JoS JOURNAL OF STROKE

Journal of Stroke 2025;27(3):338-349
https://doi.org/10.5853/jos.2025.00304

Review

Decision-Making for Endovascular Thrombectomy in Patients With Large Vessel Occlusions and Mild Neurological Deficit: A Consensus Statement

Salome L. Bosshart,[1,2] Manon Kappelhof,[3] Alexander Stebner,[1,4] Satoru Fujiwara,[5] Petra Cimflova,[6] Marie-Sophie Schüngel,[7] Genevieve Milot,[8] Pascal J. Mosimann,[9] Joanna D. Schaafsma,[10] Marc Ribo,[11] Alexandra R. Paul,[12] Christian Ulfert,[13] Mohammed Almekhlafi,[1] Isabel Fragata,[14,15] Sandor Nardai,[16] Demetrius K. Lopes,[17] Bijoy Menon,[1] Pervinder Bhogal,[18] Umberto Pensato,[19,20] Christine Hawkes,[21] Shinichi Yoshimura,[22] Violiza Inoa,[23] Aravind Ganesh,[1] Nishita Singh,[24] David Volders,[25] Manuel Moreu,[26] Kazutaka Uchida,[22] Shahid Nimjee,[27] Jeffrey L. Saver,[28] Michael D. Hill,[1] Johanna M. Ospel[1,29]

[1]Department of Clinical Neurosciences, Foothills Medical Centre, University of Calgary, Calgary, AB, Canada
[2]Department of Neurology, University Hospital Basel, Basel, Switzerland
[3]Department of Radiology and Nuclear Medicine, Amsterdam University Medical Centers, University of Amsterdam, Amsterdam, The Netherlands
[4]Department of Radiology, Cantonal Hospital Muensterlingen, Muensterlingen, Switzerland
[5]Department of Neurology, Kobe City Medical Center General Hospital, Kobe, Japan
[6]Department of Diagnostic and Interventional Neuroradiology, Inselspital, University Hospital Bern, Bern, Switzerland
[7]Policlinic of Radiology and Interventional Radiology, Department of Neuroradiology, University Hospital Halle, Halle (Saale), Germany
[8]CHU de Quebec-Universite Laval, Quebec City, QC, Canada
[9]Interventional and Diagnostic Neuroradiology, University of Toronto & Toronto Western Hospital, Toronto, ON, Canada
[10]Division of Neurology, Department of Medicine and Division of Neuroradiology, Department of Medical Imaging, University Health Network, Toronto, ON, Canada
[11]Department of Neurology, Hospital Vall d'Hebrón, Barcelona, Spain
[12]Department of Neurosurgery, Albany Medical Center, Albany, NY, USA
[13]Neuroradiologie, Universitätsklinikum Heidelberg, Heidelberg, Germany
[14]Neuroradiology Department, ULS S. José, Lisbon, Portugal
[15]NOVA Medical School, UNL, Lisbon, Portugal
[16]Semmelweis University, Department of Neurosurgery and Neurointervention, Budapest, Hungary
[17]Department of Neurosurgery, Advocate Aurora Health Inc, Park Ridge, IL, USA
[18]Interventional Neuroradiology, Royal London Hospital, London, UK
[19]Department of Neurology, IRCCS Humanitas Research Hospital, Rozzano, Milan, Italy
[20]Department of Biomedical Sciences, Humanitas University, Pieve Emanuele, Milan, Italy
[21]Division of Neurology, Department of Medicine, Sunnybrook Health Sciences Centre, University of Toronto, Toronto, ON, Canada
[22]Department of Neurosurgery, Hyogo Medical University, Nishinomiya, Japan
[23]Department of Neurology, University of Tennessee Health Science Center, Memphis
[24]Neurology Division, Department of Internal Medicine, Rady Faculty of Health Sciences, University of Manitoba, Winnipeg, MB, Canada
[25]Department of Radiology, Dalhousie University, Halifax, NS, Canada
[26]Neurointerventional Unit, Radiology Department, Hospital Clínico Universitario San Carlos, Madrid, Spain
[27]Department of Neurosurgery, The Ohio State University Wexner Medical Center, Columbus, OH, USA
[28]Department of Neurology, University of California, Los Angeles, CA, USA
[29]Department of Diagnostic Imaging, Foothills Medical Centre, University of Calgary, Calgary, AB, Canada

Copyright © 2025 Korean Stroke Society
This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (http://creativecommons.org/licenses/by-nc/4.0/) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Acute ischemic stroke patients with mild deficits (National Institutes of Health Stroke Scale [NIHSS] of 0–5) but confirmed large vessel occlusions (LVO) present a clinical challenge for endovascular thrombectomy (EVT) decisions due to limited evidence and the absence of clear guidelines. A Delphi consensus was conducted at the 2024 5T (Teamwork, Training, Technology, Technique, Transport) Think Tank conference with 40 international stroke experts. Following a systematic literature review, three iterative Delphi rounds were employed to explore EVT decision-making in strokes due to LVO with low NIHSS. Data were collected through surveys and in-person discussions, focusing on disability evaluation, imaging markers, procedural risk, and outcome scales. Consensus was achieved on key factors influencing EVT decisions. Experts emphasized the importance of symptom-specific disability (e.g., aphasia, vision loss) over NIHSS scores alone. Early neurological deterioration (END) was perceived as main concern in this patient population. Imaging markers such as proximal occlusion, poor collaterals, and large penumbra were expected to be predictors of END. The anticipated technical difficulty and patient-specific factors, such as independence and quality of life, also guided decisions. The Potential of rtPA for Ischemic Strokes With Mild Symptoms (PRISMS) trial definition of disabling deficits and the 9-level modified Rankin Scale were favored as outcome measures for future studies. EVT decisions for acute ischemic strokes with mild deficit but proven LVO require nuanced, individualized approaches beyond NIHSS thresholds. Disability assessment, imaging-based risk evaluation, and patient-centered discussions are critical for optimizing outcomes, emphasizing the need for further research and standardized guidelines.

Keywords Stroke; Thrombectomy; Low NIHSS; Mild deficit; Large-vessel occlusion; Early neurological deterioration

Correspondence: Salome L. Bosshart
Department of Neurosciences, University of Calgary, 2500 University Dr NW, Calgary, T2N 1N4, AB, Canada
Tel: +1-403-671-3605
E-mail: salome.bosshart@ucalgary.ca
https://orcid.org/0009-0007-7570-8723

Received: January 18, 2025
Revised: May 25, 2025
Accepted: June 18, 2025

Introduction

Acute stroke patients with mild deficits (baseline National Institutes of Health Stroke Scale [NIHSS] of 0–5) but proven large vessel occlusion (LVO) present a clinical treatment dilemma. The evidence on benefit from endovascular thrombectomy (EVT) is very limited; the Multicenter Randomized Clinical Trial of Endovascular Treatment for Acute Ischemic Stroke in the Netherlands (MR CLEAN) and Extending the Time for Thrombolysis in Emergency Neurological Deficits–Intra-Arterial (EXTEND-IA) trials included a total of 14 patients with NIHSS scores of 0–5.[1,2] No clear guideline recommendations for EVT in patients with low NIHSS exist, and EVT decisions are made on a case-by-case basis, with high variability among practitioners and institutions.[3] Two randomized trials are currently ongoing to investigate the effect of EVT in anterior circulation LVO stroke with low NIHSS: Endovascular Therapy for Low NIHSS Ischemic Strokes (ENDOLOW, NCT04167527) and Minor Stroke Therapy Evaluation (MOSTE, NCT03796468).

With up to 30% of stroke patients with LVO reported to present with an NIHSS <6,[4] this minor stroke subset of patients with LVO is not small. It is estimated that 30%–40% will remain disabled at 90 days,[5,6] and this proportion doubles in the 20% of patients in whom early neurological deterioration (END) occurs.[7] Observational data on EVT for minor stroke remain inconclusive, with reports ranging from clinical benefit to harm, including elevated rates of symptomatic intracranial hemorrhage.[8-11] The risk/benefit ratio seems to differ based on the risk of END, the occlusion location, and size of the ischemic territory at risk. Currently, no randomized trials are specifically testing the safety and efficacy of EVT in stroke due to vertebrobasilar occlusion and medium vessel occlusion (MeVO) with low NIHSS, although several ongoing and recently completed EVT trials for stroke due to MeVO do include patients with low NIHSS.[12]

Even when the results of these trials are available, the question of EVT benefit in the minor stroke (low NIHSS) population remains complex. Heterogeneity in outcome may be influenced by within-NIHSS score variation: a total NIHSS score of 3 can be caused by severe aphasia as well as facial droop and loss of sensation—but the former will be more likely to lead to a much higher disability burden than the latter. Heterogeneity may be further influenced by the modified Rankin Scale (mRS) score itself, which is traditionally used as the primary outcome in EVT trials, but may not be sensitive enough to detect small but meaningful differences in long-term post-EVT outcomes in minor stroke patients. The individual impact of any neurological loss of func-

tion will differ from patient to patient—for example, hemianopia in a truck driver is much more detrimental compared to hemianopia in a retiree whose vision was impaired to begin with.[13] The inflection point in the risk/benefit ratio may vary according to the arterial lesion location: patients with a proximal occlusion and a large territory at risk may have more potential benefit with revascularization. In contrast, the predicted benefit may be smaller in the setting of an MeVO, where there will be a smaller territory at risk, or when extensive ischemic changes are already present at baseline. Even a slight increase in complication rates could tip the balance against EVT.

A simple total NIHSS score threshold for EVT decision-making does not take the anticipated complexity of the endovascular procedure into account. EVT decisions in this setting are therefore more complex and require a more nuanced approach as compared to major stroke due to LVO with more severe deficits.

During the 2024 5T (Teamwork, Training, Technology, Technique, Transport) Think Tank conference, this topic was discussed following a live modified Delphi consensus approach. In preparation for the live session, a systematic literature search had been performed. We summarized the results of the literature search and synthesized the expert opinions of the 31 participating neurointerventionalists, neurologists, and neurosurgeons on the topic of EVT for low NIHSS LVO stroke.

Methods

5T Think Tank attendees and sponsoring

This Delphi consensus was conducted as part of the 5T Think Tank that was held in September 2024 in Banff, Alberta, Canada. The 5T Think Tank is an annual 3-day in-person meeting of international experts in the field of neurology and neurointervention (neurologists, radiologists, and neurosurgeons). Every year, the latest research and future developments in the field of interventional stroke therapy are discussed. Focus is laid on areas with lacking or unclear evidence. The meeting is by invitation only. The selection of 5T attendees focused on representing a diverse spectrum of specialists regarding geography, sub-specialties, and gender. The 5T Think Tank is sponsored by Medtronic, Stryker, Terumo, Cerenovus, and Penumbra in equal parts. However, the industry did not control the guest list, the choice of topics, or the content of the presentations. The preparation and analysis of the Delphi rounds were conducted by 5T Think Tank attendees unaffiliated with and independent from the sponsors.

Delphi methodology

The Delphi method is a structured, iterative forecasting technique incorporating feedback loops.[14] In the medical field, it has been used to develop interim treatment guidelines and standardize patient care in the absence of strong evidence, serving as a provisional approach until sufficient data supports evidence-based practices.[15] The Delphi method relies on a panel of individuals with content expertise that answers a series of questions with controlled opinion feedback, the goal being to assess expert opinions and achieve consensus among the respondents. In this study, the Delphi technique was applied to identify aspects influencing decision-making to undergo EVT in patients with low NIHSS strokes due to LVO or MeVO. Figure 1 shows the key elements of the Delphi methodology that were used in this study.

Literature search

In preparation for the Delphi consensus, a scoping literature

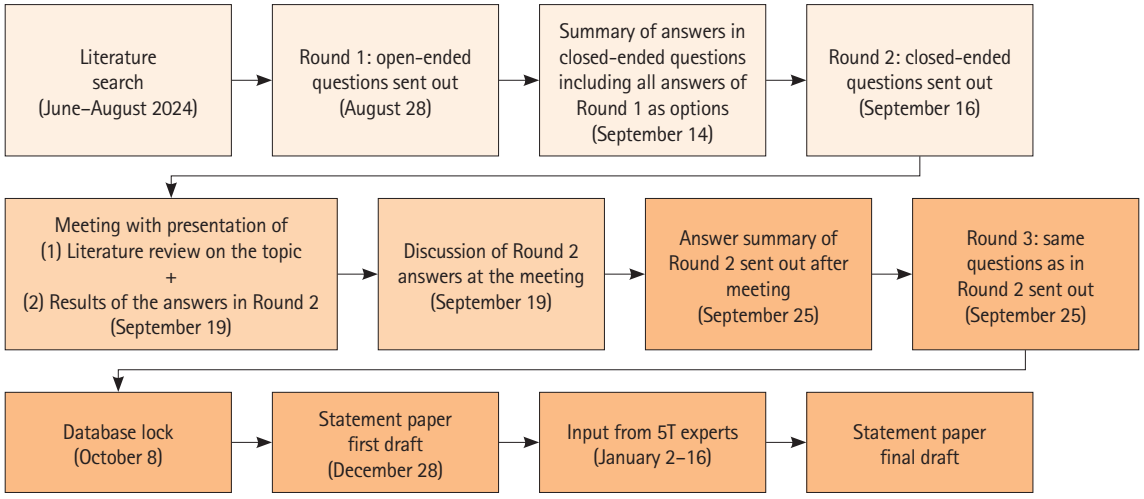

Figure 1. Delphi methodology and processes used for this manuscript. Arrows indicate the chronological order of the process elements. Light orange boxes represent pre-5T meeting activities, medium orange boxes denote in-person meeting steps, and dark orange boxes indicate post-meeting tasks. 5T, Teamwork, Training, Technology, Technique, Transport.

https://doi.org/10.5853/jos.2025.00304

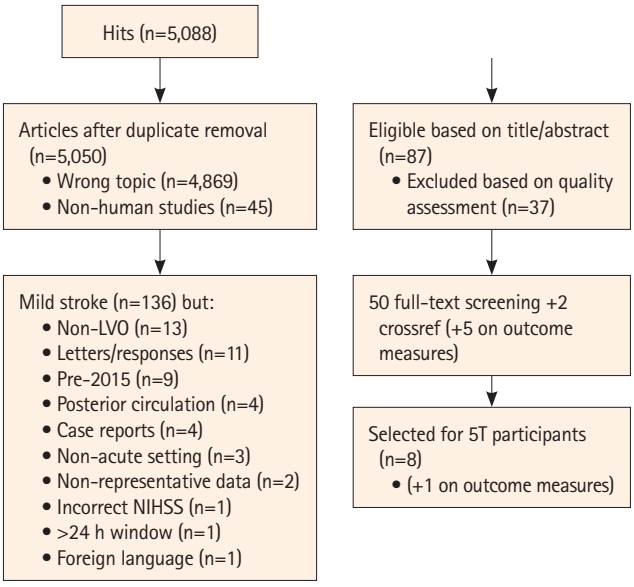

Figure 2. Flowchart of the scoping literature search in preparation of the meeting. LVO, large vessel occlusion; NIHSS, National Institutes of Health Stroke Scale; 5T, Teamwork, Training, Technology, Technique, Transport.

search was performed to identify key publications on EVT in LVO and MeVO in the anterior circulation with low NIHSS (see search strategy in Figure 2). Neurointerventional treatment of posterior circulation occlusions comes with different challenges compared to the anterior circulation, which can significantly affect how treatment decisions are made. We chose to exclude posterior circulation occlusions to keep the questions simpler and get clearer answers during the Delphi process. The purpose of this literature search was to identify high-quality prospective and retrospective cohort studies and ongoing trials focused on EVT for LVO or MeVO with low NIHSS. One of the coauthors (MK) summarized and presented the results of this search during the live session. A list of the publications selected for presentation during the meeting can be found in Supplementary Table 1.

Round 1

After a scoping review of literature, 5T attendees were asked the following five open-ended questions via email prior to the in-person meeting, inquiring about decision-making on EVT treatment and suitable outcome measures in patients with low NIHSS (0–5) due to LVO or MeVO stroke:

(1) Would you, and if yes, how would you account for different levels of disability within one NIHSS score (e.g., NIHSS 3 aphasia vs. NIHSS 3 sensory+facial movement) when considering EVT?

(2) Would you, and if yes, how would you account for different levels of disability impact based on individual patient factors/professions (e.g., hemianopia in a truck driver, arm drift in a professional musician) when considering EVT?

(3) How would you identify low NIHSS patients with a high risk of early neurological deterioration without EVT?

(4) What are your thoughts on the risk-benefit balance of EVT in low NIHSS patients?

(5) Which outcome measure(s) would be the most suitable for assessing intravenous thrombolysis (IVT)/EVT benefit in patients with baseline NIHSS 0–5?

These questions were intentionally broad, and phrased as open-ended questions, to encourage discussion and brainstorming, and ensure that all relevant points for future rounds are captured. All questions referred to stroke patients with a low NIHSS (0–5) due to LVO or MeVO.

Rounds 2 and 3

Rounds 2 and 3 consisted of 15 closed-ended questions that were drafted based on the round 1 open-ended questions. They aimed to examine the group's attitudes towards EVT decision-making in low NIHSS MeVO and LVO stroke in more concrete, practical terms. The questions in rounds 2 and 3 were identical. Round 2 questions were sent out to participants via email prior to the in-person meeting. Prior to round 3, the results of round 2 were presented and discussed at the meeting. All original questions from rounds 2 and 3 can be found in Supplementary Materials.

Data collection and analysis

An online survey tool (Qualtrics.com) was used for data collection. Respondent's email addresses were recorded to prevent duplicate responses. The first two rounds were conducted prior to the meeting.

During the 5T Think Tank in-person meeting, the current evidence on the topic was presented as well as a summary of the answers from round 1. Thereafter followed a 90-minute discussion. The second round was closed after this session, and the answers of round 2 were summarized and distributed to all participants. All participants then reviewed the results of the second round in detail before answering the questions of round 3.

Frequent reminders were sent out shortly after the meeting to achieve the same response rate in all rounds. Thereafter, the database was locked, and data analysis was performed by two think tank attendees (SLB and AS), who did not participate in the consensus themselves.

Consensus in multiple-choice questions was defined based on the type of response allowed. For questions permitting multiple answers, consensus required at least 70% agreement among participants. When only a single answer could be selected, a minimum of 50% agreement on one option was considered suffi-

cient. For binary questions, such as yes/no, consensus was defined as at least 70% agreement. This approach is similar to the previous Delphi consensus in the field of neurointervention.[16-18]

No approval by an institutional review board was necessary for this study. By participating in the survey, respondents have agreed to their data being analyzed in anonymized form.

Results

Response data were collected from September 18 to October 9, 2024. Of the 40 5T Think Tank attendees with expertise in stroke medicine, 31 (78%) responded to rounds 1 and 2, and 29 (73%) responded to round 3. A list of the Delphi participants can be found in the Supplementary Material. Participants had the option to skip questions if they felt the topic was outside their area of expertise. As a result, the number of responses varies across questions.

Delphi results round 1

Question 1: Would you, and if yes, how would you account for different levels of disability within one NIHSS score (e.g., NIHSS 3 aphasia vs. NIHSS 3 sensory+facial movement) when considering EVT?

All respondents indicated that they use no fixed NIHSS cutoff in clinical practice to decide whether a patient should receive EVT. In patients with low NIHSS, debilitating symptoms lead to more aggressive management, while less severely disabling symptoms may be managed conservatively. There was agreement that not all NIHSS categories represent the same level of disability per NIHSS point. Categories such as vision loss and aphasia were considered more disabling deficits, while facial droop and sensory deficits were generally considered less disabling and, thus, less likely to trigger a decision in favor of EVT.

Question 2: Would you, and if yes, how would you account for different levels of disability impact based on individual patient factors/professions when considering EVT?

While many respondents stated that they include occupation, age, baseline functional status, quality of life (QoL), and level of independence as factors in their EVT decision-making, others were critical of this individualized approach: they felt that this approach is often based upon assumptions, as history-taking is typically crude in a hyper-acute setting. Therefore, many times this level of patient history is not readily available. It was also noted that the inherent desire to help a patient when we have more specific details about how a stroke will affect them can also bias decision-making towards overly aggressive or conservative treatment decisions.[19] Some felt that individual patient factors should only be accounted for after discussing with the patient (or a proxy) how they would manage and adapt if they had to continue living with the present disability in their daily life. Other respondents perceived EVT to be much safer today than in the past, so they tend to offer it to most patients if technically feasible. Finally, some participants stated they treat all patients with LVO who are still working due to the risk of END.

Question 3: How would you identify low NIHSS patients with a high risk of early neurological deterioration without EVT?

Respondents listed the following indicators for END: worsening upon orthostatic challenge, large perfusion deficit on imaging that does not match the clinical symptoms, low collateral flow reserve, fluctuating NIHSS score/symptoms, long clot length, proximal occlusion of a major intracranial vessel, potential embolic stroke origin/multiple artery occlusions, incomplete circle of Willis, high blood pressure, diabetes, and elderly patients. Five (16%) respondents felt that any low NIHSS patient with LVO was at risk of secondary neurological deterioration, and as this often leads to significant disability, all low NIHSS individuals with LVO should be treated. One of these respondents mentioned they treat all LVOs that are not determined to be from intracranial atherosclerotic disease (ICAD) because ICAD markedly increases the risk of the intervention.

Question 4: What are your thoughts on the risk-benefit balance of EVT in low NIHSS patients?

The responses again reflected a wide range of perspectives, highlighting the complexity and nuance of decision-making in this subgroup. Factors felt to decrease the benefit of EVT in low NIHSS stroke patients with LVOs were ICAD, distal location of arterial vessel occlusion, simultaneous treatment with intravenous tenecteplase or alteplase, and low degree of disability. Factors felt to increase the benefit of EVT in low NIHSS stroke patients were young patient age, aphasia as a symptom, an experienced interventionalist performing the EVT, and any indicators of a high risk of secondary neurological deterioration or if the latter could not be reliably detected due to, for example, organizational structures of the hospital. Two respondents (6%) felt that there was nearly always a benefit of EVT.

Question 5: Which outcome measure(s) would be the most suitable for assessing IVT/EVT benefit in patients with baseline NIHSS 0–5?

Some respondents felt that the mRS traditionally used in stroke trials in ordinal or dichotomized form was also appropriate for low NIHSS patients. However, the majority of experts suggested

https://doi.org/10.5853/jos.2025.00304

other scales that could be combined with the mRS if necessary, such as a QoL scale (e.g., EuroQol 5-Dimension 5-Level [EQ-5D-5L]) or early neurological improvement on the NIHSS scale.

Delphi results rounds 2 and 3

Detailed results of rounds 2 and 3 are presented in Table 1. There was consensus that a hard NIHSS cut-off alone is not a good basis for deciding on EVT treatment for low NIHSS patients. Ninety-six percent of respondents felt that EVT decision should rather be based on the degree of disability that the symptoms cause. Ninety percent thought that the degree of disability should always be discussed with the patient and/or family despite the additional time lost for discussion. When deciding on the threshold of disability to qualify for EVT, 18/30 (60%) in round 2 and 19/29 (66%) in round 3 favored any decrease in baseline functional status that prevents the patient from exerting their main daily activity, which is favorably determined by the patient.

Disabling symptoms

The expert panel agreed that aphasia and vision loss were the symptoms on the NIHSS scale with the largest impact on QoL and the functional status of a patient.

There was consensus (16/29 [55%] strongly agree, 11/29 [38%] somewhat agree) that these symptoms should have more weight on EVT decision-making than their actual NIHSS score. For patients with aphasia, the expert panel reached consensus that this symptom alone suffices to justify the indication for EVT.

Study measures of disability in low NIHSS stroke patients

The panelists reached a consensus that the Potential of rtPA for Ischemic Strokes With Mild Symptoms (PRISMS) trial's operational definition of the presence or absence of disabling deficits offered the best measure of disability in prospective studies involving low NIHSS stroke patients.

After an extensive discussion of possible outcome measures of long-term functional outcome, the expert panel chose the 9-level mRS (currently under development in the StrokeNet Thrombectomy Endovascular Platform [STEP] trial, https://www.nihstrokenet.org/trials/step-trial/master) as the most appropriate outcome measure of trials involving low NIHSS LVO/MeVO stroke patients. This was followed by a combination of the ordinal mRS and another scale (rank 2), dichotomous mRS of 0 (rank 3), and a QoL scale (rank 4). The panel felt that the ordinal mRS alone was the least appropriate outcome measure for this patient population (Supplementary Table 2).

Imaging features

The expert panel agreed that the anticipated technical difficulty of the EVT and the occlusion location should be accounted for when deciding on EVT in low NIHSS patients. There was disagreement among the group on whether or not to take ASPECTS into account for decision-making, as it is virtually always high in low NIHSS patients.

Patient characteristics/treatment goals

Among the mentioned patient characteristics that potentially influence decision-making for EVT in low NIHSS stroke patients ≤65 years, QoL and independence without treatment emerged as the most important factors for EVT decisions in patients with low NIHSS. Ability for social interaction holds moderate importance. Interestingly, 9/29 (31%) respondents rated the discussion with patient or family without fixed parameters highest, while 10/29 (34%) chose it as the least important among the presented characteristics. Detailed results are presented in Table 1.

In patients >65 years, level of independence without treatment and QoL without treatment remained the most important parameters, similar to the general population, but with stronger emphasis.

Elaborating reasons not to take individual patient factors into account when deciding on EVT in low NIHSS stroke patients, there was only consensus on the statement that "history-taking was typically crude in a hyper-acute setting, therefore such decisions are based on assumptions that could be wrong."

Early neurological deterioration

The risk for END in low NIHSS LVO/MeVO stroke was generally perceived as moderate by 18/28 (64%) and high by 6/28 (21%) of the experts in round 3. The panel agreed that no single clinical or imaging factor was extremely useful as an indicator for END. However, by round 3 there was consensus that a large penumbra, low collateral flow reserve, a proximal occlusion location, and fluctuating symptoms were the most reliable predictors of END. Additionally, orthostatic neurological deterioration, high blood pressure, multiple occlusions, an incomplete circle of Willis, and a long clot length were felt to be somewhat useful as indicators of an increased risk of END. There was agreement that diabetes and potential embolic origin of the stroke were not useful predictors of an increased END risk. Detailed results are provided in Supplementary Table 3.

Risk-benefit balance of EVT

There was consensus that some patients with low NIHSS despite LVO benefit more from EVT than others. The expert panel agreed that patients with aphasia, poor collaterals, or with a proximal clot have a great net benefit of EVT. Combining round 3 votes for a small and great perceived benefit of EVT, there was consen-

Table 1. Summary of round 2 and round 3 questions and answers

Question	Answer options	Answers		Final consensus achieved?
		Round 2	Round 3	
Do you agree that the decision for or against EVT in low NIHSS stroke patients should not be based on a hard NIHSS cut-off?	- Strongly agree - Somewhat agree - Somewhat disagree - Strongly disagree	18/30 (60%) 6/30 (20%) 4/30 (13%) 2/30 (7%)	20/29 (69%) 6/29 (21%) 1/29 (3%) 2/29 (7%)	Yes
Do you agree that the decision for or against EVT in low NIHSS stroke patients should be based on the degree of disability that the symptoms cause?	- Strongly agree - Somewhat agree - Somewhat disagree - Strongly disagree	16/30 (53%) 9/30 (30%) 2/30 (7%) 3/30 (10%)	23/29 (79%) 5/29 (17%) 0 1/29 (3%)	Yes
To determine if the disability is high enough to qualify for EVT, which of the following should be the measure?	(A) Decreased baseline functional status such that main daily activity cannot be exerted. (B) Significantly impaired QoL (as per patient).	(A) 18/30 (60%) (B) 12/30 (40%)	(A) 19/29 (66%) (B) 10/29 (34%)	Yes
To determine if the disability is high enough to qualify for EVT, which of the following applies:	(A) Should only be an expert judgement. (B) Has to be discussed with patient and/or family.	(A) 5/29 (17%) (B) 24/29 (83%)	(A) 3/29 (10%) (B) 26/29 (90%)	Yes
Rate your degree of agreement with the following statements about disabling symptoms: (A) Aphasia should always be treated with EVT (if LVO/MeVO) if a benefit of the treatment can be expected. (B) For treatment decision, aphasia should get more weight/points on the NIHSS score. (C) For treatment decision, vision loss/field cut should get more weight/points on the NIHSS score.	- Strongly agree - Somewhat agree - Somewhat disagree - Strongly disagree	- Technical difficulty occurred, thus the results are not valid for the 2nd round	- (A) 14/29 (48%), (B) 16/29 (55%), (C) 6/29 (21%) - (A) 13/29 (45%), (B) 11/29 (38%), (C) 17/29 (59%) - (A) 2/29 (7%), (B) 2/29 (7%), (C) 4/29 (14%) - (A) 0/29 (0%), (B) 0/29 (0%), (C) 2/29 (7%)	(A) No (B) Yes (C) Yes
In a prospective study on EVT in patients with low NIHSS, how should disability be assessed and weighed?	(A) Use a simple description of the deficit and give it a number of NIHSS points reached in this category (e.g., aphasia; motor deficit/unable to walk; sensory deficit; visual deficit). (B) Don't necessarily differentiate different levels of disability, but just differentiate presence/absence of disability. (C) Use the PRISMS trial operational definition of the presence or absence of disabling deficits: Disabling is "defined as either inability to return to work or perform basic activities of daily living based on current deficits."	(A) 10/30 (33%) (B) 3/30 (10%) (C) 17/30 (57%)	(A) 5/29 (17%) (B) 1/29 (3%) (C) 23/29 (79%)	Yes
Which of the following factors should be accounted for when deciding over EVT in low NIHSS patients?	(A) Anticipated technical difficulty of EVT. (B) Level of occlusion. (C) ASPECTS in the territory responsible for the (disabling) symptoms.	Strongly agree: (A) 16/29 (55%), (B) 10/28 (36%), (C) 10/29 (34%) Somewhat agree: (A) 9/29 (31%), (B) 12/28 (43%), (C) 10/29 (34%) Somewhat disagree: (A) 3/29 (10%), (B) 5/28 (18%), (C) 5/29 (17%) Strongly disagree: (A) 1/29 (3%), (B) 1/28 (4%), (C) 4/29 (14%)	Strongly agree: (A) 8/29 (28%), (B) 12/29 (41%), (C) 10/29 (34%) Somewhat agree: (A) 18/29 (62%), (B) 15/29 (52%), (C) 12/29 (41%) Somewhat disagree: (A) 1/29 (3%), (B) 1/29 (3%), (C) 6/29 (21%) Strongly disagree: (A) 2/29 (7%), (B) 1/29 (3%), (C) 1/29 (3%)	(A) Yes (B) No (C) No

https://doi.org/10.5853/jos.2025.00304

Table 1. Continued

Question	Answer options	Answers		Final consensus achieved?
		Round 2	Round 3	
For EVT decision in low NIHSS stroke patients which of the following parameters is the most important in patients <65 years?	Profession alone; profession+hobbies; profession+age; QoL without treatment; level of independence without treatment; no fixed parameters, always discuss with patient or proxy.	The 3 top choices: - No fixed parameters: 11/29 (38%) - QoL without treatment: 8/29 (28%) - Level of independence without treatment: 4/29 (14%)	The top 3 ranks: 1. Level of independence without treatment, 2. No fixed parameters, 3. QoL without treatment	Yes
For EVT decision in low NIHSS stroke patients which of the following parameters is the most important in patients >65 years?	Ability for social interaction; QoL without treatment; level of independence without treatment; no fixed parameters, always discuss with patient or proxy.	The 3 top choices: - No fixed parameters: 11/27 (41%) - QoL without treatment: 7/27 (26%) - Level of independence without treatment: 6/27 (22%)	The top 3 ranks: 1. Level of independence without treatment, 2. No fixed parameters, 3. QoL without treatment	Yes
Mark your agreement with the following statements: individual patient factors should NOT be taken into account when deciding on EVT in low NIHSS stroke patient because… (A) History-taking is typically crude in a hyper-acute setting, therefore such decisions are based on assumptions that could be wrong. (B) The risk of EVT is generally low and should be done anyway if possible. (C) This information could lead us to be overly aggressive or conservative in our treatment decision. (D) Any patient who is still working/of working age should be treated.	- Strongly agree - Somewhat agree - Somewhat disagree - Strongly disagree	- (A) 3/26 (12%), (B) 2/26 (8%), (C) 2/28 (7%), (D) 3/27 (11%) - (A) 12/26 (46%), (B) 8/26 (31%), (C) 11/28 (39%), (D) 11/27 (41%) - (A) 5/26 (19%), (B) 10/26 (38%), (C) 11/28 (39%), (D) 10/27 (37%) - (A) 6/26 (23%), (B) 6/26 (23%), (C) 4/28 (14%), (D) 3/27 (11%)	- (A) 3/28 (11%), (B) 1/28 (4%), (C) 4/28 (14%), (D) 4/28 (14%) - (A) 17/28 (61%), (B) 11/28 (39%), (C)13/28 (46%), (D) 14/28 (50%) - (A) 4/28 (14%), (B) 11/28 (39%), (C) 9/28 (32%), (D) 7/28 (25%) - (A) 4/28 (14%), (B) 5/28 (18%), (C) 2/28 (7%), (D) 3/28 (13%)	(A) No (B) No (C) No (D) No
How high would you estimate the risk of neurological deterioration in low NIHSS LVO/MeVO stroke patients without EVT?	- Low risk - Moderate risk - High risk	4/28 (14%) 17/28 (61%) 7/28 (25%)	4/28 (14%) 18/28 (64%) 6/28 (21%)	Yes
Do you think the benefit of EVT is always given in low NIHSS LVO/MeVO stroke patients?	- Yes - No	3/28 (11%) 25/28 (89%)	2/28 (7%) 26/28 (93%)	Yes

EVT, endovascular thrombectomy; NIHSS, National Institutes of Health Stroke Scale; QoL, quality of life; LVO, large vessel occlusion; MeVO, medium vessel occlusion; PRISMS, Potential of rtPA for Ischemic Strokes With Mild Symptoms; ASPECTS, Alberta Stroke Program Early CT Score.

sus that the net benefit was greater than the risks in patients with poor collaterals, orthostatic deterioration, aphasia, and a proximal clot. There was consensus that the risk of EVT surpasses potential benefits when the clot is poorly accessible (15/28, 54%). Detailed results are presented in Supplementary Table 4.

Recommendations guiding treatment decisions in low NIHSS LVO/MeVO patients are summarized in Table 2.

Discussion

Prudence regarding EVT in low NIHSS patients originates from the delicate balance of the risks of EVT that may not be counterbalanced by the possible benefits in patients with minimal impairment. Absence of level 1 evidence leaves the decision on treatment of low NIHSS stroke patients to the discretion of the clinicians.

This Delphi consensus session among international experts on interventional stroke treatment suggests that the decision in favor or against EVT in low NIHSS stroke patients with LVO or MeVO is often not solely based on a strict NIHSS cut-off, but rather an individualized decision based on the degree of disability and if possible, based on the patient's perspective. Presumed QoL and independence without treatment were key factors swaying treatment decisions. The majority of the expert panel relied on discussions with the patient to arrive at a personalized decision whenever possible.

Table 2. Summary of recommendations guiding EVT treatment decisions in low NIHSS LVO/MeVO patients

No.	Recommendation
1	In stroke patients with LVO and low NIHSS, treatment decision should be guided by anticipated technical difficulty of EVT and the degree of disability defined as inability to return to work or perform basic activities of daily living. It should not be guided by a strict NIHSS cut-off.
2	The level of disability that warrants the risk of EVT should ideally be determined through a discussion with the patient and/or their family. When such a discussion is not possible, disability was considered sufficient to justify EVT if the current symptoms result in a decreased baseline functional status that prevents the patient from performing their main daily activities.
3	For EVT treatment decisions, aphasia and vision loss/field cut should be regarded as highly disabling symptoms that may justify intervention even in patients with low NIHSS scores.
4	The risk of END in low NIHSS LVO/MeVO stroke patients not undergoing EVT was considered moderate.

END, early neurological deterioration; EVT, endovascular thrombectomy; LVO, large vessel occlusion; MeVO, medium vessel occlusion; NIHSS, National Institutes of Health Stroke Scale.

However, the following factors were identified that influence the decision in a certain direction:

Disabling symptoms

While the NIHSS scale is a well-established measure of neurological deficits, the degree of disability within the total score can vary substantially. In the present analysis, aphasia and vision loss were considered the most disabling symptoms captured on the NIHSS scale, particularly compared to sensory deficits that contribute a similar number of points to the score. It has previously been shown that aphasia significantly affects functional outcome, mood, QoL, social participation and the ability to return to work.[20-23] Additionally, aphasia is often co-occurring with dysphagia—a symptom that is not captured on the NIHSS but that has a severe impact on QoL, and increases the likelihood of associated complications such as pneumonia.[24,25]

Vision loss is less straightforward. For instance, the disability caused by vision loss was rated with 0.60 disability adjusted life year (DALY; 0=no disability, 1=maximal disability similar to death) in the original Global Burden of Disease (GBD) study in 1990,[26] and with 0.19 DALY in the 2010 GBD study.[27] The reason for the large difference between the two studies likely lies in the questions asked during the assessment: while the original GBD study focused on introduced impairment and need for assistance, the 2010 GBD study asked "how sick" a completely blind person was.[28] Although blindness can lead to significant impairment, one would not necessarily consider a visually impaired person as "sick."[28] Interestingly, there appears to be a difference in disability depending on the age somebody turns blind: vision loss in older adults is associated with reduced QoL, increased risk of cognitive impairment, and greater difficulties in performing daily activities.[29] Additionally, older adults with visual impairment have an increased risk of falls, and thus, with associated morbidity.[30]

The expert panel felt that the degree of disability introduced through aphasia and vision loss justifies EVT if their presence as isolated symptoms was resulting in the low NIHSS.

However, there is a potential bias here, as proprioceptive and kinesthetic functions, which depend on sensation and may initially present with subtle impairments, can later become more overt during the recovery phase and still lead to significant disabling effects.

The discussion among the expert panel acknowledged that even seemingly mild symptoms can be associated with a high degree of disability for certain individuals. For example, facial palsy in a professional trumpet player can lead to full invalidity. McDonough et al.[13] have shown that such factors in fact play a role in real-world decision-making on EVT for low-NIHSS patients with MeVOs. However, in our analysis, there was consensus that the importance of the profession and hobbies is surpassed by the QoL and the level of independence. Even though some deficits may be debilitating for someone's profession, they may still not justify risking a patient's independence. It was argued that taking "low-level disability" into account for EVT decision-making in low NIHSS patients may underestimate the risk of the intervention. Considering individual patient factors could thus lead interventionalists to be overly aggressive or conservative in their treatment decision. Additionally, the term "individual patient factors" is not trivial, taking into account that essential skillsets of a housewife or a retired person with caregiving responsibilities ought to be equally considered as a profession.

The experts thus coincided that differentiating disability versus no disability was most appropriate approach for selecting patients who qualify for EVT, but the final decision should be guided by the discussion with the patient or their proxy.

A measure of disability is needed that can be efficiently applied in the time-sensitive setting of stroke care. To date, such scores have been implemented in prospective trials, but are not yet common in real-world practice. The expert panel agreed that the PRISMS trial's operational definition of the presence or absence of disabling deficits was currently the most appropriate: "disabling is defined as either inability to return to work or perform basic activities of daily living based on current deficits."[31]

 https://doi.org/10.5853/jos.2025.00304

In terms of long-term outcomes for trial settings, experts expressed their concern that a single conventional outcome measure of stroke patients, such as the ordinal mRS, may not be granular enough to reliably measure differences in treatment effect in patients who had a low NIHSS to begin with. A combination of two established scores was proposed as a pragmatic solution to capture small changes in neurological deficit. However, the results of the survey at the end of each Delphi round reflect that experts would prefer a single, new score tailored to patients with mild to moderate disability (i.e., a low NIHSS score).

Anticipated technical difficulty

The potential benefit of an EVT encompasses the alleviation of current symptoms, the prevention of long-term sequelae (e.g., pneumonia resulting from dysphagia), and the mitigation of END. Conversely, the risk associated with the intervention reflects a combination of technical complexity, the interventionalist's expertise, and individual patient characteristics.

Factors known to increase the risk of an intervention are, among others, the need for multiple passes with thrombectomy devices,[32] a fibrin-rich clot composition,[33] and underlying ICAD.[34] Those still cannot be reliably predicted based on routine imaging, nor are they modifiable in a given patient with acute stroke. The interventionalist's experience is positively correlated with recanalization rates and inversely correlated with the duration of the procedure,[35] but this, again, is a non-modifiable factor in the acute setting.

The expert panel agreed that the anticipated technical difficulty of EVT was mostly a function of the accessibility of the clot—mainly defined by occlusion location and presence of ICAD—as well as the interventionalist's experience. Individual patient characteristics such as age and diabetes mellitus were thought to have a lower priority when estimating the risk of EVT.

END/risk without treatment

END is a frequent phenomenon of neurological worsening of ≥4 NIHSS points within 24 hours after a baseline assessment or treatment.[36] Its incidence lies between 9%–10% in strokes due to LVO, and it is a reliable predictor of poor outcome in stroke patients.[36,37] Risk factors for END include age, glucose level at admission, symptom onset to treatment time, high systolic blood pressure, history of hypertension, diabetes mellitus, atrial fibrillation, and large artery atherosclerosis.[36] Collateral status is the only imaging-based risk factor for END.

END in low NIHSS patients likely has a larger impact on functional outcome compared to high-NIHSS patients. Hence, the identification of risk factors for END in the low NIHSS LVO population is of particular interest.

The expert panel agreed that poor collaterals, a large penumbra on perfusion imaging, proximal occlusion location, and fluctuating symptoms were the most reliable predictors for END in low NIHSS LVO/MeVO patients. That is, the panel relied on imaging markers for which limited evidence is available, and their value to predict END has yet to be studied.

Interestingly, to date, there is no convincing evidence that EVT actually reduces the risk of END compared to IVT, as there seems to be a similar incidence among patients treated with EVT and IVT only.[36,38] Of note, however, rescue EVT in case of END seems to improve outcomes.[39] In the discussion among the expert panel it was brought up that, given the known time-sensitive nature of stroke, the potential harm of END in low NIHSS LVO/MeVO patients is higher in institutions that cannot guarantee close neurological monitoring. This could thus be a valuable consideration for triage and transport decisions.

Of note, despite its correlation with poor outcome in stroke patients, END is just an intermediary endpoint, and as such, a surrogate for the final 90-day outcome. As not all cases of END result in long-term disability, further research is needed to identify patients who benefit from END treatment or prevention.

Limitations

Delphi consensus sessions are conducted on topics with little or no evidence, and thus represent opinions of the experts surveyed. The selective group of participants may not represent the global perspective on EVT in low NIHSS patients. Recommendations may not apply to all healthcare systems due to variations in resources, expertise, and patient demographics. The study is qualitative and does not provide definitive recommendations. The conclusions drawn are interim, reflect the opinions of the Delphi panel members only, and may change upon completion of ENDOLOW, MOSTE, and other ongoing trials. For example, the 9-level mRS, selected as the most suitable outcome measure for trials involving low NIHSS LVO/MeVO stroke patients, has not yet been published or validated. As a result, its suitability will need to be evaluated once evidence is available.

Conclusions

This Delphi consensus panel suggests that a single, universal NIHSS cut-off may not be appropriate to guide EVT decisions in low NIHSS LVO and MeVO stroke. Instead, factors such as the degree of disability, anticipated technical difficulty, and the risk of END should be taken into account. The panel emphasized the importance of patient-centered discussions and individualized treatment approaches, and highlighted critical gaps in evidence,

including the need for more robust predictors of END in low NIHSS populations. These findings provide an interim framework for clinicians while awaiting results from ongoing randomized trials.

Supplementary materials

Supplementary materials related to this article can be found online at https://doi.org/10.5853/jos.2025.00304.

Funding statement

None

Conflicts of interest

The authors have no financial conflicts of interest.

Author contribution

Conceptualization: SLB, AS, JMO, MDH. Study design: SLB, AS, JMO. Methodology: SLB, JMO, MDH. Data collection: SLB, AS. Investigation: SLB, MK, AS, JMO. Statistical analysis: SLB, JMO. Writing—original draft: SLB, MK, AS, JMO. Writing—review & editing: all authors. Approval of final manuscript: all authors.

References

1. Berkhemer OA, Fransen PS, Beumer D, van den Berg LA, Lingsma HF, Yoo AJ, et al. A randomized trial of intraarterial treatment for acute ischemic stroke. *N Engl J Med* 2015;372:11-20.
2. Campbell BC, Mitchell PJ, Kleinig TJ, Dewey HM, Churilov L, Yassi N, et al. Endovascular therapy for ischemic stroke with perfusion-imaging selection. *N Engl J Med* 2015;372:1009-1018.
3. Ospel JM, Kim B, Heo JH, Yoshimura S, Kashani N, Menon B, et al. Endovascular treatment decision-making in acute ischemic stroke patients with large vessel occlusion and low National Institutes of Health Stroke Scale: insights from UNMASK EVT, an international multidisciplinary survey. *Neuroradiology* 2020;62:715-721.
4. Duloquin G, Crespy V, Jakubina P, Giroud M, Vergely C, Béjot Y. Large vessel occlusion in patients with minor ischemic stroke in a population-based study. The Dijon Stroke Registry. *Front Neurol* 2022;12:796046.
5. Schwarz G, Cascio Rizzo A, Matusevicius M, Giussani G, Invernizzi P, Melis F, et al. Reperfusion treatments in disabling versus nondisabling mild stroke due to anterior circulation vessel occlusion. *Stroke* 2023;54:743-750.
6. Khatri P, Kleindorfer DO, Devlin T, Sawyer RN Jr, Starr M, Mejilla J, et al. Effect of alteplase vs aspirin on functional outcome for patients with acute ischemic stroke and minor nondisabling neurologic deficits: the PRISMS randomized clinical trial. *JAMA* 2018;320:156-166.
7. Seners P, Ben Hassen W, Lapergue B, Arquizan C, Heldner MR, Henon H, et al. Prediction of early neurological deterioration in individuals with minor stroke and large vessel occlusion intended for intravenous thrombolysis alone. *JAMA Neurol* 2021;78:321-328.
8. Lin CH, Saver JL, Ovbiagele B, Tang SC, Lee M, Liebeskind DS. Effects of endovascular therapy for mild stroke due to proximal or M2 occlusions: meta-analysis. *J Neurointerv Surg* 2023;15:350-354.
9. Schwarz G, Bonato S, Lanfranconi S, Matusevicius M, Ghione I, Valcamonica G, et al. Intravenous thrombolysis + endovascular thrombectomy versus thrombolysis alone in large vessel occlusion mild stroke: a propensity score matched analysis. *Eur J Neurol* 2023;30:1312-1319.
10. Wang P, Chen W, Chen C, Bivard A, Yu G, Parsons MW, et al. Association of perfusion lesion variables with functional outcome in patients with mild stroke and large vessel occlusion managed medically. *Neurology* 2023;100:e627-e638.
11. Xu Y, Liu X, Li H. A comparison of endovascular therapy and medical management in patients with large vessel occlusion mild stroke treated between 2015 and 2023: a systematic review and meta-analysis. *J Stroke Cerebrovasc Dis* 2024;33:107721.
12. Ospel JM, Nguyen TN, Jadhav AP, Psychogios MN, Clarençon F, Yan B, et al. Endovascular treatment of medium vessel occlusion stroke. *Stroke* 2024;55:769-778.
13. McDonough R, Cimflova P, Kashani N, Ospel JM, Kappelhof M, Singh N, et al. Patient-relevant deficits dictate endovascular thrombectomy decision-making in patients with low NIHSS scores with medium-vessel occlusion stroke. *AJNR Am J Neuroradiol* 2021;42:1834-1838.
14. Dayé C. How to train your oracle: the Delphi method and its turbulent youth in operations research and the policy sciences. *Soc Stud Sci* 2018;48:846-868.
15. Steurer J. The Delphi method: an efficient procedure to generate knowledge. *Skeletal Radiol* 2011;40:959-961.
16. Goyal M, Yoshimura S, Milot G, Fiehler J, Jayaraman M, Dorn F, et al. Considerations for antiplatelet management of carotid stenting in the setting of mechanical thrombectomy: a Delphi consensus statement. *AJNR Am J Neuroradiol* 2020;41:2274-2279.
17. Ospel JM, Brouwer P, Dorn F, Arthur A, Jensen ME, Nogueira R, et al. Antiplatelet management for stent-assisted coiling

and flow diversion of ruptured intracranial aneurysms: a DELPHI consensus statement. *AJNR Am J Neuroradiol* 2020;41:1856-1862.
18. Ospel JM, Mirza M, Clarençon F, Siddiqui A, Doyle K, Consoli A, et al. What is a challenging clot?: a DELPHI consensus statement from the CLOTS 7.0 summit. *Clin Neuroradiol* 2023;33:1007-1016.
19. Whelehan DF, Conlon KC, Ridgway PF. Medicine and heuristics: cognitive biases and medical decision-making. *Ir J Med Sci* 2020;189:1477-1484.
20. Ferro JM, Madureira S. Aphasia type, age and cerebral infarct localisation. *J Neurol* 1997;244:505-509.
21. Mazaux JM, Lagadec T, de Sèze MP, Zongo D, Asselineau J, Douce E, et al. Communication activity in stroke patients with aphasia. *J Rehabil Med* 2013;45:341-346.
22. Carod-Artal FJ, Egido JA. Quality of life after stroke: the importance of a good recovery. *Cerebrovasc Dis* 2009;27(Suppl 1):204-214.
23. Koleck M, Gana K, Lucot C, Darrigrand B, Mazaux JM, Glize B. Quality of life in aphasic patients 1 year after a first stroke. *Qual Life Res* 2017;26:45-54.
24. Flowers HL, Silver FL, Fang J, Rochon E, Martino R. The incidence, co-occurrence, and predictors of dysphagia, dysarthria, and aphasia after first-ever acute ischemic stroke. *J Commun Disord* 2013;46:238-248.
25. Banda KJ, Chu H, Kang XL, Liu D, Pien LC, Jen HJ, et al. Prevalence of dysphagia and risk of pneumonia and mortality in acute stroke patients: a meta-analysis. *BMC Geriatr* 2022;22:420.
26. Murray CJ. Quantifying the burden of disease: the technical basis for disability-adjusted life years. *Bull World Health Organ* 1994;72:429-445.
27. Salomon JA, Vos T, Hogan DR, Gagnon M, Naghavi M, Mokdad A, et al. Common values in assessing health outcomes from disease and injury: disability weights measurement study for the Global Burden of Disease Study 2010. *Lancet* 2012;380:2129-2143.
28. Braithwaite T, Taylor H, Bourne R, Keeffe J, Pesudovs K. Does blindness count? Disability weights for vision loss. *Clin Exp Ophthalmol* 2017;45:217-220.
29. Li S, Ye E, Huang J, Wang J, Zhao Y, Niu D, et al. Global, regional, and national years lived with disability due to blindness and vision loss from 1990 to 2019: findings from the Global Burden of Disease Study 2019. *Front Public Health* 2022;10:1033495.
30. Singh RR, Maurya P. Visual impairment and falls among older adults and elderly: evidence from longitudinal study of ageing in India. *BMC Public Health* 2022;22:2324.
31. Yeatts SD, Broderick JP, Chatterjee A, Jauch EC, Levine SR, Romano JG, et al. Alteplase for the treatment of acute ischemic stroke in patients with low National Institutes of Health Stroke Scale and not clearly disabling deficits (potential of rtPA for ischemic strokes with mild symptoms PRISMS): rationale and design. *Int J Stroke* 2018;13:654-661.
32. Ringheanu VM, Tekle WG, Preston L, Sarraj A, Hassan AE. Higher number of stent-retriever thrombectomy passes significantly increases risk of mass effect, poor functional outcome, and mortality. *Interv Neuroradiol* 2023;29:674-682.
33. Jolugbo P, Ariëns RAS. Thrombus composition and efficacy of thrombolysis and thrombectomy in acute ischemic stroke. *Stroke* 2021;52:1131-1142.
34. Kim YW, Hong JM, Park DG, Choi JW, Kang DH, Kim YS, et al. Effect of intracranial atherosclerotic disease on endovascular treatment for patients with acute vertebrobasilar occlusion. *AJNR Am J Neuroradiol* 2016;37:2072-2078.
35. Dimitrios X, Ghozy S, Christina C, Kolovoy A, Ramanathan K, Kallmes DF. The effect of operator's experience on mechanical thrombectomy outcomes: a systematic review. *Interv Neuroradiol* 2025;31:121-127.
36. Shi HX, Li C, Zhang YQ, Li X, Liu AF, Liu YE, et al. Predictors of early neurological deterioration occurring within 24 h in acute ischemic stroke following reperfusion therapy: a systematic review and meta-analysis. *J Integr Neurosci* 2023;22:52.
37. Seners P, Turc G, Oppenheim C, Baron JC. Incidence, causes and predictors of neurological deterioration occurring within 24 h following acute ischaemic stroke: a systematic review with pathophysiological implications. *J Neurol Neurosurg Psychiatry* 2015;86:87-94.
38. Bourcier R, Goyal M, Muir KW, Desal H, Dippel DWJ, Majoie CBLM, et al. Risk factors of unexplained early neurological deterioration after treatment for ischemic stroke due to large vessel occlusion: a post hoc analysis of the HERMES study. *J Neurointerv Surg* 2023;15:221-226.
39. Broccolini A, Brunetti V, Colò F, Alexandre AM, Valente I, Falcou A, et al. Early neurological deterioration in patients with minor stroke due to isolated M2 occlusion undergoing medical management: a retrospective multicenter study. *J Neurointerv Surg* 2023;16:38-44.

Supplementary Table 1. List of the publications selected for presentation during the meeting

No.	Publications
1	Seners P, Perrin C, Lapergue B, Henon H, Debiais S, Sablot D, et al; MINOR-STROKE Collaborators. Bridging therapy or IV thrombolysis in minor stroke with large vessel occlusion. *Ann Neurol* 2020 Jul;88(1):160-169. doi: 10.1002/ana.25756. Epub 2020 May 14. PMID: 32350929.
2	Lin CH, Saver JL, Ovbiagele B, Tang SC, Lee M, Liebeskind DS. Effects of endovascular therapy for mild stroke due to proximal or M2 occlusions: meta-analysis. *J Neurointerv Surg* 2023 Apr;15(4):350-354. doi: 10.1136/neurintsurg-2022-018662. Epub 2022 Mar 15. PMID: 35292565; PMCID: PMC10086511.
3	Schwarz G, Bonato S, Lanfranconi S, Matusevicius M, Ghione I, Valcamonica G, et al. Intravenous thrombolysis + endovascular thrombectomy versus thrombolysis alone in large vessel occlusion mild stroke: a propensity score matched analysis. *Eur J Neurol* 2023 May;30(5):1312-1319. doi: 10.1111/ene.15722. Epub 2023 Feb 24. PMID: 36746650.
4	Wang P, Chen W, Chen C, Bivard A, Yu G, Parsons MW, et al; INSPIRE. Association of perfusion lesion variables with functional outcome in patients with mild stroke and large vessel occlusion managed medically. *Neurology* 2023 Feb 7;100(6):e627-e638. doi: 10.1212/WNL.0000000000201498. Epub 2022 Oct 28. PMID: 36307224; PMCID: PMC9946183.
5	Dunne T, Patel K, Siegles JE. How low do we go? NIHSS in anterior circulation thrombectomy decision-making. *Stroke Vasc Interv Neurol* 2024;4(5):e001212. doi: 10.1161/SVIN.123.001212.
6	Xu Y, Liu X, Li H. A comparison of endovascular therapy and medical management in patients with large vessel occlusion mild stroke treated between 2015 and 2023: a systematic review and meta-analysis. *J Stroke Cerebrovasc Dis* 2024 Jul;33(7):107721. doi: 10.1016/j.jstrokecerebrovasdis.2024.107721. Epub 2024 Apr 13. PMID: 38616013.
7	Seners P, Ben Hassen W, Lapergue B, Arquizan C, Heldner MR, Henon H, et al; MINOR-STROKE Collaborators. Prediction of early neurological deterioration in individuals with minor stroke and large vessel occlusion intended for intravenous thrombolysis alone. *JAMA Neurol* 2021 Mar 1;78(3):321-328. doi: 10.1001/jamaneurol.2020.4557. PMID: 33427887; PMCID: PMC7802007.
8	Heitkamp C, Winkelmeier L, Flottmann F, Schell M, Kniep H, Broocks G, et al; German Stroke Registry-Endovascular Treatment (GSR-ET). Thrombectomy patients with minor stroke: factors of early neurological deterioration. *J Neurointerv Surg* 2025 Jul 14;17(8):796-802. doi: 10.1136/jnis-2024-021930. PMID: 38991731; PMCID: PMC12322444.
9	Romano JG, Gardener H, Campo-Bustillo I, Khan Y, Tai S, Riley N, et al; MaRISS Investigators. Predictors of outcomes in patients with mild ischemic stroke symptoms: MaRISS. *Stroke* 2021 Jun;52(6):1995-2004. doi: 10.1161/STROKEAHA.120.032809. Epub 2021 May 5. PMID: 33947209; PMCID: PMC9254134.

Supplementary Table 2. Number of panelist votes for ranking outcome measures to assess IVT/EVT benefit in patients with baseline NIHSS 3–5

	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	Rank 7	Rank 8	Rank 9
mRS 0–1	5	6	3	5	5	0	3	0	2
mRS 0	6	5	3	4	5	4	0	2	0
Ordinal mRS alone	1	0	5	4	3	4	7	2	3
Ordinal mRS in combination with another score.	2	4	3	5	5	4	0	4	2
9-level mRS with 1a, 1b, 2a, and 2b levels (under development in STEP trial).	8	5	3	4	3	4	1	0	1
QoL scale	5	2	6	3	3	5	2	2	1
NIHSS	0	2	3	1	1	3	8	6	5
Delta-NIHSS (baseline NIHSS minus 30 d NIHSS)	1	4	2	3	2	2	3	10	2
Delta mRS	1	1	1	0	2	3	5	3	13

Panelists were asked to assign a rank/priority to the outcome measures to assess IVT/EVT benefit in patients with baseline NIHSS 3–5 in a trial setting. The number of votes per rank for the outcome measures listed in the first column is shown. Rank 1=highest priority; Rank 9=lowest priority.
EVT, endovascular thrombectomy; IVT, intravenous thrombolysis; mRS, modified Rankin Scale; STEP trial, StrokeNet Thrombectomy Endovascular Platform trial; NIHSS, National Institutes of Health Stroke Scale; QoL, quality of life.

Supplementary Table 3. Round 3 ratings regarding usefulness of different indicators for END risk

	Not useful at all	Slightly useful	Extremely useful
How useful are the following factors to identify low NIHSS LVO/MeVO patients with high risk of END without EVT?			
Orthostatic challenge	1	20	8
Any low NIHSS patient with LVO is at risk. Secondary deterioration often leads to disability → all low NIHSS individuals with LVO should be treated.	8	16	5
Any LVO not determined to be from ICAD.	9	12	8
Older age	13	14	2
Incomplete circle of Willis	8	19	2
Multiple occlusions	3	15	11
Long clot length	5	15	9
Large penumbras	2	6	21
Proximal occlusion of major intra-cranial vessel	1	5	23
Potential embolic origin	12	13	3
Low collateral flow reserve (=poor collaterals)	3	9	17
High blood pressure	6	17	6
Diabetes	16	12	0
Fluctuating symptoms	1	9	19

END, early neurological deterioration; EVT, endovascular thrombectomy; ICAD, intracranial atherosclerotic disease; LVO, large vessel occlusion; MeVO, medium vessel occlusion; NIHSS, National Institutes of Health Stroke Scale.

Supplementary Table 4. Perceived risk–benefit balance of EVT in low NIHSS LVO patients (Round 3 responses, stratified by patient and treatment characteristics; number of panelist votes)

	Risk is higher than benefit	No benefit, no risk	Small net benefit	Great net benefit
How do you rate the benefit of EVT in low NIHSS patients with...				
Ipsilateral ICAD	8	4	13	3
Poor collaterals	2	3	6	17
Orthostatic deterioration	0	2	12	14
Aphasia	0	2	7	19
Distal clot (MeVO)	6	4	14	3
Proximal clot (LVO)	0	0	6	22
Poor accessibility of clot	15	4	9	0
After TNK application	0	8	14	6
If EVT is performed by an experienced interventionalist	0	1	9	17
If EVT is performed by an un-experienced interventionalist	15	5	8	0
Disabling symptoms	0	0	9	19
Young patient	0	3	8	17

Round 3 answers are shown to how participants perceive the risk-benefit balance of EVT in low NIHSS LVO patients stratified for different patient or treatment characteristics. The number of votes from panelists are shown per patient or treatment characteristic.
EVT, endovascular thrombectomy; ICAD, intracranial atherosclerotic disease; LVO, large vessel occlusion; MeVO, medium vessel occlusion; NIHSS, National Institutes of Health Stroke Scale; TNK, tenecteplase.

https://doi.org/10.5853/jos.2025.00304