PREHOSPITAL RECOGNITION OF STROKE: PERFORMANCE OF FAST AND BE-FAST SCALES AND IMPACT ON ACCESS TO REPERFUSION

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Abstract: Objective: to analyze the performance of the FAST and BE-FAST scales in prehospital stroke recognition and their impact on access to reperfusion therapy. Method: an integrative review was conducted in PubMed/MEDLINE, LILACS, SciELO and the Virtual Health Library, including studies published between 2021 and July 2026. Results: 28 studies were included in the synthesis. FAST showed high operational applicability, but lower sensitivity for posterior circulation events and mild deficits. BE-FAST expanded the detection of balance and visual abnormalities, potentially reducing false negatives, although at the cost of lower specificity. Clinical benefit depended on combining the scale with clinical reasoning, determination of the last-known-well time, capillary glucose testing, prenotification and transport to the appropriate center. Conclusion: BE-FAST can complement FAST, but does not replace structured neurological assessment, continuing education and regional management of the stroke care pathway.

Keywords: Stroke; Emergency Medical Services; Early Diagnosis; Triage; Reperfusion Therapy.

INTRODUCTION

Stroke is a time-dependent neurological emergency in which the effectiveness of reperfusion therapies progressively declines as the interval between symptom onset and treatment increases. Its clinical presentation can range from overt motor and language deficits to subtle changes in balance, vision, coordination, sensation or behavior. This heterogeneity

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makes initial recognition—often performed by family members, dispatch center professionals and prehospital care (PHC) teams—a decisive point in the care pathway.

The epidemiological burden underscores the urgency of the problem. Recent global estimates indicate approximately 12 million new stroke episodes per year, around 94 million people living with its consequences, and a lifetime risk close to one in four adults. In addition to mortality, stroke remains among the leading causes of years of life lost due to disability, with a disproportionate impact on low- and middle-income countries, where a higher burden of risk factors, territorial inequality and lower availability of specialized units coexist (Feigin et al., 2025; World Health Organization, 2025).

In Brazil, stroke care is organized within the Emergency Care Network, linking the Mobile Emergency Care Service (SAMU 192), dispatch centers, hospital emergency departments, stroke units and centers capable of performing intravenous thrombolysis and mechanical thrombectomy. However, the formal existence of the network does not in itself guarantee equitable access. Brandão, Lanzoni e Pinto (2023) demonstrated that care pathways, inter-service communication, referral and counter-referral arrangements, and resource availability directly affect timely treatment. Thus, prehospital performance should be understood both as a clinical outcome and as an indicator of system management.

The Face, Arm, Speech, Time (FAST) scale has become established because of its simplicity: it assesses facial asymmetry, upper-limb weakness, and speech changes, linking any finding to the immediate activation of emergency services. Its ease of recall has encouraged its use by laypeople and professionals. However, its focus on typical anterior circulation signs limits the identification of posterior circulation strokes, in which sudden vertigo, ataxia, diplopia, visual loss, nystagmus, dysmetria, and postural instability may predominate (Devlin, 2022; Hunt et al., 2024).

The Balance, Eyes, Face, Arm, Speech, Time (BE-FAST) approach adds assessment of balance and visual changes. This addition aims to increase sensitivity, particularly for posterior circulation strokes, without making the examination incompatible with the emergency setting. The review by Chen et al. (2022) and subsequent studies suggest that BE-FAST may reduce missed cases, but point to methodological heterogeneity, variation in

ISSN: 2763-5724

item definitions, and a possible increase in activations for stroke mimics. Hilditch et al. (2025) emphasize that superiority cannot be assumed in all systems, since sensitivity and specificity depend on the population, training, stroke prevalence, and quality of administration.

The clinical problem extends beyond choosing an acronym. A positive screening result must trigger coordinated actions: establishing the last-known-well time, checking capillary blood glucose, assessing the airway and ventilation, identifying anticoagulant use, conducting a brief neurological examination, preventing avoidable delays, providing pre-notification, and selecting the destination. When the scale is treated as an isolated form, the opportunity to integrate recognition, decision-making, and reperfusion is lost. When linked to regional protocols and trained teams, it becomes a trigger for reorganizing the entire care pathway.

The most recent international guidelines recommend that emergency services use validated instruments for suspected stroke, adopt destination protocols based on network capacity, and provide advance notification to the receiving facility. The 2026 update from the American Heart Association/American Stroke Association (AHA/ASA) incorporated refinements to emergency medical services triage, expanded thrombectomy criteria, and strengthened mobile stroke units and reperfusion strategies. In parallel, the World Health Organization emphasizes that prehospital care should provide rapid assessment, immediate management, and transport to an appropriate facility, with integration across the community, emergency medical dispatch, and hospital (Prabhakaran et al., 2026; World Health Organization, 2025).

For nurses, prehospital recognition requires clinical reasoning in an uncertain environment. Nurses must distinguish focal signs from changes caused by hypoglycemia, seizure with Todd's paralysis, intoxication, migraine, peripheral vestibular disorders, and infections, without delaying referral when stroke remains a plausible diagnosis. Decision-making involves balancing the risk of a false negative, which may exclude a patient from a therapeutic window, against the risk of a false positive, which mobilizes specialized resources and may overload the network.

In hospital and prehospital management, this balance should be monitored using indicators such as the proportion of patients assessed with a standardized scale, documentation of last-known-well time, documented blood glucose, pre-notification rate, scene time, onset-to-door time, door-to-imaging time, door-to-needle time, access to thrombectomy, secondary transfers, activation rate for stroke mimics, and functional outcome. Joint analysis of these indicators makes it possible to identify whether weaknesses lie in recognition, dispatch, transport, hospital reception, or available capacity.

Given the controversies surrounding the diagnostic benefit of BE-FAST and the need to link triage with effective treatment, the following question was formulated: in adults with suspected stroke attended in the prehospital setting, how does the performance of the FAST and BE-FAST scales influence early recognition, care pathway organization, and access to reperfusion therapies? The rationale lies in the need to support protocols that increase sensitivity without leading to indiscriminate referral, while recognizing the role of nursing and the network's clinical governance.

The objective of this study was to analyze the scientific evidence on the early recognition of stroke in prehospital care, with an emphasis on the performance of the FAST and BE-FAST scales and the impact on access to reperfusion. The specific objectives were to compare the diagnostic properties of the scales; identify factors associated with recognition failures; examine the effects of training, prenotification, telemedicine, and routing; and propose quality indicators applicable to nursing and the management of the stroke care pathway.

METHODOLOGY

This is an integrative literature review of a descriptive nature and an analytical-critical approach. The integrative review was chosen because it allows the inclusion of observational studies, diagnostic validations, systematic reviews, implementation trials, and clinical recommendations, while preserving the analysis of contextual differences between emergency systems. The methodological report was organized in accordance with the

recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) (Page et al., 2021).

The research question was structured according to the adapted PICo strategy: population — adults with suspected stroke; interest — prehospital recognition using FAST, BE-FAST, or related instruments; context — emergency medical services, dispatch, ambulances, and transition to stroke centers. The guiding question was: what evidence demonstrates the performance of the FAST and BE-FAST scales and their relationship with timely access to reperfusion in prehospital care?

The search was conducted on July 16, 2026, in the PubMed/MEDLINE, Latin American and Caribbean Literature in Health Sciences (LILACS), Scientific Electronic Library Online (SciELO), and Virtual Health Library (BVS) databases. DeCS/MeSH descriptors and free-text terms in Portuguese, English, and Spanish were used: "Acidente Vascular Cerebral", "Stroke", "Accidente Cerebrovascular", "Serviços Médicos de Emergência", "Emergency Medical Services", "Atención Prehospitalaria", "FAST", "BE-FAST", "Stroke Scale", "Early Diagnosis", "Triage", "Reperfusion Therapy", "Thrombolysis", "Thrombectomy" and "Prenotification".

The main search strategy was: ((Stroke OR "Acidente Vascular Cerebral" OR "Accidente Cerebrovascular") AND ("Emergency Medical Services" OR "Prehospital Care" OR "Atendimento Pré-Hospitalar" OR "Atención Prehospitalaria") AND (FAST OR BE-FAST OR "stroke scale" OR "early recognition" OR triage) AND (reperfusion OR thrombolysis OR thrombectomy OR prenotification)). In the Latin American databases, the expressions were adapted to the respective syntax without changing the central concepts. Language filters — Portuguese, English, and Spanish — and a period from January 2021 to July 2026 were applied.

Full-text scientific articles involving adults, prehospital care or a direct interface between EMS and the hospital, and at least one of the following outcomes were included: sensitivity, specificity, accuracy, or predictive value of a scale; stroke recognition; identification of posterior circulation or large-vessel occlusion; transport or arrival time; prenotification; time to neuroimaging; thrombolysis; thrombectomy; mortality; or functional

outcome. Primary studies, systematic reviews, meta-analyses, implementation studies, and evidence-based guidelines were included.

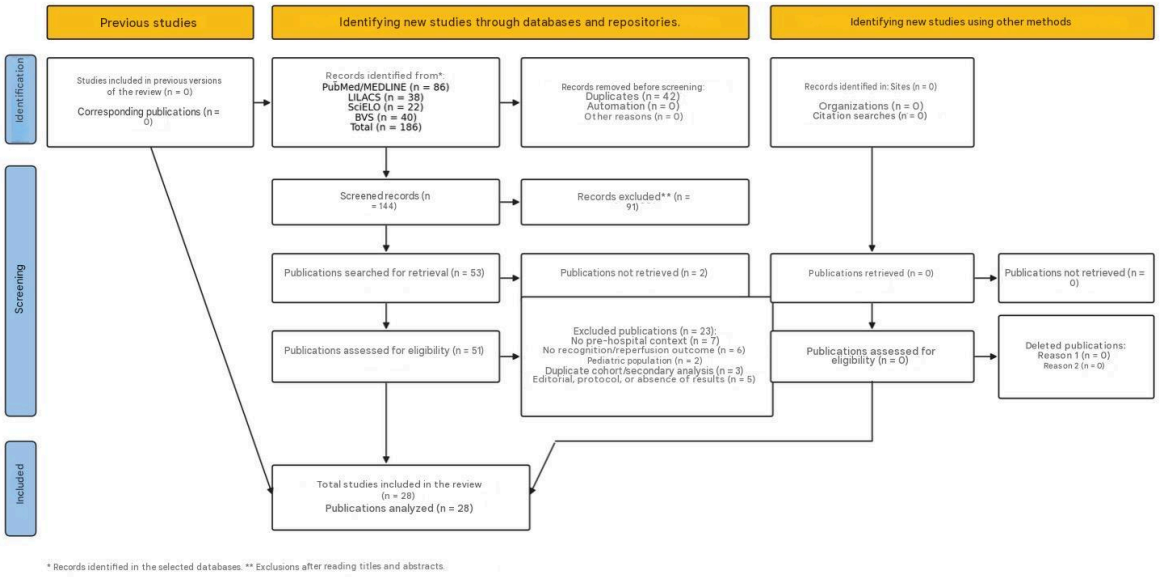
Studies exclusively involving pediatric populations; studies restricted to the in-hospital setting without a prehospital variable; editorials without data analysis; conference abstracts; protocols without results; duplicate publications; secondary analyses that fully reproduced the same cohort without adding a relevant outcome; texts without access to the content required for data extraction; and studies that did not focus on recognition, triage, or access to reperfusion were excluded.

Records were organized in a standardized spreadsheet. Selection took place in two stages: reading of titles and abstracts, followed by full-text assessment. For each study, authorship, year, country, design, sample, scale or intervention, diagnostic measures, care times, outcomes, and implications for nursing and management were extracted. Conceptual discrepancies were resolved by rereading the methods and prioritizing the directly observed outcome, avoiding the conflation of stroke recognition, identification of large-vessel occlusion, and eligibility for reperfusion.

Critical appraisal considered the appropriateness of the study design, clarity of the population, diagnostic reference standard, blinding when applicable, data completeness, and generalizability. Accuracy studies were examined for clinical spectrum and risk of selection bias; observational studies, for confounding; and implementation studies, for sustainability of the effect. The evidence was synthesized narratively because the heterogeneity of scales, thresholds, and outcomes did not allow for a standalone meta-analysis.

The search identified 186 records, of which 42 duplicates were removed. After screening 144 titles and abstracts, 53 publications were sought for full-text review; two could not be retrieved, and 51 were assessed. Twenty-three were excluded because they lacked a prehospital setting or a relevant outcome, involved a pediatric population, duplicated a cohort, or were non-analytical in nature. The final sample comprised 28 studies. As the databases are dynamic, the figures should be rechecked before the final manuscript is submitted.

Figure 1 – PRISMA 2020 flow diagram of study selection



Source: prepared by the authors (2026), adapted from the PRISMA 2020 model provided by the author and from Page et al. (2021). The figures should be rechecked before the final submission.

RESULTS

The 28 included studies were published between 2021 and 2026 and covered scale validation, emergency medical services cohorts, implementation studies, systematic reviews, guidelines, and investigations of routing, telemedicine, and mobile stroke units. Research from high-income countries predominated, but relevant Brazilian contributions were identified on the adaptation of the Cincinnati Prehospital Stroke Scale (CPSS), Los Angeles Prehospital Stroke Screen (LAPSS), FAST-ED performance, and emergency care network organization.

The synthesis showed that a scale's result varies according to its purpose. General recognition instruments seek high sensitivity to avoid missing strokes; severity and

large-vessel occlusion scales aim to direct patients to thrombectomy centers; and destination protocols need to incorporate distance, estimated time, neuroimaging availability, and reperfusion capacity. Therefore, a given measure should not be judged independently of the purpose for which it was developed.

FAST retained an operational advantage: few items, rapid administration, low technological requirements, and easy communication among dispatch centers, ambulances, and hospitals. In contrast, studies of posterior circulation and mild stroke showed that the absence of facial droop, arm weakness, or speech disturbance does not rule out a vascular event. BE-FAST expanded assessment to include balance and vision, improving syndromic coverage; however, it increased the need for clinical judgment to differentiate peripheral vertigo, ophthalmological disorders, and other common conditions.

Training studies indicated that interactive training, simulation, and hospital feedback improve recognition and reduce delays, but the effect depends on repetition and integration into routine practice. Prenotification and adherence to quality measures were associated with faster hospital assessment, greater access to reperfusion, and, in some cohorts, lower mortality. Telemedicine and mobile stroke units showed potential to expedite specialist assessment, imaging, and thrombolysis, although they require investment and cost-effectiveness analysis.

Table 1 summarizes the studies and underpins the four thematic categories presented below.

TABLE 1 – CHARACTERISTICS OF THE STUDIES INCLUDED IN THE INTEGRATIVE REVIEW

Author/year	Country	Study design	Sample/setting	Scale/strategy	Main findings	Implications for nursing and management
Almeida *et al.* (2021)	Brazil	Cross-cultural validation	n = 101	CPSS	Accuracy of 93.0% and sensitivity of 92.4% for the	Supports the use of a simple instrument, provided it is administered in a

					Brazilian version.	standardized manner.
Almeida *et al.* (2022)	Brazil	Cross-cultural validation	n = 86	LAPSS	Sensitivity of 83.8%, specificity of 40.7%, and accuracy of 77%.	Additional criteria may reduce false positives but may also miss mild cases.
Carbonera *et al.* (2022)	Brazil	Prospective field study	n = 74	FAST-ED	Sensitivity of 80% and specificity of 47.7% for large-vessel occlusion.	Useful for severity/destination assessment; does not replace a general recognition scale.
Brandão *et al.* (2023)	Brazil	Care network study	RUE services	Stroke care pathways	Identified weaknesses in coordination, regulation, and timely access.	Scale performance depends on an agreed-upon network and responsive entry points.
Chen *et al.* (2022)	Multiple countries	Systematic review and meta-analysis	Comparative studies	FAST versus BE-FAST	BE-FAST showed higher overall sensitivity, with heterogeneity and lower specificity in some studies.	Expansion should be accompanied by training and assessment of stroke mimics.
Devlin (2022)	United Kingdom	Clinical review	Recent literature	FAST and posterior circulation	FAST may not detect vertigo, ataxia, and visual symptoms.	Assess balance, eyes, coordination, and sudden onset.
Hunt *et al.* (2024)	Australia/Multic ountry	Systematic review	Paramedic studies	Posterior circulation	Prehospital accuracy for posterior stroke was variable and insufficient.	Need for specific training and complementary tools.
Tanglay *et al.* (2024)	Australia	Comparative study	Patients with posterior stroke	FAST versus BE-FAST	BE-FAST identified a higher proportion of posterior presentations.	Balance and Eyes add information, but depend on operational definitions.
Hilditch *et al.* (2025)	United Kingdom	Systematic review	Prehospital studies	FAST versus BE-FAST	FAST: sensitivity 64–97%; BE-FAST showed possible improvement, but direct evidence	There is insufficient basis for uncritical adoption; local monitoring is recommended.

ISSN: 2763-5724

					was limited.	
Bugge *et al.* (2026)	Norway	Post hoc analysis	n = 431; NIHSS 0–2	Nine scales	NIHSS had the highest sensitivity; LAPSS had the highest specificity; BE-FAST remained sensitive but not very specific.	Mild stroke requires serial examination and contextual interpretation.
Dekker *et al.* (2025)	The Netherlands	Comparative cohort	n = 3,317	Seven scales	Sensitivity 66–84% and specificity 28–49%; some scales missed reperfused patients.	The choice of threshold should consider the cost of missing reperfusion versus overtriage.
Chiu *et al.* (2021)	Taiwan	External validation	Patients with suspected stroke	LVO scales	Moderate performance, dependent on the threshold; no scale eliminated uncertainty.	Use as an aid to routing, not as a definitive diagnosis.
Daly *et al.* (2021)	United States	Validation in rural EMS	Rural system	FAST-ED	Demonstrated applicability for destination selection in a setting with long distances.	Additional transport time should be incorporated into the regional protocol.
Frank *et al.* (2021)	Germany	Retrospective validation	n = 2,815	Abbreviated digital FAST-ED	AUC 0.887; sensitivity 77% and specificity 87% for LVO.	An app can standardize calculation, but requires data governance and training.
Shao *et al.* (2022)	China	Development/validation	Suspected stroke identified by EMS	New stroke/LVO scale	The proposal combined recognition and LVO prediction in an urban population.	External validation is needed before broad adoption.

Sveikata *et al.* (2022)	Lithuania	Implementation study	EMS teams	Interactive training	Improved recognition and the proportion of early arrivals, with effects sustained for months.	Continuing education should be based on cases, feedback, and reassessment.
Melaika *et al.* (2022)	Lithuania	Professional survey	Paramedics	Training needs	Professionals reported gaps in recognition and a need for hospital feedback.	Prehospital-hospital integration promotes learning and safety.
Magnusson *et al.* (2022)	Sweden	Observational cohort	Patients transported by EMS	Prehospital recognition	Recognition was associated with a lower risk of death and shorter delays.	Failure to recognize should be treated as a quality event.
Nielsen *et al.* (2023)	United States	Cross-sectional study	Stroke registry	Prenotification	Was associated with lower odds of in-hospital mortality and shorter time to imaging.	Prenotification should be a mandatory prehospital care indicator.
Oostema *et al.* (2024)	United States	Linked EMS-hospital cohort	State registry	Quality metrics	Higher compliance was associated with faster assessment/treatment.	Integrated dashboards enable shared accountability.
Weiss *et al.* (2024)	Germany	Service analysis	n = 1,714 transports	Telemedicine	Identified a substantial portion of time elapsed before imaging and proposed video support.	Teleconsultation can improve the quality of atypical cases without prolonging on-scene time.
Tansuwannarat *et al.* (2021)	Thailand	National study	EMS database	Prehospital times	Demonstrated the influence of distance, response, and on-scene time.	Indicators should break down each interval to guide improvement.
Grotta *et al.* (2021)	United States	Multicenter controlled trial	BEST-MSU	Mobile stroke unit	Treatment in a mobile unit improved utility-weighted outcomes in	This model brings imaging and thrombolysis forward, but requires economic evaluation.

					patients eligible for thrombolysis.	
Pérez de la Ossa *et al.* (2022)	Spain	Randomized clinical trial	n = 1,401	RACECAT routing	Direct transport increased thrombectomy, reduced thrombolysis, and did not improve mRS at 90 days.	Destination should be regionalized; indiscriminate bypass may delay thrombolysis.
Ashcraft *et al.* (2021)	United States	Scientific statement	Evidence synthesis	Nursing care	Reinforced recognition, glucose testing, last known well, monitoring, and communication.	Nursing coordinates critical data and safe transitions.
Heran *et al.* (2024)	Canada	Practice guideline	Evidence review	Acute management	Recommends validated screening, prenotification, and destination protocols.	A reference for process standardization and auditing.
Dylla *et al.* (2024)	United States	Review of recommendations	Prehospital guidelines	Specific care	Identified convergence on scales, glucose, speed, transport, and prenotification.	Protocols should make recommendations measurable.
Prabhakaran *et al.* (2026)	United States	AHA/ASA Guideline	Systematic review	Acute ischemic stroke	Updated EMS triage, thrombolysis, thrombectomy, and mobile units.	Integrates recognition into a network with expanded therapeutic options.

Source: prepared by the authors (2026).

PERFORMANCE OF FAST AND BE-FAST

The comparison between FAST and BE-FAST revealed a consistent pattern: FAST

offers excellent operational feasibility, while BE-FAST broadens coverage of neurological manifestations. Chen et al. (2022) observed a trend toward greater sensitivity with the expanded version, but with variability across studies. Hilditch et al. (2025) found a wide range of FAST performance and cautioned that the direct comparative evidence base remains limited. In other words, adding items may reduce omissions, but the magnitude of the benefit depends on the assessor's competence and on how a positive test is defined.

In prehospital care, high sensitivity is desirable because the clinical cost of a false negative may be loss of the thrombolysis window or a delay in thrombectomy. However, excessively low specificity increases overtriage, ambulance dispatches, and activation of specialized teams. The safest approach is not to select a universally superior scale, but to determine which instrument best suits the epidemiological profile and regional infrastructure, accompanied by an audit of missed cases and stroke mimics.

BE-FAST should be administered using objective descriptions. For Balance, assess sudden onset of instability, inability to stand, ataxic gait, or unexplained falls; for Eyes, assess diplopia, visual loss, ocular deviation, or sudden visual field changes. Vague questions, such as "are you dizzy?", tend to reduce specificity. Nurses can refine the assessment by relating the symptom to its onset, functional impairment, focal signs, and the presence of severe headache, vomiting, or decreased level of consciousness.

POSTERIOR CIRCULATION, MILD STROKE, AND MIMICS

Hunt et al. (2024), Devlin (2022), and Tanglay et al. (2024) concur in showing that posterior circulation stroke remains underrecognized. While these authors advocate broadening the examination, Bugge et al. (2026) add a caveat: even sensitive scales have limited performance in mild deficits because signs and symptoms overlap with those of mimics. Thus, BE-FAST addresses an anatomical gap but does not fully resolve diagnostic uncertainty.

Clinical reasoning should integrate sudden onset, laterality, symptom associations, and new disability. Isolated vertigo, for example, is common and usually nonvascular;

however, abrupt vertigo accompanied by diplopia, dysarthria, dysmetria, sensory changes, or inability to walk warrants high priority. Similarly, transient symptoms should not be dismissed, as they may represent a transient ischemic attack or spontaneous reperfusion of an unstable occlusion.

Excluding hypoglycemia is mandatory because it can mimic focal deficits and is immediately treatable. Seizure, postictal state, migraine with aura, intoxication, neuropathies, and vestibular disorders are differential diagnoses, but they do not justify prolonged delays at the scene. When reasonable doubt persists and the onset is compatible, the safety principle is to transport the patient with prenotification, documenting the uncertainty and objective findings.

LARGE VESSEL OCCLUSION TRIAGE AND DESTINATION SELECTION

Identifying large vessel occlusion serves a different purpose from recognizing stroke. Carbonera et al. (2022), Chiu et al. (2021), Frank et al. (2021), Shao et al. (2022), and Dekker et al. (2025) demonstrate that severity scales can support referral to thrombectomy centers, but none is sufficiently accurate to be used as the sole basis for a decision. Pretest probability, distance, and the ability to perform thrombolysis at the nearest hospital alter the value of the strategy.

The RACECAT trial reinforces this nuance. Pérez de la Ossa et al. (2022) observed that direct transport to a thrombectomy center increased the rate of the procedure, but reduced thrombolysis and did not result in overall functional improvement in nonurban areas. This finding is consistent with Dekker et al. (2025): a scale that prioritizes LVO may improve one component of the care pathway while simultaneously harming patients without LVO who would benefit from closer care.

Consequently, destination protocols should be regional and dynamic. Dispatch must consider additional transport time, imaging capacity, center availability, the possibility of rapid transfer, and the therapeutic window. Prehospital nurses contribute by providing a minimum set of reliable information: scale administered, predominant deficit, last known well

time, clinical severity, blood glucose, anticoagulant use, premorbid dependency, and physiological stability.

ORGANIZATIONAL STRATEGIES TO CONVERT RECOGNITION INTO REPERFUSION

Sveikata et al. (2022) demonstrated that interactive training improves recognition and early transport; Melaika et al. (2022) explain why the effect tends to be greater when the professional receives feedback on the final diagnosis. Magnusson et al. (2022) associated prehospital recognition with lower mortality, while Nielsen et al. (2023) and Oostema et al. (2024) linked prenotification and compliance with metrics to faster processes and better outcomes. These studies converge in shifting the discussion from isolated scale use to a learning system.

Telemedicine can expand this capacity. Weiss et al. (2024) found that a substantial proportion of the time to imaging elapses before arrival and proposed video support to improve assessment. In selected settings, remote consultation makes it possible to observe speech, motor function, gaze, and balance, as well as anticipate destination decisions. However, the technology should not increase scene time; its value should be measured by the reduction in total time and the quality of the decision.

Mobile stroke units represent the technological extreme of early care. Grotta et al. (2021) showed functional benefit in eligible patients by bringing imaging, laboratory testing, and thrombolysis into the community. The 2026 AHA/ASA guideline recognizes this model, but its adoption depends on population density, cost, coverage, and integration with the network. For most Brazilian systems, initial gains will probably come from less complex measures: a single protocol, training, prenotification, active coordination, and an indicator dashboard.

TABLE 2 – PROPOSED INDICATORS FOR MONITORING THE PREHOSPITAL STROKE CARE PATHWAY

Indicator	Operational definition	Suggested benchmark/target	Management utility
Screening coverage	Patients with suspected stroke assessed using FAST/BE-FAST ÷ total suspected cases × 100	≥ 90% as an initial institutional target	Audits adherence to the protocol and completeness of documentation.
Last known well	Records with the exact or estimated time of the last moment without a deficit ÷ suspected cases × 100	≥ 90%	Defines time-window eligibility and reduces hospital rework.
Capillary blood glucose	Suspected cases with blood glucose recorded before arrival ÷ total × 100	≥ 95%	Identifies a treatable stroke mimic and improves safety.
Prenotification	Cases with structured notification to the hospital before arrival ÷ suspected cases transported × 100	≥ 90%	Enables activation of CT, the team, and the emergency room.
Scene time	Median time from team arrival to departure for the hospital	≤ 15–20 min when clinically feasible	Identifies procedures or decisions that delay transport.
Confirmed recognition	Strokes confirmed and recognized by EMS ÷ strokes transported × 100	Monitor trends and stratify by circulation/severity	Measures the system's actual sensitivity.
Overtriage	Stroke mimics with stroke code ÷ total activated codes × 100	Local target based on capacity	Balances safety with rational use of resources.
Door-to-imaging	Median time from hospital arrival to start of CT	≤ 20–25 min	Assesses continuity between prenotification and hospital response.
Door-to-needle	Median time from arrival to initiation of thrombolysis	≤ 60 min; aim for ≤ 45 min in mature centers	Classic indicator of intravenous reperfusion.
Access to thrombectomy	Eligible patients who received thrombectomy ÷ identified eligible patients × 100	Monitor by region and time of day	Reveals barriers related to destination, transfer, and capacity.
Secondary transfer	Time from decision to departure and initial door-to-puncture time in transferred patients	Continuous reduction	Measures the time cost of the drip-and-ship model.
Outcome	Mortality, discharge home, and mRS at 90 days	Comparison adjusted for severity	Connects process indicators to clinical value.

Source: authors' own work (2026), based on Ashcraft et al. (2021), Heran et al. (2024), Oostema et al. (2024), and Prabhakaran et al. (2026). Targets should be agreed upon according to regional maturity and capacity.

DISCUSSION

FAST AND BE-FAST: AN INAPPROPRIATE DEBATE BETWEEN SIMPLICITY AND COMPREHENSIVENESS

The findings indicate that FAST and BE-FAST should not be treated as mutually exclusive alternatives. Chen et al. (2022) argue that adding Balance and Eyes increases the likelihood of identifying manifestations that fall outside the classic phenotype. Hilditch et al. (2025), however, qualify this conclusion by pointing to the small number of direct prehospital comparisons and substantial variability in specificity. Taken together, the findings suggest that BE-FAST is a conceptually coherent expansion, but its superiority needs to be demonstrated in the system in which it will be used.

Tanglay et al. (2024) strengthen the argument made by Chen et al. (2022) by observing better coverage of posterior stroke; Hunt et al. (2024), however, show that the problem is not limited to the absence of two items. The challenges paramedics face involve nonspecific presentations, relatively low prevalence, limited training, and the lack of an operational standard for oculomotor and cerebellar signs. Thus, simply replacing the acronym may create the appearance of change without altering clinical reasoning.

Bugge et al. (2026) add another dimension: mild stroke. In patients with NIHSS scores of zero to two, more sensitive scales identified more cases but lost specificity. Dekker et al. (2025) reach a similar conclusion in a broad population, demonstrating that improving specificity may mean failing to recognize patients who subsequently undergo reperfusion. Taken together, these authors show that no cutoff is neutral; every choice redistributes risk between false negatives and false positives.

In practice, FAST may remain a public-facing message and initial screening tool,

while BE-FAST may serve as an expanded professional assessment. This tiered approach preserves FAST's communicative strength and offers the prehospital emergency care team a more sensitive tool. The protocol should stipulate that a negative FAST result does not end the investigation when there is sudden onset of visual, balance, coordination, sensory, or consciousness changes.

Discussion of accuracy must take the reference standard into account. Studies conducted in tertiary centers may include a higher proportion of severe cases, artificially increasing sensitivity. In population-based services, mimics are more prevalent, and specificity tends to decrease. Hilditch et al. (2025) warn of this heterogeneity, while Almeida et al. (2021; 2022) demonstrate that cultural adaptation and local validation are essential. Translating words is not enough; it is necessary to verify how professionals interpret instructions, responses, and exclusions.

The Brazilian experience with CPSS and LAPSS reveals a similar tension. Almeida et al. (2021) found high sensitivity for CPSS, consistent with a simple instrument; in the LAPSS study, Almeida et al. (2022) observed limited specificity. These results do not invalidate the scales, but demonstrate that additional filters may perform differently in contexts with specific population profiles, training, and diagnostic reference standards.

For quality management, it is recommended that false-negative cases be analyzed at joint meetings involving prehospital emergency care, medical regulation, emergency care, neurology, and nursing. The question should not be merely "Was the scale administered?" but rather "Which sign was present, why was it not interpreted as vascular, and what process change would reduce recurrence?" This method turns missed events into organizational learning, avoiding individual blame.

NURSING CLINICAL REASONING IN THE PREHOSPITAL SETTING

Prehospital nurses work in a setting without neuroimaging, with limited time and incomplete information. Clinical reasoning should begin with the ABCDE approach, prioritizing airway patency, ventilation, circulation, and level of consciousness. Hypoxemia,

hypotension, hyperthermia, and hypoglycemia can worsen brain injury or mimic symptoms; therefore, the neurological scale cannot be administered outside the context of physiological assessment. Ashcraft et al. (2021) reinforce this sequence and assign nursing a central role in data collection, monitoring, and communication.

After initial stabilization, the assessment should establish the timeline. “Last known well” is not necessarily the time when the deficit was noticed; in wake-up stroke, it corresponds to the last time the patient was seen without changes. This distinction affects eligibility and imaging-based selection. The team should document the source of the information, the degree of certainty, and the approximate time, avoiding the conversion of assumptions into exact data.

Capillary blood glucose should be measured without delaying transport. Low values warrant correction according to protocol and neurological reassessment, but partial improvement does not rule out concomitant stroke. Blood pressure should be measured and communicated; however, empirical reduction in the prehospital setting is not recommended without a specific indication and medical regulation, because penumbral perfusion may depend on elevated blood pressure. Supplemental oxygen should be administered for hypoxemia, rather than used automatically in normoxemic patients.

The expanded neurological assessment can follow a brief sequence: level of consciousness; gaze and visual fields when possible; face; arm strength and drift; speech and comprehension; sensation; coordination; balance/gait only if safe. The aim is not to reproduce the NIHSS in full on scene, but to recognize focal deficits, estimate severity, and document change. Repeated examinations during transport are particularly useful when symptoms fluctuate.

Information about anticoagulants, antiplatelet agents, recent surgeries, bleeding, trauma, prior dependence, seizures, pregnancy, and comorbidities should be obtained with a focus on what affects the acute decision. Information gathering must not turn into a prolonged interrogation. One strategy is to divide tasks: while one professional assesses and stabilizes the patient, another confirms the timeline, medications, and contacts, and medical dispatch determines the destination.

Handover should be structured. A functional format includes identification, last known well, FAST/BE-FAST and severity score, blood glucose, blood pressure, anticoagulation, prior functional status, events during care, and estimated time of arrival. Communication must indicate diagnostic uncertainty when present, without lowering the priority: “suspected posterior stroke, FAST negative, BE-FAST positive for diplopia and sudden inability to walk” is more informative than “dizziness.”

FROM DETECTION TO REPERFUSION: INTEGRATION OF PREHOSPITAL CARE, MEDICAL DISPATCH, AND HOSPITAL

Magnusson et al. (2022) demonstrate that recognizing stroke before arrival is associated with a lower risk of death. Nielsen et al. (2023) add that prenotification is associated with lower in-hospital mortality; Oostema et al. (2024) show that adherence to a bundle of measures accelerates assessment and treatment. Taken together, these results support a plausible causal chain: recognition improves communication; communication prepares the emergency department; a prepared emergency department reduces time to imaging and reperfusion.

However, association does not mean that the scale alone produces the outcome. Services with better recognition may have more highly trained teams, more complete documentation, and more responsive hospitals. Therefore, managers should avoid rewarding only the rate of scale administration. Process indicators need to be linked to door-to-imaging time, door-to-needle time, access to thrombectomy, and outcomes adjusted for severity.

Prenotification should be bidirectional. Prehospital care sends essential data, and the hospital confirms its capacity to receive the patient, activates the protocol, and reports any constraints. When the destination center is unavailable, medical dispatch must redirect the case before transport. This mechanism reduces time spent at an unsuitable emergency department and avoidable transfers.

The choice between transporting the patient to the nearest center or bypassing it requires regional governance. Carbonera et al. (2022) and Frank et al. (2021) show that

ISSN: 2763-5724

FAST-ED can support identification of probable LVO. Pérez de la Ossa et al. (2022), however, demonstrate that directing all suspected cases to a thrombectomy center does not ensure better outcomes and may reduce thrombolysis. The decision should combine the severity scale, additional travel time, treatment window, stability, and the center's actual capacity.

Guidelines such as Heran et al. (2024) and Prabhakaran et al. (2026) advocate regionalized systems. For Brazil, this means mapping centers by operating hours, reperfusion modalities, transport time, and transfer capability. Printed or digital protocols should be updated whenever a unit's capacity changes. The medical dispatch center needs to view this information in real time.

The mobile stroke unit analyzed by Grotta et al. (2021) confirms that bringing diagnosis and treatment forward improves outcomes in appropriate settings. However, its cost limits generalizability. The transferable lesson is that steps can be moved to before arrival: focused history-taking, data collection, remote specialist assessment, CT activation, and team preparation. Even without a CT scanner in the ambulance, it is possible to "bring organization to the patient."

CONTINUING EDUCATION, SIMULATION, AND A CULTURE OF FEEDBACK

Sveikata et al. (2022) observed improvement after interactive training; Melaika et al. (2022) identified paramedics' desire for hospital feedback. These findings complement one another: decontextualized knowledge tends to fade, whereas real cases, diagnostic feedback, and discussion of errors produce meaningful learning. Continuing education should take place in the workplace and use data from the service itself.

A training program may include: recognition of anterior and posterior circulation syndromes; standardized administration of FAST and BE-FAST; differentiation of peripheral vertigo from central signs without attempting a definitive diagnosis; calculation of an LVO scale; communication with medical dispatch; pre-notification simulation; and review of times. Scenarios involving women, older adults, patients with pre-existing disabilities, mild stroke,

and stroke mimics reduce the bias of training focused solely on the classic case.

Competency assessment should not be limited to a theoretical examination. Structured observation in simulation, chart audits, and inter-rater agreement provide measures that more closely reflect practice. The rate of scale completion may be high even when the examination is performed incorrectly; therefore, supervision and refresher training are necessary.

Hospital feedback should respect confidentiality and be straightforward: final diagnosis, affected vessel, reperfusion performed, key times, and opportunities for improvement. Periodic meetings may select cases involving false negatives, overtriage, on-scene delays, and destination deviations. The approach should be based on a just culture, distinguishing human error, system conditions, and deliberate violations.

IMPLICATIONS FOR HOSPITAL MANAGEMENT AND CARE INDICATORS

Hospital management begins before the patient reaches the door. When a hospital receives reliable pre-notification, it can organize imaging, laboratory services, pharmacy, neurology, interventional radiology, and bed availability. When information arrives incomplete, the process starts over at admission. Prehospital quality should therefore be part of the institutional stroke dashboard, rather than remaining confined to the ambulance service.

Table 2 proposes structure, process, and outcome indicators. Screening coverage, documentation of the last known well time, and blood glucose reflect basic reliability. Pre-notification and on-scene time measure coordination. Door-to-imaging and door-to-needle times assess whether the advance notice prompted a response. Reperfusion rate and mRS link the process to value for the patient. Stratified analysis by shift, municipality, sex, severity, and circulation may reveal hidden inequalities.

Oostema et al. (2024) support the use of a set of metrics rather than a single indicator. A service may achieve a short on-scene time while simultaneously failing to document the chronology; another may pre-notify all cases but direct them to an inappropriate destination. The dashboard should enable balanced interpretation and avoid perverse

incentives.

The rate of stroke mimics should not be interpreted in isolation as waste. In systems that prioritize sensitivity, some overtriage is expected. The target should be agreed upon based on capacity and the cost of missing a treatable stroke. Frequent stroke-mimic cases may inform specific protocols, but should not justify excessive barriers to activation.

Integration of SAMU, medical dispatch, and hospital databases is strategic. Shared identifiers make it possible to follow patients from the call through to the outcome. Without linkage, prehospital care does not know the final diagnosis and cannot calculate sensitivity; the hospital does not know the preceding intervals and attributes all delays to the door. Data governance, information protection, and shared accountability are requirements for continuous improvement.

STUDY LIMITATIONS

This review has limitations. Heterogeneity in populations, reference standards, FAST/BE-FAST definitions, and thresholds precluded an original quantitative synthesis. Some of the evidence comes from retrospective studies and high-income systems, which limits direct transferability to Brazilian regions with long distances and inconsistent availability of stroke centers.

The period from 2021 to July 2026 prioritizes recency but may exclude foundational studies of the scales. Guidelines and systematic reviews were included to contextualize practice, resulting in a range of evidence levels. In addition, BVS and LILACS overlap, requiring rigorous deduplication. Search counts need to be rechecked before submission because indexing is dynamic.

There are fewer Brazilian studies directly comparing FAST and BE-FAST in prehospital care. Consequently, recommendations for national adoption should be treated as inferences based on international evidence and local validation of related scales. Prospective multicenter studies linking prehospital data to diagnosis and reperfusion are needed.

CONCLUSION

The review demonstrated that early recognition of stroke in prehospital care depends on more than the choice between FAST and BE-FAST. FAST remains an operationally robust, simple tool suitable for rapid communication, but has limitations in cases of posterior stroke and mild deficits. BE-FAST expands the assessment to include balance and vision and may reduce false negatives, although comparative evidence remains heterogeneous and indicates a possible loss of specificity.

The impact on reperfusion occurs when the scale is integrated into a care bundle: determination of the last-known-well time, capillary blood glucose, physiological assessment, brief neurological examination, recognition of possible mimics, prenotification, regional destination decision-making, and immediate hospital response. Interactive training, simulation, feedback on the final diagnosis, telemedicine, and indicator audits were shown to be relevant strategies for sustaining performance.

For nursing, the recommendation is to use BE-FAST as a professional complement to FAST, without replacing clinical reasoning and serial reassessment. For management, the recommendation is to establish a single protocol across prehospital care, dispatch, and hospitals; monitor false negatives, overtriage, times, and reperfusion; integrate databases; and review routes according to the actual capacity of the centers. Future research should validate FAST and BE-FAST in different regions of Brazil, assess cost-effectiveness, and relate prehospital accuracy to functional outcomes at 90 days.

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ISSN: 2763-5724