Comparison of Prehospital Stroke Severity Scales

Scale Year Published	Description and Items	Sensitivity	Specificity	Positive Predictive Value (PPV)	Negative Predictive Value (NPV)	Accuracy	Additional Validity & Reliability Measures	Additional Notes for Consideration
Cincinnati Stroke Triage Assessment Tool (C-STAT) [formerly Cincinnati Prehospital Stroke Severity Scale (CPSSS)] 2015[1,2]	3-item, 0- to 5- point scale • Gaze (0/2) • Arm weakness (0/1) • Level of consciousness (0/1)	Equiv. to NIHSS ≥ 15 (severe stroke): 0.77[1]	Equiv. to NIHSS ≥ 15 (severe stroke): 0.84[1]	ID an LVO (score ≥ 2): 0.65[3] Alternative ID an LVO (score ≥ 2): 0.69[6]	ID an LVO (score ≥ 2): 0.78[3] Alternative ID an LVO (score ≥ 2): 0.79[6]	ID an LVO (score ≥ 2): 0.75[3]	**Positive likelihood ratio (LR+)** 4.09[6] **Negative likelihood ratio (LR-)** 0.48[6]	• Validated in prehospital setting and with external data sets • Middle-of-road for time to complete this scale compared to others on this list (5/7)[7] • Fails to recognize the importance of cortical signs, such as aphasia and particularly neglect, which are highly associated with large cortical infarcts[3] • CPSS most commonly cited in EMS statewide protocols as an example or the recommended scale to use (see bottom of grid, page 3 for how this differs from C-STAT/CPSSS)[3]
		Equiv. to NIHSS ≥ 10 (moderate stroke): 0.64[1]	Equiv. to NIHSS ≥ 10 (moderate stroke): 0.91[1]					
		ID an LVO: 0.71[1]	ID an LVO: 0.70[1]					
		CSC need: 0.57[1]	CSC need: 0.79[1]					
		ID an LVO (score ≥ 2): 0.56[3]	ID an LVO (score ≥ 2): 0.85[3]	**Area under the receiver operating characteristic curve (AUC) values:** Severe stroke[2]: 0.89 Moderate stroke[2]: 0.90 (original CPSS similar, severe: 0.83 and moderate 0.95)[2] ID and LVO[5]: 0.72				
		Alternative ID an LVO (score ≥ 2): 0.59[6]	Alternative ID an LVO (score ≥ 2): 0.86[6]					
		Alternative ID an LVO (score ≥ 2): 0.83[2,7]	Alternative ID an LVO (score ≥ 2): 0.40[2,7]					
Facial palsy, Arm weakness, Speech changes, Time, Eye deviation, Denial / neglect (FAST-ED) scale 2016[3]	5-item, 0- to 9- point scale • Facial palsy (0/1) • Arm weakness (0/1/2) • Speech changes (0/1/2) • Eye devitation (0/1/2) • Denial / Neglect (0/1/2) Two thresholds of ≥3 and ≥4 were used because of high Youden Index values (0.490 and 0.491, respectively) for identifying LVOs.	ID LVO score ≥ 3: 0.71[3]	ID LVO score ≥ 3: 0.78[3]	ID LVO score ≥ 3: 0.84[3]	ID LVO score ≥ 3: 0.76[3]	**AUC values**[3]: FAST-ED=0.81 as reference NIHSS=0.80, *P*=0.28 RACE=0.77, *P*=0.02 CPSS=0.75, *P*=0.002		• Validated in prehospital setting but no external data sets (yet) • Easy to learn and remember given that many EMS agencies already are familiar with FAST[3] • FAST-ED had comparable accuracy to predict • LVO to the NIHSS and higher accuracy than RACE and CPSS[3]
		ID LVO score ≥ 4: 0.61[3]	ID LVO score ≥ 4: 0.89[3]	ID LVO score ≥ 4: 0.82[3]	ID LVO score ≥ 4: 0.79[3]			

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Rapid Arterial Occlusion Evaluation Scale (RACE)
 	
2014[4]
	5 of 6-item scale (last item is based on which side pt has deficits on); 0- to 9- point scale
	• Facial palsy (0/1/2)
	• Arm motor function (0/1/2)
	• Leg motor function (0/1/2)
	• Head & gaze deviation (0/1)
	• Based on side, do only one:
	  • R side: Aphasia (0/1/2)
	  • L side: Agnosia (0/1/2)
	Any score > 4 considered highly likely an LVO
		score ≥ 5: 0.55[3]
		
		ID LVO: 0.59[6]
		
		Alternative ID LVO: 0.85[4,7]
			score ≥ 5: 0.87[3]
			
			ID LVO: 0.86[6]
			
			Alternative ID LVO: 0.68[4,7]
				score ≥ 5: 0.68[3]
				
				ID LVO: 0.70[6]
				
				Alternative ID LVO: 0.42[4,7]
					score ≥ 5: 0.79[3]
					
					ID LVO: 0.79[6]
					
					Alternative ID LVO: 0.94[4,7]
						score ≥ 5: 0.77[3,4]	**Positive likelihood ratio (LR+)** 4.17[6]
							
							Negative likelihood ratio (LR-) 0.48[6]
								• Validated in prehospital setting and with external data sets
								• A more time-consuming scale to complete compared to others on this list (7/7)[7]

Los Angeles Prehospital Stroke Screen (LAPSS) Motor Scale (LAMS) 2001[5]	3-item, 0- to 5-point scale developed for prehospital and emergency department (ED) use • Facial droop (0/1) • Arm drift (0/1/2) • Grip strength (0/1/2)	ID LVO: 0.57[6] Alternative ID LVO: 0.81[7]	ID LVO: 0.84[6] Alternative ID LVO: 0.89[7]	ID LVO: 0.66[6]	ID LVO: 0.78[6]	---	**Positive likelihood ratio (LR+)** 3.50[6] **Negative likelihood ratio (LR-)** 0.51[6]	• Validated in prehospital setting and with external data sets • Middle-of-road for time to complete this scale compared to others on this list (4/7)[7] • Official scale used in statewide EMS protocol for Rhode Island
		Additional validity measure (available for this scale only): **Convergent validity** with NIHSS (early-post arrival): • 0.49 (LAMS prehospital) [5] • 0.89 (early-post arrival) [5]						
Prehospital Acute Stroke Severity (PASS) scale 2017[6]	3-item scale, 0- to 3-point scale to identify emergent large vessel occlusion (ELVO) in patients with acute ischemic stroke • Level of consciousness (0/1) • Gaze palsy/deviation (0/1) • Arm weakness (0/1)	ID LVO (score≥ 2): 0.66[6]	ID LVO (score≥ 2): 0.83[6]	ID LVO (score≥ 2): 0.68[6]	ID LVO (score≥ 2): 0.81[6]	---	**Positive likelihood ratio (LR+)** 3.84[6] **Negative likelihood ratio (LR-)** 0.47[6]	• Validated in prehospital setting but no external data sets (yet) • Designed for simplicity and rapid application • PASS validity scores similar to or better than CPSSS, LAMS, and RACE values in detecting verified LVOs in its original design and validation study[6]
		AUC for ID and LVO : 0.74[4]						

Scale Year Published	Description and Items	Sensitivity	Specificity	Positive Predictive Value (PPV)	Negative Predictive Value (NPV)	Accuracy	Additional Validity & Reliability Measures	Additional Notes for Consideration
Vision, Aphasia, Neglect (VAN) 2016[7]	4-item scale; designed to quickly assess functional neurovascular anatomy. Patient is considered either VAN positive (ELVO present) or VAN negative. • Weakness of Arms • Visual field • Aphasia • Neglect Patient must have weakness plus one or all of the V, A, or N to be VAN positive	1.00 (compared to NIHSS ≥ 6, also 1.00)[7]	0.90 (compared to NIHSS ≥6: 0.74)[7]	0.74 (compared to NIHSS ≥6: 0.58)[7]	1.00 (compared to NIHSS ≥6, also 1.00)[7]	---		•Not yet validated in prehospital setting or with external data sets (yet) •Performed by nurses at early hospital arrival in original study[7] •Shortest time needed to complete this scale compared to others on this list (2/7)[7] •Strong sensitivity (1.00) and NPV (1.00) values in original study •Easy to remember
Cincinnati (Prehospital) Stroke Scale (CPSS), for stroke recognition only	Included to differentiate from CPSSS. CPSS does not look at gaze or level of consciousness (in CSTAT/CPSSS), but rather facial droop and speech. *Cincinnati Prehospital Stroke Scale:* i. **Speech**: Have patient state "You can't teach an old dog new tricks" (Abnormal = wrong word, slurred, or absent speech) ii. **Facial droop** when asked to show teeth or smile (Abnormal = one side does not move as well as other) iii. Motor: Have patient close eyes and hold out both arms (Abnormal = arm cannot move or drifts down when held out) Patients with 1 of these 3 findings as a new event have a 72% probability of an ischemic stroke. If all 3 findings are present the probability of an acute stroke is more than 85%							Most commonly cited in statewide EMS protocols
NIHSS (for comparison only)	Included in this listing as a comparison to measures above	score ≥ 6: 0.76[3]	score ≥ 6: 0.70[3]	score ≥ 6: 0.55[3]	score ≥ 6: 0.85[3]	score ≥ 6: 0.72[3]	---	---
		score ≥ 10: 0.64[3]	score ≥ 10: 0.85[3]	score ≥ 10: 0.68[3]	score ≥ 10: 0.83[3]	score ≥ 10: 0.78[3]		

Sources

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