

# Automated CT Perfusion Imaging to Aid in the Selection of Patients With Acute Ischemic Stroke for Mechanical Thrombectomy: Recommendation

## Final Recommendation

- Ontario Health, based on guidance from the Ontario Health Technology Advisory Committee, recommends publicly funding mechanical thrombectomy within 24 hours of acute ischemic stroke, and that automated CT perfusion imaging is an important tool to facilitate patient selection

## Rationale for the Recommendation

The Ontario Health Technology Advisory Committee has accepted the findings of the health technology assessment.<sup>1</sup> Committee members agreed that in appropriately selected patients, functional independence in patients treated within 24 hours of an acute ischemic stroke is superior with mechanical thrombectomy, and noted that two recent randomized controlled trials<sup>2,3</sup> have both used automated CT perfusion imaging to assess the eligibility of stroke patients for mechanical thrombectomy.

The committee members also noted that using automated CT perfusion imaging to assess stroke patients may support appropriate transitions in care from referral hospitals to specialized stroke centres, optimize the quality of care for stroke patients, and lead to a more efficient use of resources. Committee members also noted that the current body of evidence primarily includes studies using one particular neuroimaging platform, and because of this it remains uncertain whether the results of these studies are generalizable to automated CT perfusion imaging using other platforms. Committee members advised that implementation be carefully planned, given that the use of automated CT perfusion imaging may substantially affect patient volumes at some centres.

## Decision Determinants for Automated CT Perfusion Imaging to Aid in the Selection of Patients With Acute Ischemic Stroke for Mechanical Thrombectomy

Decision Criteria	Subcriteria	Decision Determinants Considerations
<b>Overall clinical benefit</b> How likely is the health technology/intervention to result in high, moderate, or low overall benefit?	<b>Effectiveness</b> How effective is the health technology/intervention likely to be (taking into account any variability)?	<p>Automated CT perfusion imaging has an acceptable sensitivity and specificity for detecting brain areas that have been affected by stroke. Misclassification of patients (missing eligible patients or classifying patients as eligible for mechanical thrombectomy when they are ineligible) can occur in 7% of patients assessed using automated CT perfusion imaging (GRADE: Moderate).</p> <p>Based on the results of randomized controlled trials, patients who were assessed as eligible for mechanical thrombectomy using automated CT perfusion imaging had a significantly higher rate of functional independence (defined as a modified Rankin scale score of <math>\leq 2</math> at 90 days) after mechanical thrombectomy; mortality and risk of intracranial hemorrhage within the first 24 hours after surgery did not change significantly (GRADE: Moderate).</p>
	<b>Safety</b> How safe is the health technology/ intervention likely to be?	<p>Automated CT perfusion imaging may misclassify a person as eligible for mechanical thrombectomy when they are ineligible, or miss that they are eligible for the procedure. The evidence did not report any harms from misclassification.</p>
	<b>Burden of illness</b> What is the likely size of the burden of illness pertaining to this health technology/intervention?	<p>In Ontario, approximately 14,000 people experience an acute ischemic stroke every year.</p> <p>The use of automated CT perfusion imaging is mainly to aid in the selection of patients for mechanical thrombectomy who arrive at a hospital 6 to 24 hours after stroke symptom onset. According to experts, most patients arrive at hospital for assessment within 6 hours after stroke symptom onset, and a small proportion arrive between 6 and 24 hours after stroke symptom onset.</p>

Decision Criteria	Subcriteria	Decision Determinants Considerations
	<b>Need</b> How large is the need for this health technology/intervention?	Approximately 30% of people who experience an acute ischemic stroke have a blockage in a large vessel in the brain and could benefit from mechanical thrombectomy.  We estimated that about 42 hospitals (11 hospitals that provide mechanical thrombectomy and 31 referral hospitals) may need automated CT perfusion imaging.
<b>Patient preferences and values</b> How likely is adoption of the health technology/intervention to be congruent with patient preferences and values and with ethical or legal standards?	<b>Patient preferences and values</b> Do patients have specific preferences, values, or needs related to the health condition, health technology/intervention, or life impact that are relevant to this assessment? (Note: The preferences and values of family members and informal caregivers are to be considered as appropriate.)  <b>Autonomy, privacy, confidentiality, and/or other relevant ethical principles as applicable</b> Are there concerns regarding accepted ethical or legal standards related to patient autonomy, privacy, confidentiality, or other ethical principles that are relevant to this assessment? (Note: The preferences and values of the public are to be considered as appropriate.)	Patient preferences and values would likely reflect the clinical outcomes of mechanical thrombectomy: patients would value improved functional independence, reduced disability, and mortality after experiencing a stroke.  We identified no issues related to accepted ethical or legal standards.
<b>Equity and patient care</b> How could the health technology/ intervention affect equity of access and coordination of patient care?	<b>Equity of access or outcomes</b> Are there disadvantaged populations or populations in need whose access to care or health outcomes might be improved or worsened that are relevant to this assessment?	Some hospitals in Ontario do not have the equipment to perform automated CT perfusion imaging. In these centres, developing the capacity to perform automated CT perfusion imaging may improve access to mechanical thrombectomy for people with acute ischemic stroke.

Decision Criteria	Subcriteria	Decision Determinants Considerations
	<b>Patient care</b> Are there challenges in the coordination of care for patients or other system-level aspects of patient care (e.g., timeliness of care, care setting) that might be improved or worsened that are relevant to this assessment?	Automated CT perfusion imaging can automatically send the data to a hospital's picture archiving and communication system and other communication devices; therefore, it has the potential to provide a coordinated system of care for acute stroke patients who may benefit from mechanical thrombectomy. Automated CT perfusion imaging facilitates the assessment of patients and improves hospitals' ability to offer timely and appropriate care. It has the potential to positively affect workflow in emergency departments and allow hospitals to synchronize their operations to treat stroke patients.
<b>Cost-effectiveness</b> How efficient is the health technology/intervention likely to be?	<b>Economic evaluation</b> How efficient is the health technology/intervention likely to be?	We did not conduct a primary economic evaluation. However, based on a previous health technology assessment <sup>4</sup> in stroke patients presenting at 0 to 6 hours after stroke symptom onset and results in recent randomized controlled trials for patients presenting at 6 to 24 hours, <sup>2,3</sup> we undertook a crude cost-effectiveness estimate. Our approximation showed that mechanical thrombectomy combined with automated CT perfusion imaging was likely to be cost-effective for patients presenting at 6 to 24 hours after stroke symptom onset.
<b>Feasibility of adoption into health system</b> How feasible is it to adopt the health technology/intervention into the Ontario health care system?	<b>Economic feasibility</b> How economically feasible is the health technology/intervention?  <b>Organizational feasibility</b> How organizationally feasible is it to implement the health technology/intervention?	Publicly funding automated CT perfusion imaging for hospitals that perform mechanical thrombectomy and referral hospitals in Ontario would lead to additional costs of \$1.3 million in year 1 and \$0.9 million per year in subsequent years.  Five mechanical thrombectomy centres already have the capacity to assess patients using automated CT perfusion imaging. A small amount of training is needed for clinicians to use the neuroimaging software that supports automated CT perfusion imaging. Extending the time window for eligibility for mechanical thrombectomy in some cases may have cost implications to maintain appropriate resourcing (i.e., staffing) to assess eligibility.

Abbreviations: CT, computerized tomography; GRADE, Grading of Recommendations Assessment, Development and Evaluations.

## References

- (1) Ontario Health. Automated CT perfusion imaging to aid in the selection of patients with acute ischemic stroke for mechanical thrombectomy: a health technology assessment. Ont Health Technol Assess Ser [Internet]. 2020 Nov;20(13): 1–87. Available from: <https://hqontario.ca/Evidence-to-Improve-Care/Health-Technology-Assessment/Reviews-And-Recommendations/Automated-CT-Perfusion-Imaging-to-Aid-in-the-Selection-of-Patients-with-Acute-Ischemic-Stroke-for-Mechanical-Thrombectomy>
- (2) Albers GW, Marks MP, Kemp S, Christensen S, Tsai JP, Ortega-Gutierrez S, et al. Thrombectomy for stroke at 6 to 16 hours with selection by perfusion imaging. N Engl J Med. 2018;378(8): 708-18.
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