian Medical Association Journal*, *International Journal of Stroke*, *Canadian Journal of Neurological Sciences*, *Alzheimer's & Dementia Journal* and *American Journal of Physical Medicine & Rehabilitation*.
- **500+ authors** have contributed to writing the stroke best practices.
- **50+ stroke care organizations** have earned Accreditation Canada Stroke Distinction status, a program based on the best practice recommendations.

Despite advances, more needs to be done

Stroke prevention, awareness, treatment and recovery have greatly improved over the past several decades because of research breakthroughs, increased awareness and improvements to stroke systems of care supported by the stroke best practices.

- Stroke is on the rise in Canada due to an aging population^{iv} and more younger people having strokes^v,^{iv} but more people survive.
- Almost one million people in Canada are now living with stroke.^{vii}
- More than 108,000 strokes happen in Canada every year. That is one stroke every five minutes.^{viii}
- As many as 8 in 10 cases of premature stroke or heart disease can be prevented through healthy lifestyle behaviours.
- Nine in 10 people in Canada have at least one risk factor for stroke or heart disease.
- Stroke can happen at any age.
- 1.9 million brain cells die every minute during a stroke.^{ix}
- Stroke costs the Canadian economy more than \$3.6 billion per year in direct costs.^x
- Stroke is one of the 10 most expensive causes of acute care hospitalization in Canada, with an annual cost of \$146 million.^{xi}
- Stroke is a leading cause of adult disability in Canada.^{xii}
- Heart & Stroke has invested \$1.73 billion in world-class research to promote health, prevent disease, save lives and enhance recovery.

strokebestpractices.ca

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Heart & Stroke is the operational lead of the Canadian Stroke Best Practice Recommendations and manages them in partnership with the Canadian Stroke Consortium, Canadian Neurological Sciences Federation, and CanStroke Recovery Trials Platform Network.

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