



CLINICAL INVESTIGATIVE STUDY

Basilar artery occlusion management: Specialist perspectives from an international survey

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Funding information

None.

Abstract

Background and Purpose: Two early basilar artery occlusion (BAO) randomized controlled trials did not establish the superiority of endovascular thrombectomy (EVT) over medical management. While many providers continue to recommend EVT for acute BAO, perceptions of equipoise in randomizing patients with BAO to EVT versus medical management may differ between clinician specialties.



Methods: We conducted an international survey (January 18, 2022 to March 31, 2022) regarding management strategies in acute BAO prior to the announcement of two trials indicating the superiority of EVT, and compared responses between interventionalists (INTs) and non-interventionalists (nINTs). Selection practices for routine EVT and perceptions of equipoise regarding randomizing to medical management based on neuroimaging and clinical features were compared between the two groups using descriptive statistics.

Results: Among the 1245 respondents (nINTs = 702), INTs more commonly believed that EVT was superior to medical management in acute BAO (98.5% vs. 95.1%, $p < .01$). A similar proportion of INTs and nINTs responded that they would not randomize a patient with BAO to EVT (29.4% vs. 26.7%), or that they would only under specific clinical circumstances ($p = .45$). Among respondents who would recommend EVT for BAO, there was no difference in the maximum prestroke disability, minimum stroke severity, or infarct burden on computed tomography between the two groups ($p > .05$), although nINTs more commonly preferred perfusion imaging (24.2% vs. 19.7%, $p = .04$). Among respondents who indicated they would randomize to medical management, INTs were more likely to randomize when the National Institutes of Health Stroke Scale was ≥ 10 (15.9% vs. 6.9%, $p < .01$).

Conclusions: Following the publication of two neutral clinical trials in BAO EVT, most stroke providers believed EVT to be superior to medical management in carefully selected patients, with most indicating they would not randomize a BAO patient to medical treatment. There were small differences in preference for advanced neuroimaging for patient selection, although these preferences were unsupported by clinical trial data at the time of the survey.

KEYWORDS

basilar artery occlusion, endovascular therapy, intravenous thrombolysis, mechanical thrombectomy

INTRODUCTION

Despite considerable advances in neurointervention for acute large vessel occlusion (LVO) strokes since 2015,¹ there have been no randomized clinical trials (RCTs) to support acute endovascular intervention for basilar artery occlusion (BAO) until recently. Due to the poor natural history of BAO^{2,3} and the high degree of clinical efficacy of endovascular thrombectomy (EVT) in anterior circulation proximal LVO,^{1,4} many providers have treated patients with acute BAO⁵ based on their clinical judgment. The publication of two RCTs of EVT in BAO in 2020 and 2021 was thought to have challenged the paradigm of neurointerventional care for these patients.⁶⁻⁸ These trials did not show the superiority of EVT in acute BAO. Unfortunately, both studies suffered from slow enrollment, one required modification of initial parameters, and each may have been underpowered to prove EVT was superior to the best medical therapy. Until the results of two more recently completed trials became available—the ATTENTION and Basilar Artery Occlusion Chinese Endovascular Study (BAOCHE) trials^{9,10}—many providers considered it reasonable to treat BAO without EVT, or believed there to be equipoise in randomizing such patients to EVT or medical treatment, and

disagreed about the ideal patient to take for intervention.^{11,12} We recently surveyed an international cohort of physicians with varying backgrounds in neurology, radiology, and neurosurgery regarding their practice in BAO and found significant variation in responses based on geographic location, hospital type, training, and patient characteristics.

In this follow-up analysis to the survey, we sought to determine whether acute BAO treatment decisions and ethical considerations vary according to the specialist background. While there is increasing evidence to suggest that EVT in acute BAO is efficacious, the differential application of prior evidence according to provider specialty (particularly among providers who offer EVT as compared to those who recommend for or against it) may illuminate disparities in treatment recommendations among stroke specialists.

METHODS

Data will be made available from the corresponding author upon reasonable request. The reader is referred to the primary report of the



After the BEST of BASICS (ABBA) Survey investigators for detailed survey methodology.^{11,13} Briefly, the survey was conducted between January 18, 2022 and March 31, 2022. To maximize the representation of a diverse pool of interventional and non-interventional stroke physicians across a variety of global practice paradigms, the survey was distributed via electronic communication among members of the Dutch Neurovascular Society, the British and Irish Association of Stroke Physicians, Stroke Clinical Trials Network in Ireland, International stroke trial network of a co-author (UF), the Brazil Stroke Society, German Stroke Trial Network, the Italian Stroke Association, the Japan Stroke Society, the Japan Society for Neuroendovascular Therapy, the European Stroke Organization blog, the Madrid Association of Neurology, the Colombia Association of Neurology, the Norway Stroke Organization, Indonesian Neurointerventionalists, the Society of Vascular and Interventional Neurology (SVIN) Membership List, the Global SVIN COVID-19 stroke registry and via invitation by co-authors to their colleagues. The survey was also distributed via the WhatsApp or Telegram group for two Neurointerventional groups, the WeChat Stroke Network in China, MT2020, and Women in Neurointervention. Participant emails were obtained to prevent duplicate response bias.

Ethics

Approval by the local research ethics board was obtained via the Boston Medical Center Institutional Review Board (IRB H-42381). The study was classified as exempt as it did not qualify as human subjects research. The survey conforms with the "Good practice in the conduct and reporting of survey research" format.¹⁴

Statistical analysis

Statistical analysis was performed using SAS 9.4 software (SAS Institute, Cary, NC). The results were summarized using descriptive statistics (ie, frequencies and percentages). Differences between the groups (age, gender, experience, specialty, continent, and country income) were assessed by the χ^2 test or Fisher's exact test (when appropriate). The probability of respondents recommending specific posterior circulation Alberta Stroke Program Early Computed Tomography Scale (pc-ASPECTS) or National Institutes of Health Stroke Scale (NIHSS) thresholds, or using advanced neuroimaging, when selecting BAO patients for EVT was estimated among subspecialty background (interventionalists [INTs] vs. non-interventionalists [nINTs]) and across continents using unadjusted logistic regression. Due to variation in practice patterns and representation of INTs across continents, a multiplicative interaction term for INTs was added to each regression model. There were no missing data to impute and no adjustments were made for multiple hypothesis testing. All tests were performed at the two-sided level with p -values $<.05$ considered statistically significant. Geographic pie charts were created with Tableau. These survey results are reported in accordance with best practice guidelines as recommended by the Enhancing the Quality of Health Research Network.¹⁴

RESULTS

Among 1245 respondents representing 73 countries, 543 (43.6%) were INTs. There were fewer female nINTs and INTs (33.8% vs. 13.6%, $p < .01$, respectively). There was a higher representation of INTs compared to nINTs in Asia (65.8% vs. 34.2%, $p < .01$) and proportionally more nINTs in Europe and South America (74.6% vs. 25.4%, $p < .01$ and 79.6% vs. 20.4%, $p < .01$, respectively; Figure 1). Among respondents, 573 (46.0%) reported having >10 years of experience, with proportionally more nINTs having this level of experience as compared to INTs with this degree of experience (50.9% vs. 39.8%, $p < .01$; Table 1).

When asked about the management of BAO, there was high agreement among all survey respondents that EVT is superior to medical management in certain patients. However, INTs were more likely to agree or strongly agree that EVT was superior to medical management of BAO compared to nINTs (98.5% vs. 95.0%, $p < .01$; Table 1). There were no differences between INTs and nINTs regarding the application of a patient's pre-morbid modified Rankin score (mRS) in the decision to proceed to EVT ($p = .48$; Table 2).

Diffusion-weighted imaging was chosen as the imaging modality of choice for BAO EVT selection in 50.2% of nINTs and 55.2% of INTs (Figure 2A). Regarding use of the pc-ASPECTS score, a similar proportion 32 of INTs and nINTs reported they would use the pc-ASPECTS score in EVT decision-making for basilar occlusion (32.3% vs. 34%, $p = .53$; Figure 2B). Additionally, among respondents who indicated they would use the pc-ASPECTS score to determine thrombectomy eligibility, there was no difference in the threshold of pc-ASPECTS in which they would proceed with EVT ($p = .24$; Figure 2C).

Regarding the minimum NIHSS necessary to proceed with EVT, a higher proportion of INTs preferred a NIHSS threshold before proceeding to EVT as compared to nINTs (55.8% vs. 49.5%, odds ratio [OR] = 1.29, 95% confidence interval [CI]: 1.01-1.64, $p = .04$). Among providers who required a NIHSS minimum, there was no difference in NIHSS thresholds (<6 , ≥ 6 , >10 , or no NIHSS threshold) between INTs and nINTs ($p = .22$; Figure 2B). Additionally, there were differences in the proportion of providers who would recommend advanced neuroimaging for all patients, with neurologists preferring perfusion imaging (CT or MRI) more than INTs (24.2% vs. 19.7%, $p < .01$). When consolidating CT and MR perfusion, INTs were less likely to recommend any perfusion imaging when compared to nINTs (OR = 0.73, 95% CI: 0.56-0.97, $p = .03$).

When asked whether they would treat BAO with EVT according to prestroke disability, only 3.8% of respondents agreed they would treat with EVT exclusively as part of a RCT (Table 2). Separately, when asked if their center were to take part in a RCT, a larger proportion of respondents indicated they would participate in the trial, with 535 (43.0%) indicating they would find it acceptable to randomize patients to medical management as long as they met trial inclusion criteria. By contrast, 327 (26.2%) respondents indicated they would not randomize BAO patients to medical management at all. Interventionalists and non-interventionists were equally likely to randomize a patient to best medical management according to these prompts (46.6% vs. 44.8%,

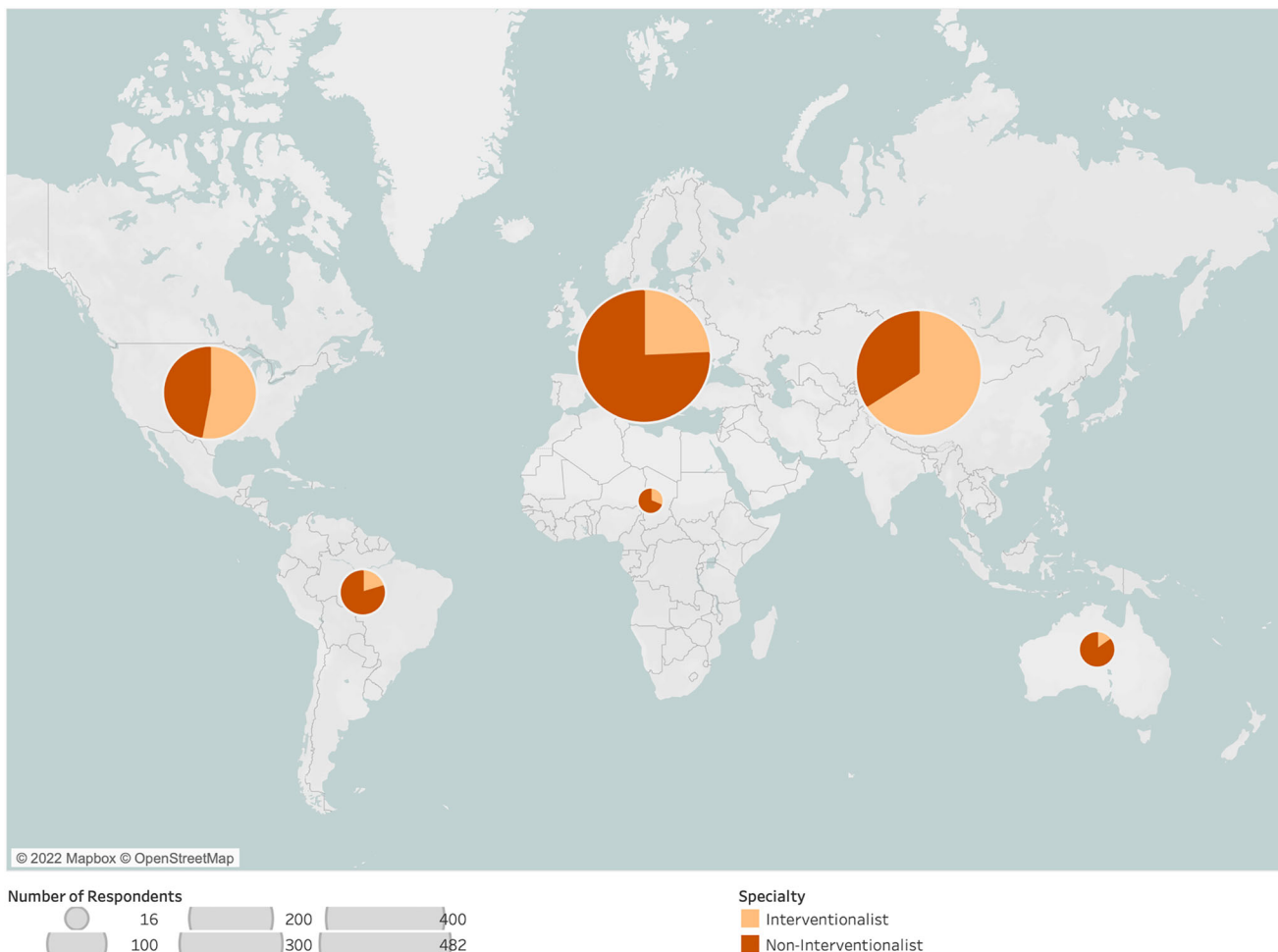


FIGURE 1 World map of respondents according to specialty.

$p = .54$). Among respondents who indicated they would randomize to medical management, a similar proportion of respondents would randomize a patient when the NIHSS was <10 (10.0% vs. 11.3%, $p = .48$), with proportionally more INTs likely to randomize when the NIHSS was ≥ 10 (15.9% vs. 6.9%, $p < .01$).

Due to the varying representation of INTs across continents, we further explored the management strategies according to geographic location. Using North America as the reference group, the requirement of any pc-ASPECTS threshold for selecting a BAO patient for EVT was more common among respondents in South America (OR = 4.38, 95% CI: 2.08-9.20) and Asia (OR = 2.04, 95% CI: 1.32-3.14) and trended toward being more common in Africa (OR = 3.54, 95% CI: 0.95-13.18). Compared to North American respondents, only European respondents had a lower probability of requiring a NIHSS minimum for selecting patients for EVT (OR = 0.52, 95% CI: 0.36-0.73), while respondents from other continents responded similarly to North American respondents regarding the use of a NIHSS cutoff. There was a universal proclivity for preferring advanced neuroimaging (perfusion, multiphase CTA, or MRI) among all continents other than North America where providers less commonly required advanced imaging for EVT selection. There were no interactions between

continents and provider specialty (INT vs. nINT) in any analysis (Table 3).

Among the subgroup of INTs, there were small differences in clinical recommendations according to the training background of individual providers (Figure 3). Specifically, radiology-trained INTs were more likely to prefer MRI with diffusion-weighted imaging in selecting patients with BAO for thrombectomy, and they were least likely to recommend CT perfusion or multiphase CTA, when compared to radiology- and neurology-trained INTs ($p < .01$ for differences). Among INT backgrounds, radiology-trained INTs were nonsignificantly more likely to recommend against NIHSS in selecting BAO patients for thrombectomy ($p = .057$).

DISCUSSION

The results of this international survey reflect the routine clinical practices of INTs and nINTs in the selection of BAO patients to EVT compared to medical management prior to the release of two recent BAO studies, ATTENTION and BAOCHE. The window of time in which the opinions of physicians were captured in this survey was

**TABLE 1** Demographics

	Non-interventional physician (N = 702)	Interventional physician (N = 543)	p-value
Female, N (%)	237/702 (33.8%)	74/543 (13.6%)	<.01
Years of practice, N (%)			<.01
<6	180/702 (25.6%)	157/543 (28.9%)	
5-10	165/702 (23.5%)	170/543 (31.3%)	
11-15	149/702 (21.2%)	111/543 (20.4%)	
>15	208/702 (29.6%)	105/543 (19.3%)	
Number of physicians who believe thrombectomy is superior to standard medical treatment for certain patients with basilar artery occlusions, N (%)			<.01
Strongly disagree with above	1/701 (0.1%)	1/543 (0.2%)	
Disagree with above	3/701 (0.4%)	2/543 (0.4%)	
Neutral	30/701 (4.3%)	5/543 (0.9%)	
Agree with above	250/701 (35.7%)	135/543 (24.9%)	
Strongly agree with above	417/701 (59.5%)	400/543 (73.7%)	
Training background among interventionalists, N (%)			<.01
Neurology	682/702 (96.8%)	301/543 (55.4%)	
Neurosurgery	0/702 (0.0%)	68/543 (12.5%)	
Radiology	20/702 (2.8%)	174/543 (32.0%)	

Abbreviation: N, Number of respondents.

unique, at a crossroad when the evidence supporting BAO EVT was not established. The BEST and BASICS trials' findings left many stroke physicians unconvinced that EVT is no more effective than medical management for acute BAO, with almost all nINTs and INTs indicating EVT should be considered in routine practice. Between specialties, there were important differences in the use of common clinical and radiological tools for medical decision-making, such as a larger proportion of INTs requiring a minimum NIHSS threshold, as well as differences in advanced imaging in the selection of patients for EVT, while no difference existed when considering mRS or pc-ASPECTS scores prior to intervention (although some regional differences were significant, described below). Since the completion of these surveys, the results from ATTENTION and BAOCHÉ have confirmed that patients with acute BAO and severe deficits may be considered for EVT based on favorable unenhanced CT imaging presenting within 24 hours of the last known well. With these new data, stroke specialists are now challenged with issues regarding the transportability of these findings (given that the trials were conducted in a Chinese population) and the broadening of these strict inclusion criteria.¹⁵

While the surveyed respondents in this analysis represent six continents and 73 countries, there was an underrepresentation of perspectives from female providers and those with significant experience with neurointervention. Three quarters of respondents were male, with disproportionately fewer female INTs, and over half of respondents had fewer than 10 years of experience in independent practice. It is difficult to determine whether the 13.6% of INTs being females

indicates a bias in survey responses, the lower likelihood for women to respond to surveys, or is reflective of female representation in this subspecialty.¹⁶

Among survey respondents who utilize the pc-ASPECTS score for acute BAO decision-making, there were no significant differences in pc-ASPECTS minimum among INTs and nINTs. While the use of the pc-ASPECTS score had not yet been validated in RCTs for acute BAO management at the time of this survey, one third of respondents who use the pc-ASPECTS would pursue EVT with a pc-ASPECTS of ≥ 6 without additional advanced imaging. When physicians preferred advanced imaging to decide whether to proceed toward intervention, the majority of respondents, particularly the INTs, opted for MRI, with the next most preferred modalities being CT or MR perfusion. In an attempt to adjust for variation in geographic access to imaging modalities and treatment paradigms, we assessed the interaction between subspecialist background (INT vs. nINT) and various clinical and imaging prerequisites for BAO EVT. We found no additional association between specialist type and continent when it came to advanced neuroimaging preference in BAO thrombectomy determination. When analyzed as a subgroup, there were small differences in imaging preferences among INTs according to training background. Specifically, radiology-trained INTs (when compared to neurosurgery- and neurology-trained INTs) were more likely to recommend against using pc-ASPECTS and were most likely to recommend MRI with diffusion-weighted imaging to guide decision-making. This may be explained by their experience and knowledge regarding the limitations of unenhanced CT in brainstem infarcts, as compared to neurology- and neurosurgery-trained INTs.

**TABLE 2** Use of clinical factors and neuroimaging in decision-making

	Non-interventional physician (N = 702)	Interventional physician (N = 543)	p-value
Number of physicians who believe thrombectomy should be performed if prestroke modified Rankin Scale is...			.48
0-2	300/645 (46.5%)	250/502 (49.8%)	
0-3	318/645 (49.3%)	235/502 (46.8%)	
Would only perform thrombectomy if in the setting of a clinical trial	27/645 (4.2%)	17/502 (3.4%)	
Physician use of posterior circulation Alberta Stroke Program Early Computed Tomography Scale in patient selection...			.31
Number of physicians who believe score >5 needed to proceed with thrombectomy	233/624 (37.3%)	172/498 (34.5%)	
Number of physicians who believe advanced imaging is needed	110/624 (17.6%)	105/498 (21.1%)	
Number of physicians who would not use unenhanced or advanced imaging in decision-making	281/624 (45.0%)	221/498 (44.4%)	
Among physicians who believe advanced neuroimaging may be needed, number of physicians who would prefer...			.04
Multiphase computed tomography angiography	48/650 (7.4%)	52/522 (10.0%)	
Computed tomography or magnetic resonance perfusion	166/650 (25.5%)	105/522 (20.1%)	
Magnetic resonance imaging with diffusion-weighted imaging	326/650 (50.2%)	288/522 (55.2%)	
Do not believe advanced imaging is required	110/650 (16.9%)	77/522 (14.8%)	
The minimum severity of deficits needed for thrombectomy...			.22
NIHSS <6 only	8/590 (1.4%)	7/475 (1.5%)	
NIHSS 6 or more	198/590 (33.6%)	175/475 (36.8%)	
NIHSS 10 or more	86/590 (14.6%)	83/475 (17.5%)	
No minimum NIHSS necessary to proceed with thrombectomy, as long as other imaging and time frame requirements are met	298/590 (50.5%)	210/475 (44.2%)	
I would randomize any of the following patients to medical therapy if...			
They met inclusion criteria set forth by a clinical trial	297 (42.3%)	238 (43.8%)	.59
Only patients with certain clinical criteria	229 (32.6%)	169 (31.1%)	.57
I would NOT randomize a patient to medical therapy	177 (25.2%)	150 (27.6%)	.34

Note: The prompt from this survey response permitted multiple answer choices; therefore, the cumulative total responses for each provider type will exceed 100%. For example, seven providers indicated they would feel comfortable randomizing any patient who meets inclusion criteria set forth in a trial, but also feel comfortable randomizing a patient with an NIHSS <10. Similarly, 26 respondents indicated they would randomize any patient who meets the inclusion criteria of a trial, but also feel comfortable randomizing a patient with an NIHSS of 10 or more.

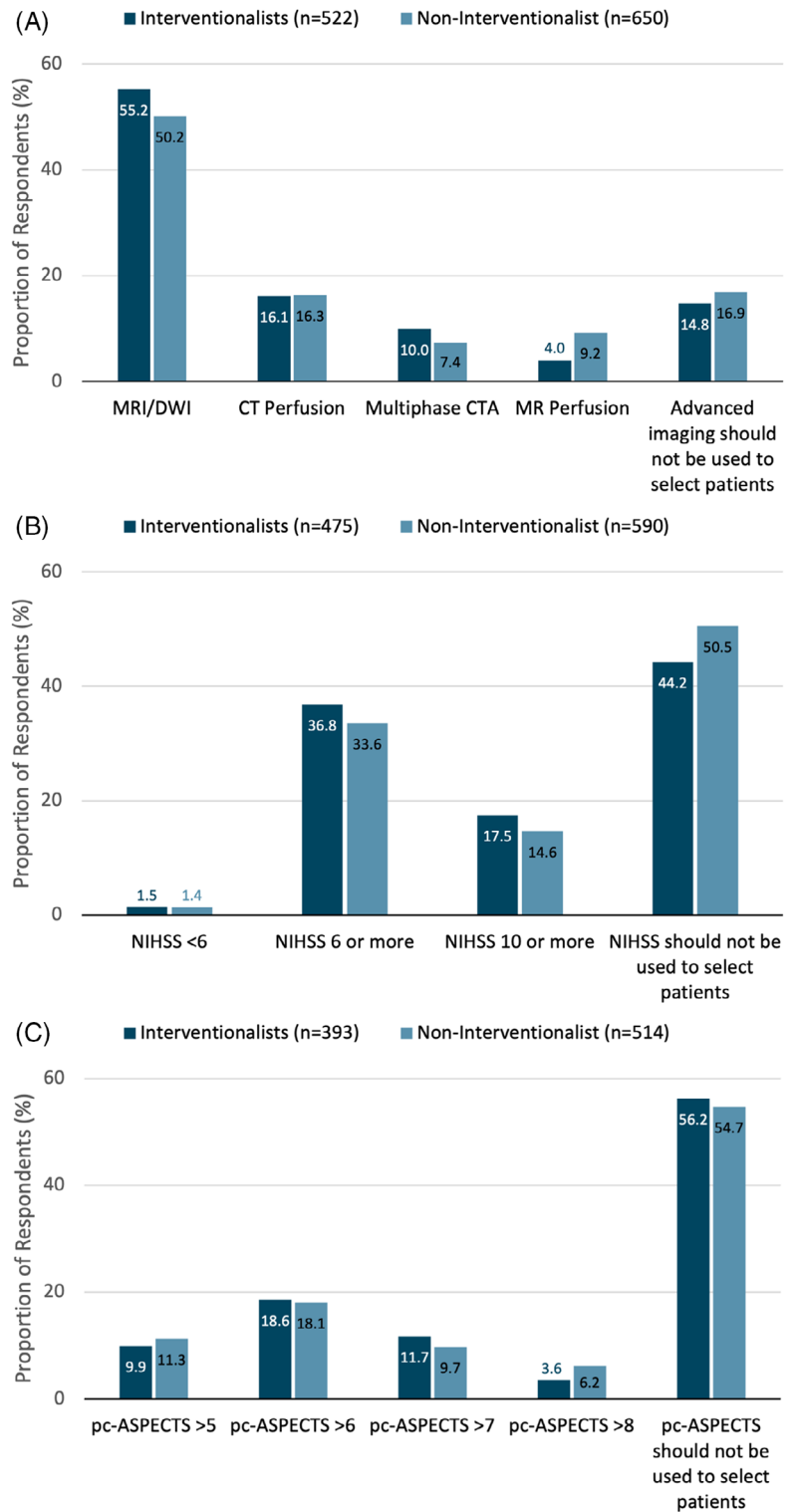
Abbreviations: N, Number of respondents; NIHSS, National Institutes of Health Stroke Scale.

Geographic variations in practice recommendations revealed certain differences in routine medical decision-making. We observed that INTs were less likely to recommend any perfusion imaging when compared to nINTs, and providers in North America were less likely to require perfusion imaging when compared to respondents from any other continent. There was generally an international consensus that the NIHSS should be used in selecting BAO patients for EVT, with the exception being European respondents, who were at half the odds of recommending an NIHSS threshold for BAO EVT when compared to respondents in North America. Despite the fact that there were proportionally more nINTs in Europe (compared to other continents), there was no interaction between provider specialty and continent when it came to recommendation for perfusion imaging or use of an NIHSS cutoff in patient selection. Therefore, the preference to defer

perfusion imaging may be favored by INTs and North American stroke providers. Respondents more commonly recommended a minimum pc-ASPECTS in South America and Africa when compared to North American respondents.

The NIHSS is an important tool that has been historically used to select patients with anterior circulation occlusion. In this survey, there was a good agreement regarding a minimum NIHSS to proceed to EVT between INTs and nINTs; however, only half of the respondents indicated a minimum NIHSS should be used in EVT decision-making. The lack of minimum NIHSS and high agreement between clinical and interventional specialists may reflect the limited utility of the NIHSS in posterior circulation disease. It is known that the NIHSS is more sensitive and specific for quantifying cortical injury, and is less sensitive in predicting outcomes of BAO.¹⁷ A dedicated posterior circulation

FIGURE 2 Clinical and radiographic recommendations for thrombectomy decision-making. (A) Distribution of advanced imaging recommendations for selecting patients with BAO for thrombectomy ($p < .01$). (B) Distribution of NIHSS minimum to select patients with BAO for thrombectomy ($p = .04$). (C) Distribution of pc-ASPECTS maximum to select patients with BAO for thrombectomy among providers who use the pc-ASPECTS score and would not require advanced imaging ($p = .26$). Responses are shown only among providers who recommended thrombectomy for acute BAO in routine clinical practice, while responses by providers who feel thrombectomy may *only* be performed in a clinical trial based on pc-ASPECTS ($n = 29$), with advanced imaging only ($n = 215$), or in other specific circumstances ($n = 67$) are not shown in part A; responses by providers who feel thrombectomy may *only* be performed in a clinical trial based on NIHSS ($n = 34$) or in other specific circumstances ($n = 92$) are not shown in part B; responses by providers who feel thrombectomy may *only* be performed in a clinical trial when advanced imaging is needed ($n = 20$) or in other specific circumstances ($n = 25$) are not shown in part C. pc-ASPECTS, Posterior Circulation Alberta Stroke Program Early Computed Tomography Scale; NIHSS, National Institutes of Health Stroke Scale; BAO, basilar artery occlusion; DWI, diffusion-weighted imaging; CTA, computed tomography angiography; n , number.



stroke scale may offer higher prognostic accuracy than the standard NIHSS.¹⁸ For example, a patient may have highly disabling symptoms (eg, severe truncal instability, cortical blindness) yet present with a low NIHSS, and as such, the threshold for non-interventional and interventional specialists to treat with EVT may be lower. While patients with lower NIHSS scores generally have better clinical outcomes in

posterior circulation occlusions,^{19,20} it remains unknown if EVT would augment any treatment effect of “mild” presentations of BAO.²¹

With the results of ATTENTION and BAOCHE, physicians now have the data to justify the decision to proceed to EVT in BAO, as long as certain clinical or radiographic criteria are met. BAOCHE limited inclusion of patients to those with a NIHSS ≥ 6 , pc-ASPECTS

**TABLE 3** Endovascular thrombectomy prerequisites according to continent and provider specialty

Comparison/Outcome	Continent	Raw counts	Unadjusted odds ratio (95% confidence interval)	p-value	p-value for interaction ^a
Requirement of a minimum posterior circulation Alberta Stroke Program Early Computed Tomography Scale score to proceed with thrombectomy	North America	42/141 (29.8%)	Referent		
	South America	26/40 (65.0%)	4.38 (2.08-9.20)	<.01	.25
	Europe	102/322 (31.7%)	1.09 (0.71-1.68)	.69	.64
	Asia	128/276 (46.4%)	2.04 (1.32-3.14)	<.01	.55
	Africa	6/10 (60.0%)	3.54 (0.95-13.18)	.06	.76
	Oceania	4/21 (19.1%)	0.55 (0.18-1.75)	.31	n/a
Requirement of a certain National Institutes of Health Stroke Scale to proceed with thrombectomy	North America	109/186 (58.6%)	Referent		
	South America	25/49 (51.0%)	0.74 (0.39-1.38)	.34	.95
	Europe	173/410 (42.2%)	0.52 (0.36-0.73)	<.01	.67
	Asia	225/377 (59.7%)	1.05 (0.73-1.49)	.81	.85
	Africa	9/14 (64.3%)	1.27 (0.41-3.94)	.68	>.99
	Oceania	16/29 (55.2%)	0.87 (0.40-1.91)	.73	.73
Requirement of perfusion imaging over unenhanced imaging to proceed with thrombectomy	North America	24/223 (10.8%)	Referent		
	South America	17/52 (32.7%)	4.03 (1.96-8.25)	<.01	.52
	Europe	104/461 (22.6%)	2.42 (1.50-3.89)	<.01	.31
	Asia	109/393 (27.7%)	3.18 (1.97-5.13)	<.01	.30
	Africa	4/14 (28.6%)	3.32 (0.96-11.40)	.06	.95
	Oceania	13/29 (44.8%)	6.74 (2.89-15.69)	<.01	n/a

Note: Denominators are different for each outcome category since the frequencies and effect estimates are only shown if the respondent indicated in the survey that they would or would not use pc-ASPECTS, minimum National Institutes of Health Stroke Scale, or perfusion imaging (respectively) in routine medical decision-making. For example, responses were excluded if respondent indicated patients should only be considered for EVT in a clinical trial setting. Abbreviation: n/a, not available.

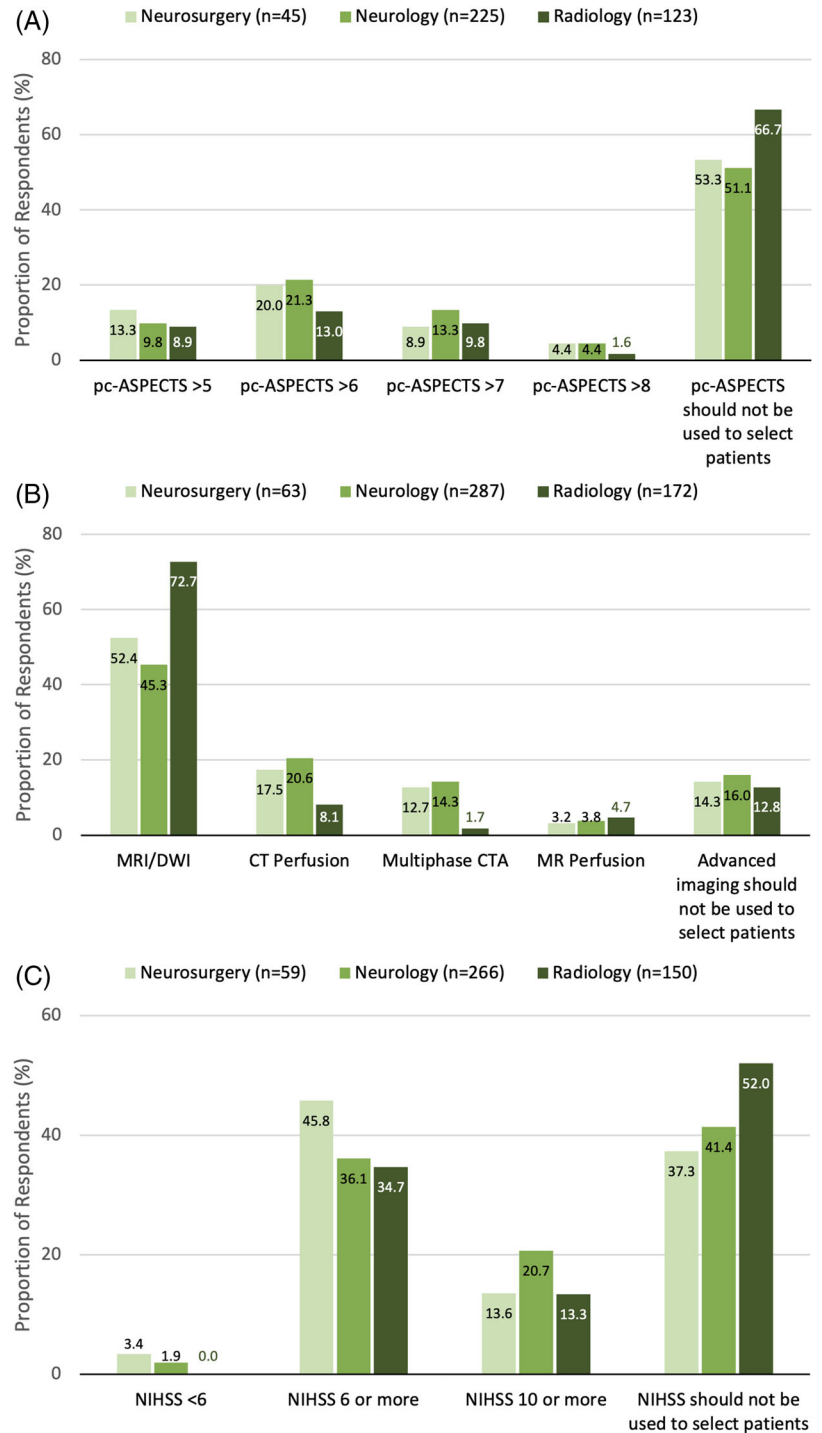
^ap-values for interaction indicate the estimate for a multiplicative interaction term for continent × provider specialty (interventionalist vs. non-interventionalist).

of ≥ 6 (or pons-midbrain index < 3), and prestroke mRS of 0-1 who presented within 6-24 hours of last known well.¹⁰ By contrast, ATTENTION limited inclusion to those presenting within 12 hours of last known well as long as they had a NIHSS ≥ 10 , prestroke mRS 0-2 for patients aged < 80 (or 0-1 for ages ≥ 80), and pc-ASPECTS ≥ 6 for patients aged < 80 (or ≥ 8 for ages ≥ 80).⁹ Despite differences in eligibility criteria, both trials demonstrated a consistent and significant benefit with EVT over medical management. The use of these criteria, which were similar to those from BEST and BASICS, have not been implemented at many centers around the world according to this survey. Further, we believe this new evidence for EVT in BAO is unlikely to lead to more stringent patient selection in routine practice, particularly as the ATTENTION and BAOCHE trials permitted patient inclusion into the trial up to 24 hours from estimated time of symptom onset based on pc-ASPECTS on plain CT or CTA source imaging, in parallel with trends for treating patients with LVO of the anterior circulation by plain CT selection.²²⁻²⁴ Instead, we anticipate that providers may liberalize their local paradigms and consider EVT in patients among whom they would previously not have considered this intervention.

Limitations

While these survey results reflect the practice paradigms of INTs and nINTs, they were captured during a unique window in time (after the BEST and BASICS studies were published, but before the announcement of ATTENTION and BAOCHE). Therefore, we are unable to conclude that the responses from physicians in this survey indicate ongoing treatment paradigms. Instead, they reflect interspecialty differences in the perception of published literature on acute BAO management that were available in early 2022 when the survey was conducted. Furthermore, randomized trials regarding BAO endovascular management have been largely conducted in Chinese populations, which limits the generalizability of the trial findings.^{12,25} In the absence of trial data representing other patient demographics and regions of the world, it is possible the perspectives of stroke specialists remain unchanged following publication of ATTENTION and BAOCHE. A heightened awareness of unique perspectives is advantageous for the reasons outlined above. In addition, the majority of survey respondents were neurology trained, with a minority of INTs having undergone formal training in neurosurgery or radiology. While the majority of stroke

FIGURE 3 Responses among interventionalists according to background training. (A) Distribution of pc-ASPECTS threshold to select patients with BAO for thrombectomy among providers who use the pc-ASPECTS score and would not require advanced imaging ($p = .148$). (B) Distribution of advanced imaging recommendations for selecting patients with BAO for thrombectomy ($p < .01$). (C) Distribution of NIHSS minimum to select patients with BAO for thrombectomy ($p = .057$). pc-ASPECTS, Posterior Circulation Alberta Stroke Program Early Computed Tomography Scale; EVT, endovascular thrombectomy; NIHSS, National Institutes of Health Stroke Scale; BAO, basilar artery occlusion; DWI, diffusion-weighted imaging; CTA, computed tomography angiography; n , number.



physicians are neurology trained, this imbalance may have contributed to a bias in the perspectives reported. This study was also limited by the survey design and questions selected. In order to permit quantitative analyses, survey responses were categorical or ordered, and not free text. Open responses might have permitted a more granular understanding of provider perspectives and treatment paradigms, but analyses would have been constrained. Furthermore, the ABBA survey did not capture information regarding the availability of advanced imaging for EVT decision-making.

CONCLUSIONS

Despite the publication of RCTs demonstrating no significant advantage for thrombectomy in acute BAO, more than nine out of 10 stroke providers continued to believe endovascular treatment was superior to medical management in certain clinical scenarios. There were generally minimal variations in this perspective between INTs and NINTs; however, there were small differences in preference for utilizing advanced imaging (eg, MRI for radiology-trained INTs), and



the use of a minimum NIHSS threshold for selecting patients for thrombectomy (which slightly more nINTs than INTs opposed). These findings reflect the global variations in the practice of INTs and nINTs who treat patients with acute BAO. Generally speaking, there was a high agreement between specialists regarding the selection of patients for EVT based on preexisting disability, use of the pc-ASPECTS, and minimum deficits as quantified by the NIHSS. Furthermore, there was little variation between INTs and nINTs when it came to whether or not the NIHSS or advanced (eg, perfusion) imaging should be utilized in EVT decision-making. With the release of the ATTENTION and BAOCHE trials demonstrating the benefit of EVT over medical management in selected patients with BAO, there may be little change in clinical practice given the high use of EVT in BAO among INTs and nINTs respondents during a period when the evidence for BAO EVT was not established. We anticipate that these findings in ABBA will offer a global perspective to trialists regarding the design of future interventional studies in posterior circulation occlusive disease.

ACKNOWLEDGEMENTS AND DISCLOSURES

Dr. Aguiar de Sousa reported speaker fees from Bayer, travel support from Boehringer Ingelheim, participating in an advisory board for AstraZeneca, and DSMB participation for the SECRET trial, outside the submitted work. Dr Field reported in-kind study medication from Bayer Canada outside the submitted work. Dr Fischer reported research grants from Medtronic (BEYOND SWIFT and SWIFT DIRECT) and from Stryker, Rapid medical, Penumbra, and Phenox (DISTAL); he is serving as consultant for Medtronic, Stryker, and CSL Behring; and participating in an advisory board for Alexion/Portola and Boehringer Ingelheim outside submitted work. He receives research support of the Swiss National Science Foundation and the Swiss Heart Foundation. He is member of a clinical event committee of the COATING study (Phenox) and member of the data and safety monitoring committee of the TITAN and IN EXTREMIS trials. Dr. Michel reported grants from Swiss National Science Foundation and Swiss Heart Foundation outside the submitted work. Dr. Nagel reported personal fees for consultancy for Brainomix and payment for lectures including speaker bureaus with Boehringer Ingelheim and Pfizer outside submitted work. Dr. Nguyen (TNN) reported research support from Medtronic and SVIN. Dr. Nogueira reported consulting fees for advisory roles with Anaconda, Biogen, Cerenovus, Genentech, Hybernia, Imperative Care, Medtronic, Phenox, Philips, Prolong Pharmaceuticals, Stryker Neurovascular, Shanghai Wallaby, and Synchron and stock options for advisory roles with Astrocyte, Brainomix, Cerebrotech, Ceretrieve, Corindus Vascular Robotics, Vesalio, Viz-AI, RapidPulse, and Perfuzo, and investments in Viz-AI, Perfuzo, Cerebrotech, Reist/Q'Apel Medical, Truvic, and Viseon. Dr. Sacco reported personal fees as speaker or advisor from Abbott, Allergan-Abbvie, AstraZeneca, Eli Lilly, Lundbeck, Novartis, NovoNordisk, Pfizer, and Teva and research grants from Allergan, Novartis, and Uriach. Dr. Saposnik reported research grants and consulting fees from Roche and receives compensation as the Editor-in-chief of the World Stroke Academy for the World Stroke Organization. Dr. Sandset has reported speaker honoraria from Boston Scientific and Boehringer Ingelheim outside the submitted work. Dr. Mikulik

was supported by the project no. CA18118, IRENE COST Action—Implementation Research Network in Stroke Care Quality, by project no. LQ1605 from the National Program of Sustainability II, and by IRIS-TEPUS Project No. LTC20051 from the INTER-EXCELLENCE INTER-COST program of the Ministry of Education, Youth and Sports of the Czech Republic. Dr. Siegler reported consulting fees from Ceribell and speakers' bureau involvement with AstraZeneca outside the submitted work. Dr. Thomalla reported fees as a consultant or lecturer from Acan-dis, Alexion, Amarin, Bayer, BristolMyersSquibb/Pfizer, Boehringer Ingelheim, Daiichi Sankyo, Portola, and Stryker. Dr. Yamagami reported research grants from Bristol-Myers Squibb, lecturer's fees from Bayer, Daiichi-Sankyo, Stryker, and Bristol-Myers Squibb, and membership of the advisory boards for Daiichi-Sankyo outside the submitted work.

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How to cite this article: Edwards C, Drumm B, Siegler JE, Schonewille WJ, Klein P, Huo X, et al. Basilar artery occlusion management: Specialist perspectives from an international survey. *J Neuroimaging*. 2023;33:422-433. <https://doi.org/10.1111/jon.13084>