

Improving Access and Efficiency of Ischemic Stroke Treatment Across Four Canadian Provinces Using a Stepped Wedge Trial

Background

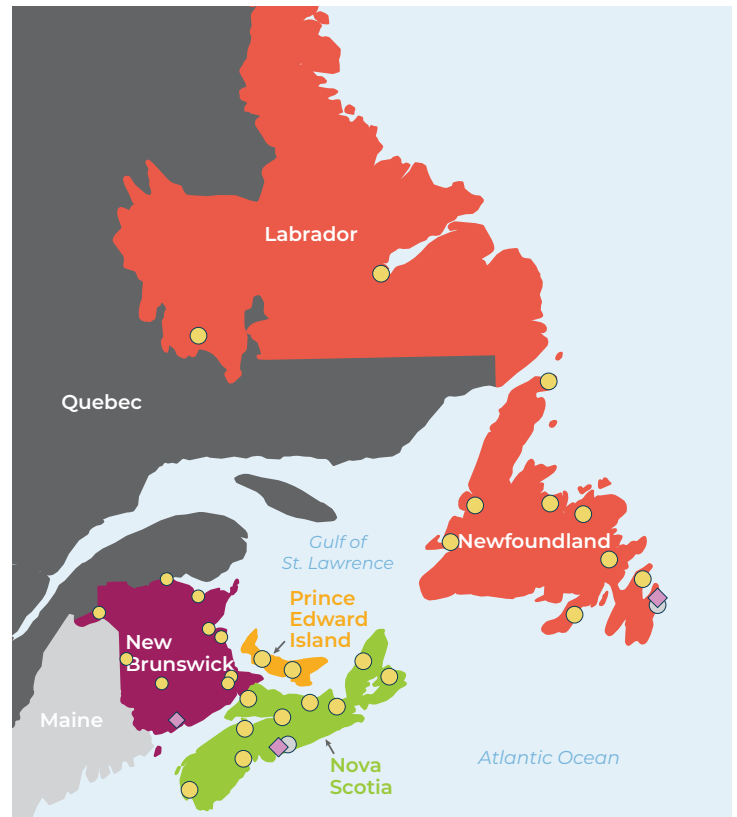
Ischemic stroke is treatable with thrombolysis and/or endovascular treatment (EVT). Both treatments are highly time dependent, as faster treatment results in better outcomes—approximately 1.9 million neurons are lost every minute. Utilization of both of these treatments is less than optimal, and treatment times continue to exceed the recommended benchmarks.

An improvement intervention was launched across Atlantic Canada, which has four provinces: Nova Scotia (NS), New Brunswick (NB), Prince Edward Island (PE), and Newfoundland and Labrador (NL). The intervention was conducted through the Atlantic Canada Together Enhancing Acute Stroke Treatment (ACTEAST) Project, which aimed to improve access and efficiency of treatment for acute ischemic stroke patients.

Table 1. Population and Geographic Size of Each of the Canadian Atlantic Provinces

	NS	NB	PE	NL
Population (2022 Estimate)	1,002,586	797,102	166,331	522,453
Size (km²)	55,284	72,907	5,660	405,720
Number of Primary Stroke Centres	9	9	2	10
Number of Comprehensive Stroke Centres	1	1	0	1*
Number of Alteplase Capable Centres (Bypass)	1	0	0	1

* The Comprehensive Stroke Centre (CSC) in NL began performing EVT treatment on June 20, 2022



- ◆ Comprehensive Stroke Centre
- Primary Stroke Centre
- Alteplase Capable Centre (Bypass)

Figure 1. Location of all Primary Stroke Centres and Comprehensive Stroke Centres in Atlantic Canada

Improvement Collaborative Intervention

The Improvement Collaborative for the ACTEAST project was modified from the IHI Breakthrough Series Collaborative model. The entire process was six months in length. There were two Learning Session/Action Periods. Each Learning Session was 1-day long. Additionally, all Learning Sessions and site visits were conducted virtually due to COVID-19 restrictions with the exception of one Learning Session for one cluster that used a hybrid delivery, which will be elaborated on in the next section.

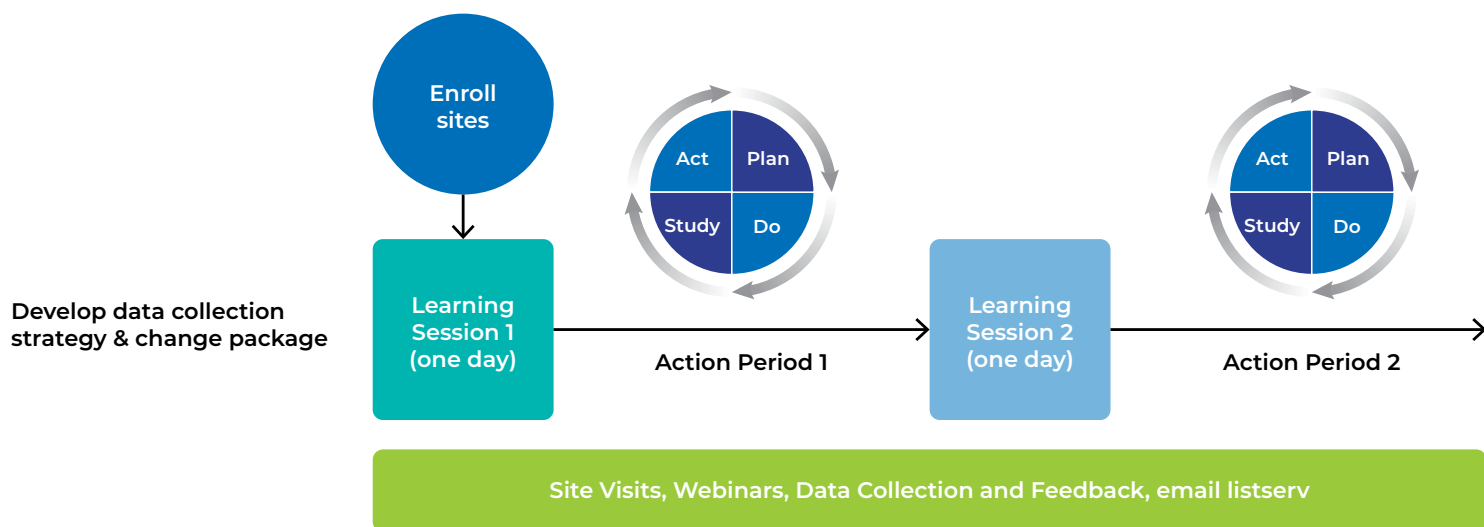


Figure 2. Improvement Collaborative Intervention for ACTEAST project

Objectives

The primary objective for the ACTEAST project is to **increase the proportion of ischemic stroke patients that receive either thrombolysis or EVT by 5%.**

The secondary objectives are as follows:

1. To reduce the median door-to-needle time (DNT) of all patients treated with alteplase or Tenecteplase.
2. To increase the proportion of all ischemic stroke patients that are discharged home from acute care.
3. To increase the proportion of all treated ischemic stroke patients that are discharged home from acute care.
4. To reduce the hospital length of stay for all ischemic stroke patients.
5. To reduce the hospital length of stay for all treated ischemic stroke patients.
6. To reduce the door-in-door-out times for all patients transferred for EVT.
7. To reduce the door-to-groin-puncture times for all EVT treated patients.
8. To reduce the time to treatment from first medical contact (911 call).

Stepped Wedge Trial

The evaluation of this Improvement Collaborative intervention will be conducted through a stepped wedge trial. In this trial, all sites will be assigned to a group or cluster. Each cluster will go through the intervention at different times. Prior to going through the intervention, all clusters are in the control phase, while after the intervention, all clusters will have the intervention fully implemented. The intervention is 6 months in length, and it is the Improvement Collaborative described generally above. In Table 2, the orange areas show the “control” periods where the intervention has not yet started, and the green areas show the periods after intervention has been completed. The data collected in the orange and the green phases will be analyzed, and data during the implementation phase will be excluded.

There are three clusters in this stepped wedge trial, and the 6-month Improvement Collaborative intervention will be delivered in phases from Nov 2020 to Apr 2022. The first cluster will include all participating sites in the province of NS. Once this cluster ends, the second cluster will immediately begin, and it includes all participating sites in the provinces of NB and PE. The final cluster includes all participating sites in NL.

Table 2. Stepped Wedge Trial for ACTEAST Project

Sites	Cluster 1 (NS)	Cluster 2 (NB, PEI)	Cluster 3 (NL)
Lead in Phase (May/20 – Oct/20)	Retrospective Data Collection	Retrospective Data Collection	Retrospective Data Collection
Phase 1 (Nov/20 – Apr/21)	Intervention	No	No
Phase 2 (May/21 – Oct/21)	Yes	Intervention	No
Phase 3 (Nov/21 – Apr/22)	Yes	Yes	Intervention
Phase 4 (May/22 – Oct/22)	Yes	Yes	Yes

- The orange periods show the time periods prior to the intervention. The green periods show the time periods after the intervention. The yellow shows the 6-month period for the Improvement Collaborative intervention.

Engagement Results (PI: Dr. N. Kamal, Dalhousie University)

There was a high level of engagement across all three clusters with a high level of physician engagement.

Table 3. Summary of Engagement Across All Three Clusters for Each Component of the Improvement Collaborative

Component	NS	NB-PE	NL
Percent of Stroke Centres Participating*	91%	100%	100%**
Total number of participants	98	86	72
Total number of teams	11	12	9
Mean number of participants per team (SD)	8.6 (3.17)	7.7 (3.00)	7.9 (2.85)
Attendance at Learning Session 1	81	73	46
Attendance at Learning Session 2	60	43	50
Number of Webinars	6	5	5
Mean attendance at webinars (SD)	29.0 (6.8)	26.0 (6.3)	19.0 (8.5)
Mean attendance at site visits (SD)	8.8 (4.5)	7.0 (2.8)	8.3 (5.7)

*including tPA capable bypass centres

**one team withdrew halfway through the Improvement Collaborative

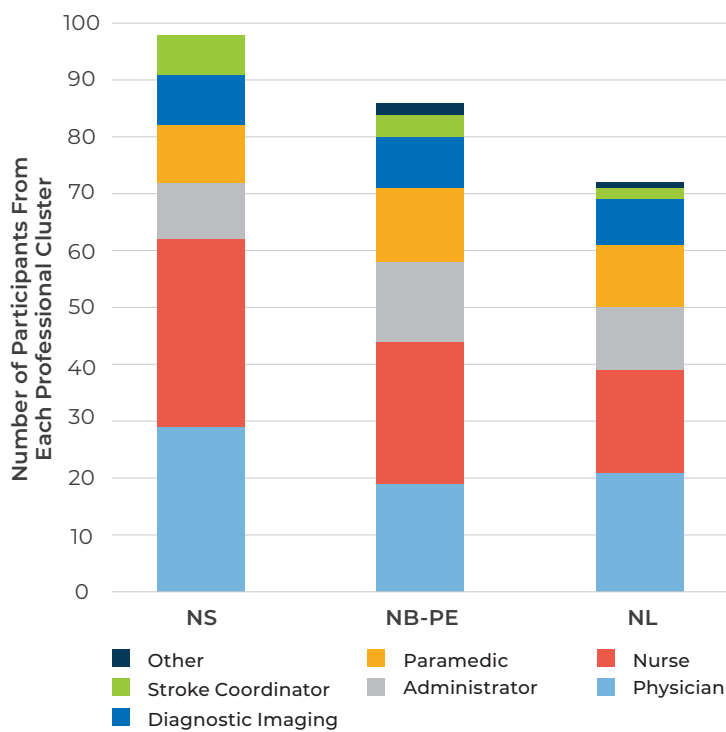


Figure 3. Number of Participants From Each Professional Group for Each Cluster in NS, NB, PE, and NL

Anticipated Results and Benefit

The health impacts of ACTEAST includes both health status (less disability) and determinants of health (efficiency, effectiveness, and appropriateness). The estimated benefit is an additional 7–15% of ischemic stroke patients will gain functional independence. This increase translates to 260 to 550 more patients every year will be able to return home after their stroke in Atlantic Canada. These benefits will be especially apparent in rural and remote communities, which are presently underserved. Additionally, stroke is a very expensive disease, as patients often require lengthy stays in hospital for rehabilitation, which will be reduced through the objectives of the ACTEAST project. If more patients can access efficient treatment, there will be significant cost avoidance to the health system across Atlantic Canada. Based on studies estimating the cost of treatment by stroke outcomes, approximately \$7.8 million per year in health care costs will be avoided across Atlantic Canada, based on an additional 260 patients being able to return home with no disability. This significant potential rate of return on a relatively small investment in a short time frame is unsurpassed by any treatment that is currently available to patients.