ACCESS TO STROKE CARE:

THE CRITICAL FIRST HOURS

THE HEART AND STROKE FOUNDATION 2015 STROKE REPORT

HEART & STROKE™ FOUNDATION

Stroke* is a serious health issue that requires immediate medical attention. The journey to recovery can take months or years, but what happens in the first few hours after stroke onset is crucial. The faster someone experiencing a stroke gets to an appropriate hospital that provides acute stroke care services, and receives treatment, the better their chances of survival — with little or no disability. Today, the majority of Canadians who make it to hospital will survive their stroke, but how quickly they get there can have a major impact on how successfully they recover.

The **Heart and Stroke Foundation 2015 Stroke Report** looks at the critical first hours in stroke care, starting from the time a stroke begins and through the important and immediate steps that need to happen to ensure stroke patients get the best and most timely care, and ultimately have the best outcome possible.

For this report we analyzed hospitalization and emergency department data from the Canadian Institute for Health Information (CIHI)**, and data from paramedic services across the country***. We also polled**** Canadians to find out how informed they are about stroke, stroke signs and the early steps in stroke care.

THE CHANGING STROKE STORY IN CANADA

As the Canadian population ages, the number of strokes each year is on the rise. At the same time there has also been an increase in strokes among people under 65 and an increase in all stroke risk factors for younger adults. The strain on Canadian families, the healthcare system and the economy will grow accordingly.

Currently an estimated 62,000 strokes occur in Canada each year — that is one stroke every nine minutes — and hundreds of thousands of Canadians are living with the effects of stroke.

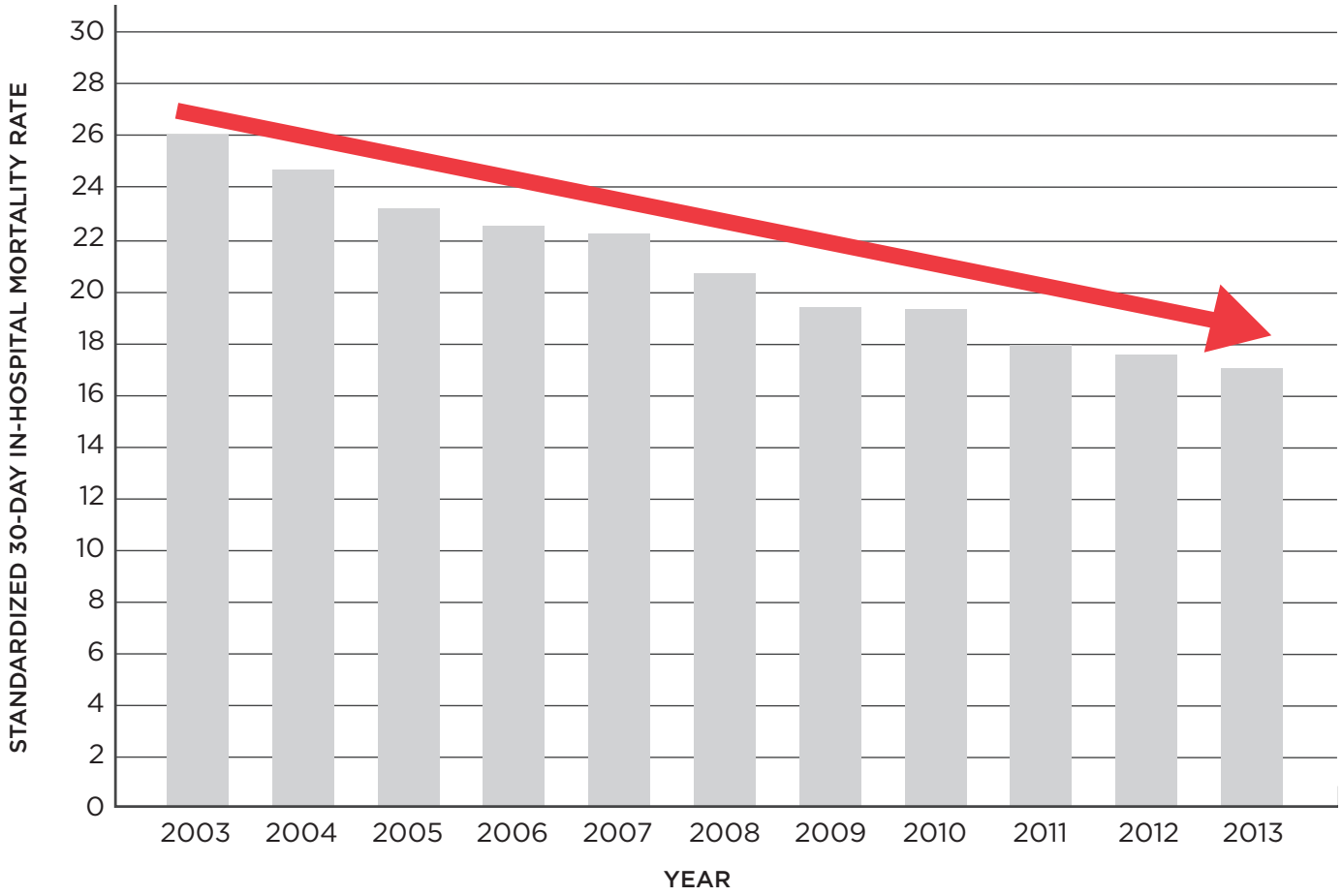
At the same time we have seen tremendous progress in stroke care thanks to health system improvements and treatment breakthroughs. More people are surviving stroke: according to the most current CIHI hospitalization data (2013 - 2014), only 17 per cent of stroke patients who are admitted to hospital die, which represents a relative decrease of 5 per cent from the two years previous. Or put another way, more than 83 per cent of those who have a stroke and are admitted to hospital will now survive.

IN CANADA SOMEONE HAS A STROKE EVERY 9 MINUTES

"We have dramatically increased the chances of surviving a stroke in this country," says Dr. Michael Hill, Director of the Stroke Unit, Calgary Stroke Program and Heart and Stroke Foundation spokesperson. "We have done this by continuously applying the results from stroke research to real life clinical stroke care. The Heart and Stroke Foundation has been a major driver in improving the coordination of stroke services and integration of stroke systems across Canada."

Now we need to do even more, to keep up with the growing threat of stroke. In this report we'll trace those critical first hours after stroke, showing what happens at each step and what improvements could ensure better outcomes for more Canadians.

Death rate in-hospital following a stroke is decreasing (per 100,000 people)

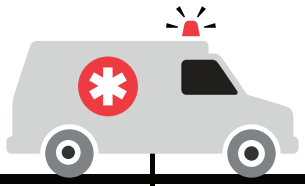


CRITICAL STEPS
IN EARLY STROKE MANAGEMENT

1 RECOGNIZE SIGNS OF STROKE —

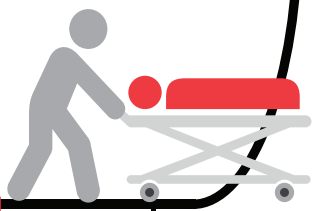
2 CALL 9-1-1 —

3 PARAMEDIC DISPATCH —

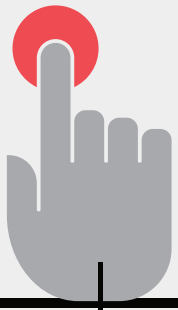


4 PARAMEDIC ON-SCENE ASSESSMENT AND MANAGEMENT —

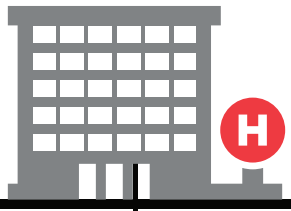
5 PRE-NOTIFY AND TRANSFER TO HOSPITAL —



6 ACTIVATE STROKE PROTOCOL —

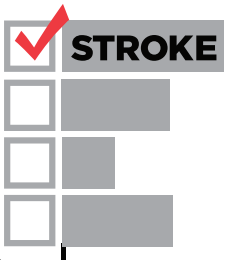


7 ARRIVE AT EMERGENCY DEPARTMENT —

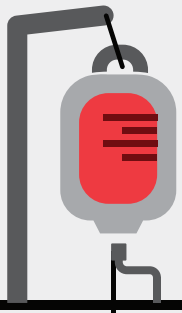


8 URGENT BRAIN/VASCULAR IMAGING —

9 DIAGNOSIS —



10 INTERVENTIONS —

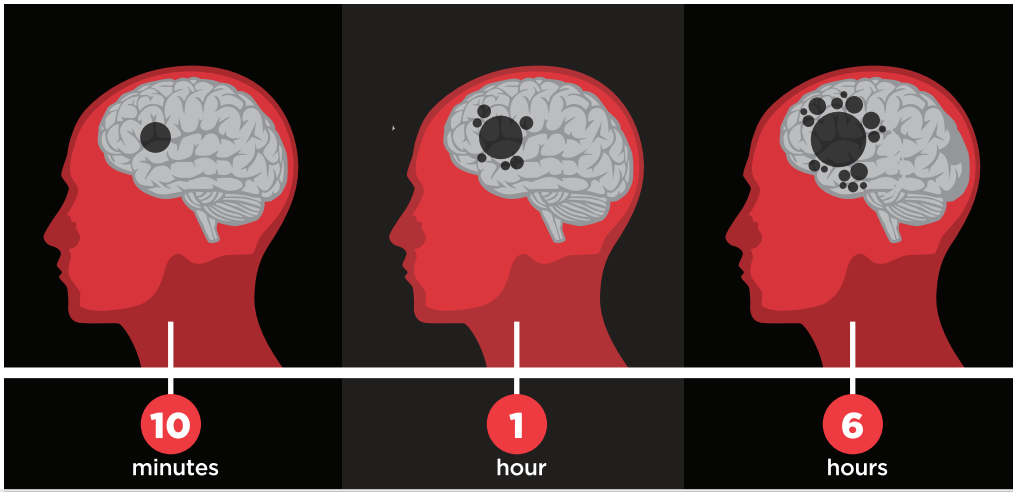


11 DISCHARGE FROM EMERGENCY DEPARTMENT TO COMMUNITY —

or

ADMIT TO HOSPITAL —

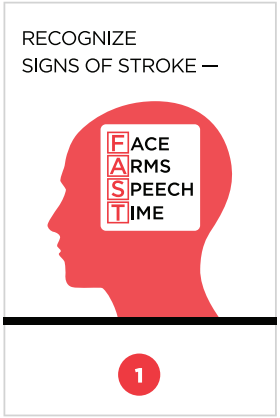
1.9 MILLION BRAIN CELLS DIE EVERY MINUTE AFTER STROKE



WHAT DO CANADIANS KNOW ABOUT STROKE?

A stroke is a sudden loss of brain function. Most strokes are caused by the interruption of blood flow to parts of the brain resulting from a clot (ischemic stroke); the rest are the result of a rupture in a blood vessel, causing bleeding in the brain (hemorrhagic stroke). A transient ischemic attack (TIA) or "mini-stroke" displays the same symptoms as ischemic stroke and should be considered as the mildest form of stroke. TIAs resolve quickly and are an important warning sign of a future, more extensive stroke; they also require urgent medical attention. Each stroke is unique and will impact each person differently based on a range of factors.

Unfortunately, according to our poll, only one-third of Canadians are able to describe what a stroke is.



HELPING CANADIANS RECOGNIZE STROKE

Stroke is a medical emergency. Recognizing the signs in someone having a stroke is the first critical step in stroke management. Brain cells generally die at a rate of 1.9 million per minute after stroke, so the sooner the normal blood flow can be restored, the greater the likelihood of a good outcome. Strokes occur in many settings where people are alone or with others — in homes, workplaces and communities across the country.

Most stroke patients will not be capable of getting help themselves, which is why it is so important that everyone learn the signs of stroke and know to call 9-1-1 or local emergency medical services right away. **Some communities do not have 9-1-1 services, and in these areas it is important that all residents know their emergency medical services contact number**.

The Foundation has launched a new campaign promoting the acronym FAST as a simple way to help Canadians recognize the signs of stroke and take action (the campaign was launched in Ontario in December 2014 and is being rolled out in other provinces). The signs of stroke can vary from person to person. However, the three FAST signs appear more consistently and are most indicative of a stroke and not other health issues. Raising awareness of these signs — along with the urgent need to call 9-1-1 — will help reduce the impacts of stroke.

FACE
is it drooping?

ARMS
can you raise both?

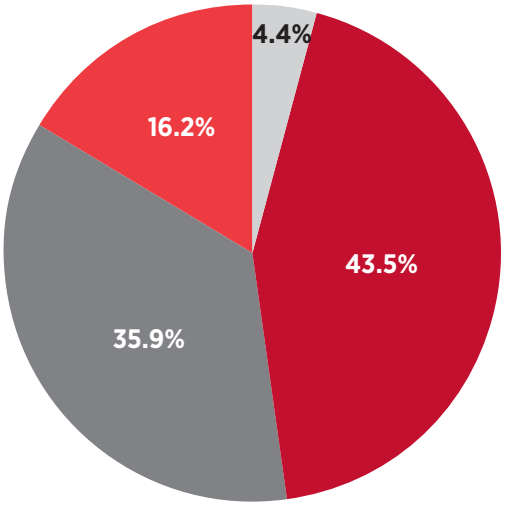
SPEECH
is it slurred or jumbled?

TIME
to call 9-1-1 right away.

ACT FAST BECAUSE THE QUICKER YOU ACT, THE MORE OF THE PERSON YOU SAVE.

Our poll revealed that there is still much work to be done to help Canadians recognize the signs of stroke and know what to do if they witness or experience them. Almost half of all respondents did not know any of the three FAST signs of stroke. Only one-third could name one FAST sign of stroke, and only one-fifth of respondents could name two or three. The poll revealed speech problems as the most frequently recognized sign.

Awareness of the three FAST signs of stroke



Reflects number of respondents who knew 0, 1, 2 or all 3 signs of stroke. Each respondent only counted once.

Awareness of the three FAST signs of stroke varies by province

Individual FAST Signs*	CAN	BC	AB	SK	MB	ON**	QC	NB	NS	PEI	NL
FACE (drooping face)	21%	19%	23%	27%	15%	26%	14%	11%	15%	16%	19%
ARMS (cannot raise arms)	13%	9%	8%	10%	11%	19%	11%	7%	6%	13%	7%
SPEECH (slurred or jumbled speech	47%	46%	42%	48%	48%	61%	26%	49%	52%	58%	42%

Notes: *Respondents may have provided more than one sign, therefore these numbers reflect responses, not people.
**The poll was carried out two months after the FAST campaign was launched in Ontario.

BLANCHE'S STORY: "If I hadn't seen that commercial..."


Blanche Gray and daughters

Blanche Gray loves to tell everyone about the commercial that saved her life.

It was January, 2015 and Blanche turned on the television to watch the evening news in her Mississauga, Ont., living room. The newscast hadn't started, so the grandmother of 10 sat through the commercial run, including an ad about the signs of stroke created by the Heart and Stroke Foundation.

The phone rang during the news. It was her daughter Lynn and they started to chat but, within seconds, Blanche's voice began to wobble. Something horrible was happening. Her words had deteriorated into a garble.

"Mom, what's the matter with you?" Blanche replied: "I think I'm having a stroke."

Lynn called 9-1-1 and the paramedics arrived quickly to Blanche's house and transported her to the hospital where she was diagnosed with a TIA or mini-stroke.

Looking back, Blanche counts herself as lucky. "In those few minutes, I recognized that the things they talked about on TV were happening to me. Pay attention to the signs your body gives you. That's what I did and that's why I got through it so well. If I hadn't seen that commercial, I probably wouldn't have recognized I was having a stroke."

CALL 9-1-1 —

2

CALLING 9-1-1 IS A CRITICAL STEP

According to our poll, about 77 per cent of Canadians report they would call 9-1-1 as the first thing they would do if someone is having a stroke. However, in reality, that is not happening as often as it should. According to data from CIHI's emergency department database, only 59 per cent of all people with stroke arrive at the hospital by ambulance having called 9-1-1 or a local emergency number.

This means that four out of 10 Canadians experiencing stroke are not arriving at hospital by ambulance — which is the safest and most efficient way to get to an appropriate hospital and to receive the best care. Of those poll respondents who stated they would not call 9-1-1 first:

- 20 per cent said they could deal with the situation themselves
- 15 per cent said they did not think about 9-1-1
- 14 per cent said they would not want to make a fuss in case it was not serious
- 12 per cent said they would drive the patient themselves.

Not everyone who has a stroke is admitted to hospital from the emergency department, but those who are may have had a more serious stroke. Of all stroke patients who are admitted to hospital, only 69 per cent arrived at the hospital by ambulance according to CIHI inpatient data.

People admitted to hospital for stroke who arrived by ambulance: The Canadian average is 69%, provincial rates as follows:

BC	AB	SK	MB	ON	QC*	NB	NS	PEI	NL
67%	75%	64%	65%	69%	- %	62%	73%	64%	68%

* Not available in Quebec data collection system

"Stroke will affect you or a member of your family during your lifetime," says Dr. Hill. "By recognizing the signs of stroke and calling 9-1-1 immediately you could save a loved one from a life of disability."

RON'S STORY: "I didn't want to have a stroke! Who does?"

Ron Smith

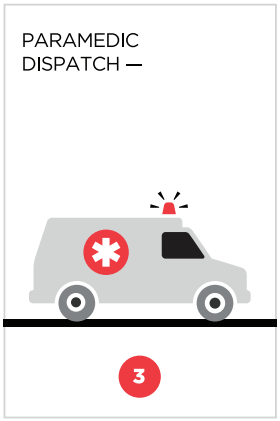
On the morning of Nov. 19, 2012, Ron Smith, a BC writer and retired teacher, stood in the bathroom doorway of his Nanoose Bay home watching his wife, Pat, get ready to go out. He felt a bit odd, a bit weak — but nothing a nap wouldn't cure. Two hours later he returned to his computer to work. Immediately he noticed his right hand was crawling over the keys; it was sluggish and required all his concentration to move each finger. His hands looked and behaved like lobster claws, moving in slow motion. Without much thought he typed "stroke" into Google. Several sites popped up, each including a list of stroke signs. Some sites recommended simple tests, which he took and felt he had passed — "inability to type" did not appear on any of the tests.

He was immediately relieved, and as he now realizes, instantly in denial. "A symptom was present, but one I was more than happy to ignore or rationalize away as anything but a stroke. After all, I didn't want to have a stroke! Who does?"

Feeling unwell and dizzy, he went back to bed for several hours. His wife returned, and concerned that something was wrong, suggested they go to the hospital. Ron resisted. More time passed. Finally he relented and his wife drove him to the emergency department of their local hospital. Ron continued to deny he was having a stroke while Pat placed it at the top of her list of possible explanations for what he was experiencing. Fortunately the emergency room doctor heeded her words and, along with Ron's anecdotal account of what he was experiencing, diagnosed Ron with stroke. Twenty minutes later while still in the emergency department he suffered a second massive, life-changing brain attack.

Determined to recover, Ron has spent the last 2½ years working hard on rehabilitation, including writing a book about his experience. In hindsight, his advice to anyone experiencing or witnessing signs of stroke is direct and to the point: "Call 9-1-1. Had I used common sense I could have possibly prevented myself a lot of unnecessary grief."

As much as a healthcare system can be set up to provide optimal service, individuals in need of those services also play a key role. Canadians need to know what they have to do to ensure the best outcomes for themselves and their families. There is still much work to do to ensure all Canadians understand what a stroke is, recognize the signs, and know they must call 9-1-1 immediately if they experience or witness someone else having a stroke.



THE PARAMEDIC'S ESSENTIAL ROLE

The understanding and treatment of stroke has changed vastly over the past several decades. There is greater clarity around what stroke looks like, and better ability to assess and diagnose a stroke more quickly and accurately. A wide range of acute treatments and rehabilitation options are available thanks to advances in research and education.

The role of paramedics in stroke care has also changed, and paramedic education now incorporates specific training in the recognition and treatment of stroke.

"Over the past 10 years there has been more research conducted around how paramedic services can help with early identification of stroke patients, and how to engage other healthcare partners," says Paul Charbonneau, President, Paramedic Chiefs of Canada. "Paramedic services are a huge workforce of highly skilled individuals who are now active stakeholders in supporting stroke teams in providing rapid clinical assessments, and helping determine which hospital is appropriate for the stroke patient based on their immediate needs."

However, according to our poll, Canadians do not have a clear understanding of the essential role that paramedics play in stroke care and treatment. When asked why it is important to call an ambulance in the case of a suspected stroke, only one-third of respondents stated this was because stroke is an urgent condition that requires immediate action. Even fewer — only one-quarter — responded that ambulances can get to the hospital faster, and one-quarter said paramedics can start clinical assessment, treatment and care at the scene. Even more disturbing, very few — only five per cent — of respondents said they realize that paramedics know which hospitals are best equipped to provide stroke care.

Canadians need to be more aware of the expertise that paramedics bring to the critical first hours of stroke care, so they understand why calling 9-1-1 for a suspected stroke is so important.

WHEN THE AMBULANCE ARRIVES

As the initial point of contact, paramedics play a key role in the critical first hours of stroke care. Across provinces, the median time from receiving the 9-1-1 call to the paramedics arriving on-scene ranges from seven to 10 minutes. The shorter times are noted in more urban locations, according to data from paramedic services.

Data show that in most provinces between 81 per cent and 97 per cent of the population are able to reach a stroke centre by ground ambulance within six hours of calling 9-1-1. Once they arrive, the paramedics' goal is to address urgent health needs

PARAMEDIC SERVICES ACROSS THE COUNTRY

Responsibility for paramedic services — which include both land and air ambulance — varies across Canada. Paramedic services can be provincial, municipal, private or contracted. Paramedicine is regulated in all regions across the country, and the Paramedics Association of Canada, which represents more than 17,000 paramedic practitioners, developed the *National Occupational Competency Profile* that defines the competencies of paramedic graduates across the country. Costs for ambulance services vary across the country.

then transport the patient as quickly as possible to the appropriate hospital with stroke services.

Recognize and mobilize

Across the country, paramedics are trained to recognize the signs of stroke. As soon as they arrive, the goal is to "recognize and mobilize" by first recognizing the event as a stroke using a tool or scale to evaluate the patient, including the FAST signs of stroke. Other signs such as vision problems, paralysis or numbness, inability to walk and impaired alertness can also be part of the assessment protocol. Once they determine that a patient has likely had a stroke, paramedics begin a management regime which includes monitoring vital signs (blood pressure, heart rate, respiratory rate, oxygen levels) and checking blood sugar levels.

Some paramedic services have set a benchmark of less than 20 minutes spent on-scene. Data show that many paramedic services are meeting this target, with the median time spent on-scene ranging from 15 to 24 minutes across the country for those suspected of having a stroke.

Getting to the most appropriate hospital

Once the ambulance service stroke protocol is activated, paramedics may be directed to bypass a closer, smaller hospital and take the suspected stroke patient to the most appropriate hospital equipped to provide emergency stroke care, including the ability to administer a clot-busting therapy such as the drug tPA.

Data from Alberta and Ontario show that approximately 38 per cent of suspected stroke patients bypass a closer hospital to arrive at a hospital with specialized stroke services. Other provinces do not routinely collect this data. Unfortunately not all regions have bypass protocols in place. Valuable time is wasted if a stroke patient is not taken to the closest hospital equipped to deal with stroke and they subsequently have to be transferred to a more appropriate hospital. Worse, if they are not transferred they may not receive an optimal level of specialized stroke care.

According to our poll, just one-third of Canadians are aware that only some hospitals are designated stroke centres that are equipped to provide the best stroke care possible. This is an important message that more Canadians need to understand, as it reinforces the need to call 9-1-1 as the best way to access the most appropriate hospital quickly.

Gathering the facts

Another important function of the paramedic team is communication. Paramedics will speak to the person with stroke, their family and friends and others present to determine the time when the first signs of stroke began (i.e., the last time the patient was known to be well). Paramedics will also ask about existing health conditions and current medications and allergies. They will encourage a family member or other decision-maker to either accompany the stroke patient to the hospital or be accessible by phone to make decisions and provide any other needed information.

CANADIAN STROKE CARE SUCCESS

NEWFOUNDLAND INITIATIVE GETS PATIENTS TO THE RIGHT HOSPITAL FASTER

As of April 2014, Newfoundland and Labrador rolled out a system to allow paramedics to bypass a closer hospital and get stroke patients to the nearest stroke centre with a CT scanner and the ability to administer therapy such as the clot-busting drug tPA delivered intravenously. Before the new system was put in place, paramedics received training around the new protocol.

In a province that is geographically unique, with many remote communities, the bypass system is improving access to the most appropriate stroke care in the critical first hours.

The next steps necessary to strengthen this policy include increasing public awareness of the signs of stroke and the importance of calling an ambulance right away; developing a centralized dispatch system to identify the closest ambulance and reduce response times; standardizing call taking to ensure stroke signs are recognized and stroke protocols are activated; ensuring trained paramedics are available in every community so that expertise in stroke is available to every patient; and collecting and reviewing data across the province to allow for quality control and improvement.

Why speed matters

Establishing the time of stroke onset has critical implications for treatment. Patients who are eligible to receive a clot-busting treatment (a drug such as IV tPA) must receive it as soon as possible, and within 4½ hours of first experiencing symptoms in order to stop or reverse the effects of stroke. New endovascular procedures in some highly specialized centres, where clots are removed using a mechanical device, have a slightly longer intervention window of generally within six hours (up to 12 hours in selected cases) but time is still very much of the essence, and the faster the treatment, the better the outcome and recovery.

GETTING PATIENTS TO HOSPITAL FASTER AND MORE EFFICIENTLY

Paramedics not only get stroke patients to the most appropriate hospital, they can get them there more safely and efficiently. According to paramedic data, across provinces the median time from leaving the scene to arriving at hospital ranges from 10 to 29 minutes.

The amount of time from when a patient first experiences the signs of stroke to when they arrive at hospital directly influences recovery, with the goal being to make this time as short as possible.

As Canadians' knowledge of stroke and the essential role that paramedics play in the critical first hours deepens, the public will better understand why they need to call 9-1-1, and why they should not drive someone having a stroke to the hospital — and more importantly, why someone who might be experiencing a stroke should never drive themselves to the hospital.

The bottom line is the faster stroke signs are recognized and treatment is started, the greater the chances of a better outcome. Looking at the steps that need to happen in the process from stroke onset to best treatment, there are many opportunities for improvement, including increased public awareness, better coordination of services and faster paramedic and emergency department response times.

LETTING THE HOSPITAL KNOW YOU'RE COMING

Following best practice, paramedics should notify the emergency department at the receiving hospital that they are on their way with a suspected stroke patient. This in turn ideally activates a "Code Stroke" in hospitals where acute stroke protocols are in place, meaning the hospital personnel and stroke team members will be ready to start diagnosis and treatment of a potential stroke as soon as the patient arrives at the emergency department.

According to a stroke services inventory carried out by the Heart and Stroke Foundation in 2013, about half of hospitals across the country with stroke

CANADIAN STROKE CARE SUCCESS

NEW NEUROPROTECTANT DRUG SHOWS PROMISE IN STOPPING STROKE IN ITS TRACKS

A new Canadian-developed neuroprotectant drug, NA-1, shows promise in containing the damage done to the brain after an acute stroke. As part of a clinical trial called FRONTIER, the drug is being administered by paramedics to stroke patients who are within a three-hour window of symptom onset. NA-1 is intended "to stop the stroke from growing — it allows the brain to hold its breath," says Dr. Michael Tymianski, the Toronto neurosurgeon who developed it.

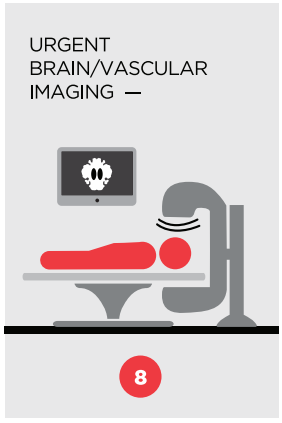
The three test sites of Greater Toronto, Peel Region and Vancouver were chosen because their paramedic services have established stroke bypass systems in place — meaning that an ambulance will bypass a closer hospital to arrive at one that offers specialized stroke services. Paramedics in the test sites have been equipped with vials of NA-1 and will work with on-call physicians to identify whether a patient experiencing stroke can receive the drug en route to the hospital.

services have such a system in place. Pre-notification systems for stroke patients are part of standard protocol in some provinces, for example Ontario and Nova Scotia. All provinces should follow this lead and make pre-notification part of standard stroke process for paramedics.

GETTING TO THE EMERGENCY DEPARTMENT

Once the ambulance arrives at the hospital, the transfer of care from paramedics to the receiving facility personnel should occur without delay along with a full report including: time of stroke onset or time the patient was last known to be well; total symptom duration time; a description of the signs of stroke observed; and the patient's age and medical history including medications and allergies. Patients with suspected acute strokes who are potentially eligible for acute stroke therapies such as tPA or endovascular therapy should receive a high priority in the emergency department triage queue.

Unfortunately, according to CIHI data, many stroke patients are not getting to the hospital soon enough to benefit from time-sensitive treatments. Only half of all stroke patients arrive within six hours from symptom onset and less than 40 per cent arrive within the 4½ hour window for administering tPA. Stroke patients in their 20s and 30s take the longest time to get to hospital — perhaps reflecting a lack of awareness that stroke can happen at any age, and denial of the signs of stroke.



GETTING A PICTURE OF WHAT'S GOING ON

Suspected stroke patients should be taken directly to a CT scanner once they arrive at hospital. A scan will determine the type of stroke (one caused by a clot or a bleed) and reveal if they can receive a clot-busting treatment within the 4½ hour window. Patients experiencing severe strokes caused by larger clots may also be eligible for new endovascular treatments to remove the clot, and this treatment must take place within six hours of stroke onset for most patients.

The CT scan produces a computer image of the brain, and important treatment decisions will be made based on these results. According to best practice all patients should have a CT scan as soon as possible after arrival and within 24 hours. CIHI data shows that 94 per cent of admitted patients

CANADIAN STROKE CARE SUCCESS

TRAINING HELPS NURSES TRIAGE STROKE PATIENTS WHO DO NOT ARRIVE BY AMBULANCE

At the McGill University Health Centre emergency department, nurses are trained to recognize the signs of stroke in patients who do not arrive by ambulance. They assess patients upon arrival for any signs of stroke such as sudden difficulty speaking, facial droop, sudden weakness of arm or leg, balance issues, and dizziness. The Canadian Neurological Scale is used to assess stroke severity.

Suspected stroke patients are triaged, a physician is called, and depending on the time of the onset of symptoms, a "Code Stroke" is activated to rapidly notify neurology and radiology. Protocols are in place for all stroke patients including those who are eligible for acute ischemic stroke treatments (such as tPA and endovascular therapy), to ensure timely access to best stroke management. Patients are also screened to make sure they can swallow safely before they are given medication, food or drinks by mouth.

Training is a collaborative effort between the emergency and neuroscience departments. Nurses benefit from formal education around standardized protocols and evidence that supports best care following the Canadian Stroke Best Practice Recommendations, and they receive one-on-one coaching. Physicians receive training as well. Open communications and relationship building between nurses and other emergency staff has been critical for success and sustainability. It has resulted in everyone speaking a common language and using the same tools in order to ensure best patient care.

CANADIAN STROKE CARE SUCCESS

PILOT PROJECT HELPS SENIORS REDUCE STROKE RISK AT HOME

Older adults are more at risk of falls and of developing cardiovascular disease and diabetes, which can lead to increased paramedic calls and costly emergency room visits. Recognizing this need, in 2012 McMaster University, the Hamilton Public Health Department, and local paramedics started the Community Health Assessment Program through Emergency Medical Services (CHAP-EMS) pilot project to provide community-based screening programs in an apartment building in a housing complex serving many seniors where emergency medical services were frequently called.

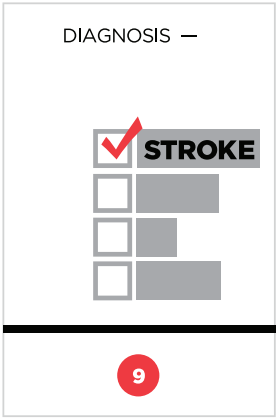
Trained paramedics who are working in alternative duties because of pregnancy or injury provide weekly drop-in sessions where they measure blood pressure, assess diabetes risk and discuss prevention including wellness activities. If the patients agree, their information is shared with their family physician. Blood pressure, lifestyle and cardiovascular risk status data is captured in a portable customized database.

Results from the pilot project included a decrease in calls to emergency medical services, improvements in blood pressure, and a decrease in diabetes risk, as well as positive changes in overall healthy lifestyle factors including improved diets and increased physical activity, and decreased tobacco and alcohol use. The social and community-building aspects of the program have also been noted as an unintended benefit.

The project now includes eight sites (four intervention and four control sites) with high populations of seniors aged 65 and over, and there are plans to expand into more regions across Ontario. Evidence is being collected for the following outcomes: hospital visits, mortality, heart attack, and stroke.

The success of the program is credited to several factors: accessibility; frequency of sessions; engagement and participation of family doctors; and approachability of the paramedics.

receive a CT scan within 24 hours of arriving at hospital; patients who arrive by ambulance are more likely to get a scan within 24 hours than those who do not come by ambulance



DIAGNOSIS: STROKE

According to emergency department data from CIHI, of all patients who arrive at hospital for stroke, 54 per cent were ischemic (caused by a clot), 35 per cent were TIAs (milder forms of ischemic stroke), and 11 per cent were hemorrhagic (caused by bleeding).

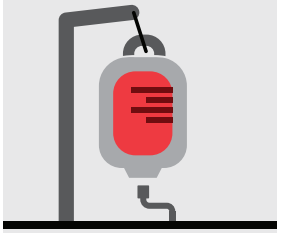
Telestroke brings expertise to distant bedsides

When stroke experts are not available within a hospital, patients can benefit from stroke expertise through telestroke. Telestroke uses various types of technology to link healthcare sites, allowing specialists to provide diagnosis and treatment recommendations and services to stroke patients wherever they are. Currently telestroke is primarily being used for urgent cases to increase access to clot-busting drugs through consulting neurologists, and this has proven to be very effective. But there are great opportunities to use it at any point in stroke care including secondary stroke prevention and rehabilitation; it can be used to provide access to other specialists, for example, speech-language pathologists.

Telestroke has numerous benefits to both stroke patients and the health system, including reducing the effects of stroke. Telestroke can address regional inequities in access to specialized stroke services, and also the standards of that care. This is an issue of concern to Canadians as according to our poll, most respondents (80 per cent) believe that people in urban centres have more and better access to stroke care than those in more rural regions across the country.

Telestroke can also reduce costs for health care and long-term social support. Although telestroke continues to expand in areas across the country, there is still much opportunity to make better use of this technology to increase access for all Canadians to specialized stroke care.

INTERVENTIONS —



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TIMELY TREATMENT CAN SAVE LIVES

There have been improvements both large and small in stroke interventions over the past several years. Thrombolytic drugs such as tPA, which break up the clots that cause ischemic strokes, were revolutionary when they were introduced and have greatly improved outcomes for stroke patients. Although there is still room to improve access to tPA — through telestroke and other initiatives — progress is being made. CIHI data reveal that the number of patients receiving tPA has had a relative increase of five per cent over the past two years.

Optimal door-to-needle times for clot-busting drugs

Unfortunately, not enough patients are receiving treatment quickly enough — described as "door-to-needle time," meaning the time from arrival at hospital to the time they receive IV tPA. CIHI data reveal that the median door-to-needle time is 104 minutes, which is too long and far outside the 30-minute target and the upper limit of receiving IV tPA within 60 minutes of arriving at hospital. By using a systematic quality improvement approach, this target can be achieved, as it has been in Calgary. Comprehensive stroke centres in Montreal and Ottawa have also improved door-to-needle times. It starts with healthcare providers recognizing that stroke care requires a sense of urgency and putting the appropriate processes in place; success requires paramedics, the emergency department and the stroke team to work collaboratively and seamlessly.

CANADIAN STROKE CARE SUCCESS

EXPANDING TELESTROKE ACROSS THE COUNTRY

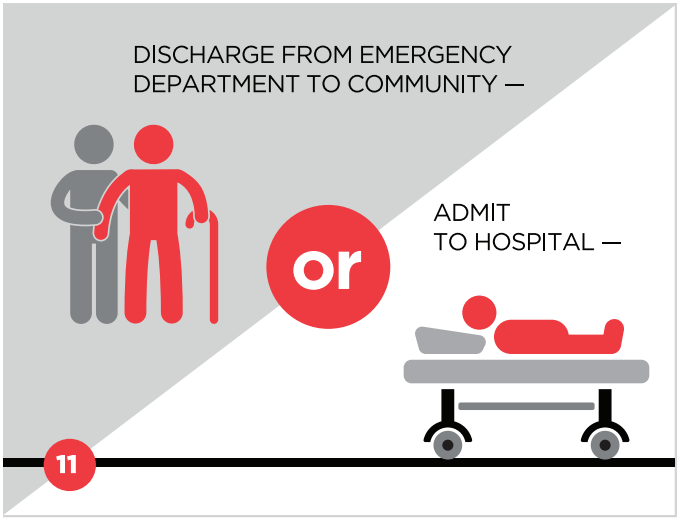
New Brunswick: As of December 2014, all 10 facilities with CT scanners that provide emergency care in New Brunswick implemented telestroke services around the clock, ensuring stroke patients have access to emergency stroke care across the province. Using telestroke to link emergency department physicians to a neurologist any time of day ensures rapid assessment, diagnosis, and treatment of stroke patients. All protocols are available in both English and French, and the FAST stroke signs (Face, Arms, Speech, Time) are used by the paramedics.

Several partners were involved from the outset of the project, ensuring successful implementation. Partners include Ambulance New Brunswick, Horizon Health Network, Vitalité Health Network, the Heart and Stroke Foundation of New Brunswick, the Ministry of Health and the New Brunswick Medical Association. Working with a diverse group of partners, including medical staff, information technology experts and administrators, required active engagement from all parties as well as commitment to working together, learning each other's language and understanding different priorities. Excellent coordination between emergency departments and diagnostic imaging has resulted in reduced door-to-CT-scan times.

Northern Manitoba: A telestroke program has expanded access to emergency stroke care in northern Manitoba. Using telehealth technology, the Thompson General Hospital (TGH) is the first telestroke site and the fourth location to provide stroke care in the province, joining the Health Sciences Centre and St. Boniface Hospital in Winnipeg, and the Brandon General Hospital.

Several committees were formed during the planning stages, which enabled important groundwork to be carried out. This multidisciplinary team included partners from emergency medical services (EMS), community sites, TGH emergency room staff, CT scan technologists, laboratory technologists, neurologists and management. Pre-hospital work included developing a stroke protocol for paramedics, which includes pre-notifying the stroke centre, and an acute stroke care map for community sites, which helps staff rapidly recognize, assess and transport suspected stroke patients to TGH. A time-driven stroke protocol was developed for TGH emergency, which enables rapid stroke assessment and diagnosis. Telehealth technology (available 24/7) was also installed to enable real-time communication with the telestroke neurologist in Winnipeg during a stroke protocol. Leadership in the North and at Manitoba Health were also essential in the planning and successful roll out of the pilot project.

As part of the province's stroke strategy, the plan is to have telestroke rolled out to other general hospitals with CT scanners in each regional health authority by 2016.



AFTER THE EMERGENCY DEPARTMENT

Hospitalizations from stroke have decreased in some provinces, in part because there are more services available in the community for people with mild stroke. According to the latest data from CIHI, one-third of stroke patients are sent home from the emergency department and the other two-thirds are admitted to hospital. All stroke patients discharged directly from the emergency department (i.e., not admitted to hospital) should be referred to a stroke prevention clinic for follow-up and additional evaluation and management, including rehabilitation if indicated.

Even though patients who are not admitted to hospital should receive a referral to a stroke prevention service, fewer than half of these patients do. Receiving an individualized plan and coordinated follow-up helps patients manage their risk factors and reduces risk of recurrent stroke. This is especially important as the first 90 days is a high risk period for a recurrent stroke, and in particular the first two weeks pose the greatest risk. This lack of follow-up in the community for all Canadians is a substantial gap in stroke care.

CANADIAN STROKE CARE SUCCESS

ENDOVASCULAR TREATMENTS SHOW HUGE PROMISE IN IMPROVING OUTCOMES

Endovascular treatment is a minimally invasive procedure that allows access to many regions in the body through a large blood vessel using a special device. This has been a rapidly advancing field in the treatment of ischemic stroke over the past few years, with Canada being one of the leading forces.

Dramatic results from the ESCAPE trial, co-funded by the Heart and Stroke Foundation, are set to change the way major strokes are treated in Canada and around the world. The new treatment was shown to cut by half the death rate from major ischemic strokes and also showed a 30 per cent increase in positive outcomes and reduced disability. In the test group, high-tech equipment and imaging was used to remove the clot through the patient's blood vessels, restoring blood flow to the brain.

"Speed of treatment and teamwork were critical factors in the success of the ESCAPE trial. We emphasized speed and seamless work flow to ensure patients were treated very fast and the arteries were being unblocked as quickly as possible," says Dr. Hill.

Using a procedure called endovascular thrombectomy (ET), doctors insert a thin tube through an artery in the patient's groin, guiding it with advanced X-ray imaging through blood vessels to the brain. There, a retrievable stent is used to remove the clot. While ET is not a completely new procedure, the ESCAPE trial tested its effectiveness in a new model of care that relies on:

- **Imaging for diagnosis**: Innovative imaging was used to quickly identify which patients could receive ET.
- **Speed**: Coordinated hospital workflow and teamwork was essential to getting them treated fast.
- **Novel technology**: The retrievable stent was used to remove a clot with X-ray imaging to guide it to the blockage.

The Heart and Stroke Foundation has been working to facilitate implementation of these findings into practice. This endovascular treatment is now included in the Canadian Stroke Best Practice Recommendations with a treatment window of six hours from stroke onset for most eligible patients — making Canada one of the first countries in the world to incorporate this treatment into its healthcare systems.

WHAT DO CANADIANS KNOW ABOUT STROKE RISK?

When asked to identify the main risk factors for stroke, surprisingly only one-third of respondents to our poll identified smoking, one-quarter identified diet, one-quarter noted physical inactivity, and one-fifth identified obesity. Although all of these results show a general lack of awareness around stroke risk factors, of particular concern is that only one-fifth of the Canadians who responded to the poll noted high blood pressure as a main risk factor for stroke, when in fact it is the number one risk factor.

When asked what is the most important thing they could do personally to help reduce their risk of stroke, the top three responses were getting more exercise, eating better and quitting smoking.

Nine out of 10 Canadians have at least one risk factor for stroke. **Here are the risk factors Canadians can do something about**:

- Know and control your blood pressure.
- Be physically active. Try to get at least 150 minutes of moderate- to vigorous-intensity activity per week, in bouts of 10 minutes or more.
- Eat a healthy diet. Aim for between five and 10 servings of vegetables and fruit every day.
- Achieve and maintain a healthy weight: Watch your waistline. According to the *Canadian Stroke Best Practice Recommendations*, waist circumference should be less than 88 centimetres for women and less than 102 centimetres for men.
- If you choose to drink, consume alcohol in moderation. Women should limit themselves to two drinks a day, to a weekly maximum of 10; and men to three drinks a day to a weekly maximum of 15.
- Be smoke-free.
- Manage diabetes.
- Keep your blood cholesterol in check.
- Be pulse aware. Ask your doctor about atrial fibrillation.
- Manage stress. Identify the source of your stress, talk to friends and family and take time for yourself.

Risk factors that Canadians cannot control but should be aware of:

- age
- gender
- family history
- ethnicity
- history of stroke or TIA (“mini-stroke”).

CANADIAN STROKE CARE SUCCESS

THE POWER OF NUMBERS: USING DATA TO IMPROVE STROKE CARE ACROSS QUEBEC

A novel collaborative initiative is underway in Quebec that will help ischemic stroke patients get treated faster and recover better. Using methodology developed for a similar project carried out for heart attack patients, data is being collected and analyzed to identify improvements in stroke care.

Ten independent medical record librarians are reviewing stroke charts in all hospitals across the province that had at least 20 stroke admissions in the previous year. Results are entered into a central, secure stroke website. Clinical chart data will be linked to provincial pre-hospital and in-hospital administrative databases. Through data linkage, the researchers are able to measure delays throughout the processes of care, for example, time from 9-1-1- call to arrival at hospital, triage at the emergency department, CT scan time, stroke severity, thrombolysis (administering of clot-busting drugs), and endovascular treatment. Hospital readmissions, billed medical services and deaths after the stroke are being identified.

Data from 3,500 patients discharged from hospital with ischemic stroke for a six-month period (October 2013 – March 2014) in 79 hospitals is being collected. The researchers are currently developing a preliminary report based on information from the province’s four tertiary hospitals that provide comprehensive stroke care. The final report will provide a comprehensive and impartial portrait of the system of ischemic stroke care in Quebec, with recommendations where the system can be improved.

HOW HEART AND STROKE FOUNDATION FUNDED RESEARCH IS MAKING A DIFFERENCE

2015

ESCAPE, a Canadian-led, international clinical trial co-funded by the Foundation, shows remarkable results in the treatment of major strokes caused by blood clots, and heralds the most significant change in stroke treatment in the last 20 years.

2015

The Foundation co-funded the work of Dr. Michael Tymianski that led to the discovery of NA-1, a neuroprotectant drug that shows promise containing the damage done to the brain after an acute stroke. The drug begins testing in the FRONTIER trial in March 2015.

2014

The Foundation supports research that uses improved heart monitoring to better detect atrial fibrillation, a risk factor for stroke.

2011

Quality of Stroke Care in Canada is released, a report based on the first Canada-wide stroke audit and a survey of stroke service availability, co-led by the Foundation. The Foundation produces annual stroke reports based on a range of data sources to continually monitor stroke care delivery.

2010

The INTERSTROKE study, co-funded by the Foundation, identifies 10 risk factors that account for 90% of the risk of ischemic and intracerebral hemorrhagic stroke worldwide.

2006

The Foundation co-leads the development of the *Canadian Stroke Best Practice Recommendations*, leading to increased consistency and standardization of stroke care in Canada.

2003

The Foundation leads the development of the Canadian Stroke Strategy, which will revolutionize stroke prevention, treatment and care.

2000

A Foundation-funded project discovers that ACE inhibitors significantly reduce the risk of heart attacks and strokes.

1999

Foundation researchers pioneer access to tPA, a clot-busting drug that can erase the effects of stroke.

1997

Human genome is mapped with Foundation funding, including identification of more than 84,000 DNA sequences related to heart disease and stroke.

1983

Foundation funded researcher Dr. Robert Côté perfects the Canadian Neurological Scale, a clinical tool that measures neurological deficit following an acute stroke. The scale is now used in Canada and all over the world.

1976

Dr. Henry Barnett conducts the first clinical trial using Aspirin to prevent strokes. Dr. Barnett was instrumental in increasing funding for stroke research.

STRENGTHENING STROKE CARE ACROSS THE COUNTRY

What can Canadians do?

Learn the signs of stroke and act FAST. Information about the recently launched FAST campaign is available on the Foundation's **website**, or order or download resources for your family, friends or patients **online**.

Get informed and take action.

- ***Your Stroke Journey: A Guide for People Living with Stroke*** is a comprehensive guide to help stroke survivors and their families understand the effects of stroke and manage their recovery. Available to **download** or **in print**.
- ***Taking Charge of your Stroke Recovery: a Survivor's Guide to the Canadian Stroke Best Practice Recommendations*** is a resource for stroke survivors and their families that describe key recommendations for stroke care. Available to **download**.
- **Post-stroke checklist for clinicians and patients** is an easy to use guide to ensure important aspects of stroke prevention and follow-up are addressed. Available to **download**.
- *Canadian Stroke Best Practice Recommendations* provide comprehensive guidelines for healthcare professionals working with stroke patients and their families, and patient and professional education resources have also been developed. Available at **strokebestpractices.ca**

Health eTools are available on the Foundation website:

- Learn your risks with the **Heart&Stroke Risk Assessment**
- Take control of your blood pressure with the **Heart&Stroke Blood Pressure Action Plan**.

What can governments and healthcare system decision-makers do?

- Support FAST campaigns in all provinces and territories to ensure all Canadians recognize the signs of stroke and know to call 9-1-1 or emergency medical services immediately.
- Take a leadership role in stroke care and continue to fund and support provincial stroke strategies leveraging the Heart and Stroke Foundation's *Canadian Stroke Best Practice Recommendations*.
- In provinces and territories without a stroke strategy, the government in collaboration with regional authorities should develop a comprehensive strategy, which includes an integrated approach covering prevention, diagnosis, treatment, rehabilitation and community re-engagement.
- Support the development of coordinated systems of stroke care including stroke units and stroke care teams.
- Implement and support 9-1-1 systems across each province and territory to ensure access to timely life-saving services for all residents. Reduce financial barriers to emergency medical services across the country.
- Develop coordinated regional bypass systems so emergency medical services can bypass non-stroke hospitals and get stroke patients to the right hospitals with the appropriate level of stroke services in a timely manner.
- Expand telestroke infrastructure and utilization to provide access to optimal stroke services across the continuum of care (diagnosis, treatment, rehabilitation and prevention) to all Canadians including those in rural and remote regions.
- Expand access to outpatient stroke services including stroke prevention clinics and community-based rehabilitation programs.
- Develop detailed and coordinated provincial surveillance systems and other data and information infrastructure which allow for continuous tracking to address gaps across the system from prevention to treatment and care through to rehabilitation.

What can healthcare providers do?

- Train all paramedics and healthcare team members to recognize the signs of stroke and carry out stroke protocols.
- Implement the Heart and Stroke Foundation's *Canadian Stroke Best Practice Recommendations*.
- Promote and implement coordinated systems of stroke care working with interdisciplinary teams across the continuum of care starting with emergency medical services and primary prevention.
- Put patients, families and caregivers at the center of stroke care to increase positive patient and family experiences and improve outcomes.
- Take a leadership role and advocate for stroke systems improvement, enabling all patients to receive optimal stroke care across the continuum regardless of location.
- Collect continuous data on all aspects of stroke care to help drive improvement.

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*Unless otherwise indicated, the term stroke throughout the report includes all ischemic and hemorrhagic strokes as well as transient ischemic attacks (TIAs or mini-strokes).

DATA SOURCES:

** Canadian Institute for Health Information:

- Discharge Abstract Database (DAD) data includes all stroke patients admitted to any hospital in Canada (except Quebec) from April 2003 to March 2014, with a most responsible diagnosis of ischemic stroke, transient ischemic attack, intracranial hemorrhage or subarachnoid hemorrhage. Total available cases = 425,799.
- The National Ambulatory Care Reporting System (NACRS) includes data from stroke patients seen in emergency departments from all Ontario hospitals, all Alberta hospitals (2010 – 2013), and some hospitals in Nova Scotia (2003 – 2013), Prince Edward Island (2003 – 2013), Manitoba (2009 – 2013), Saskatchewan (2011 – 2013) and British Columbia (2003 – 2009). Total available cases = 279,462.

***Emergency Medical Services data contains four key time intervals during paramedic response to emergency stroke calls. Data was provided by paramedic services that have access to electronic tracking systems from British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia and Prince Edward Island. Newfoundland and Labrador does not collect paramedic response time data in electronic format. Quebec data not available at this time.

****The Heart and Stroke Foundation Signs of Stroke poll was conducted by Environics Research Group. A total of 2,888 Canadians 18 years of age and over were surveyed by telephone between March 2 and 15, 2015. A survey of this magnitude yields results that are accurate to within plus or minus 1.8 points, 19 times out of 20.