Cochrane Corner: How Accurate are Prehospital Stroke Scales at Identifying People with Stroke or Transient Ischemic Attack?

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How accurate are prehospital stroke scales at identifying people with stroke or transient ischemic attack?

BACKGROUND

Prehospital stroke recognition tools are widely recommended to ensure fast recognition of stroke and transient ischemic attack

EVIDENCE ASSESSED

23 studies:

- China, USA, UK, Australia, Sweden, Korea, Belgium, Canada, Italy
- 9230 non-comatose, non-trauma adults with suspected stroke

8 stroke scales:

	# studies
1. CPSS (Cincinnati Prehospital Stroke Scale)	11
2. ROSIER (Recognition of Stroke in the Emergency Room)	8
3. FAST (Face Arm Speech Time)	5
4. LAPSS (Los Angeles Prehospital Stroke Scales)	5
5. MASS (Melbourne Ambulance Stroke Scale)	3
6. OPSST (Ontario Prehospital Stroke Screening Tool)	1
7. MedPACS (Medic Prehospital Assessment for Code Stroke)	1
8. PreHAST (PreHospital Ambulance Stroke Test)	1

applied by ambulance crew, emergency room (ER) crew or general practitioners (GPs)

RESULTS

Scale user	Correctly identifying people WITH stroke (scale sensitivity)	Correctly identifying people WITHOUT stroke (scale specificity)
AMBULANCE CREW	LAPSS: 83% ? CPSS > MedPACS CPSS > LAPSS CPSS = MASS MASS > LAPSS	LAPSS: 93% ? MedPACS > CPSS MASS > CPSS ROSIER > CPSS MASS = LAPSS
ER CREW	ROSIER: 88% ROSIER = FAST	ROSIER = FAST
GPs	ROSIER > CPSS ?	ROSIER > CPSS ?

CONCLUSIONS

In the ambulance, CPSS is the most sensitive
In the ER, ROSIER shows consistently high sensitivity and is as accurate as FAST
In primary care, ROSIER may be more accurate than CPSS

! These findings **should be treated with caution** due to:
- the small number of studies per test in a specific setting
- the poor quality of the studies
- substantial differences in study characteristics
- substantial variability in results between the studies

Further verification with better-designed studies is needed

Zhelev Z, Walker G, Henschke N, Fridhandler J, Yip S. Prehospital stroke scales as screening tools for early identification of stroke and transient ischemic attack. Cochrane Database of Systematic Reviews 2019, Issue 4. Art. No.: CD011427. DOI: 10.1002/14651858.CD011427.pub2.

Cochrane First Aid

Visual abstract created in October 2021

This is the second Cochrane Corner of Cochrane First Aid in the International Journal of First Aid Education. Like any Cochrane Corner, it summarizes the findings of a Cochrane systematic review. It is meant to give first aid trainers, laypeople providing first aid, and guideline developers direct access to highly relevant first aid-related evidence tailored to them, which they might otherwise not have access to. Additionally, this Cochrane Corner is accompanied by a visual abstract that highlights the key findings.

This Cochrane Corner is based on a review that investigated the accuracy of stroke recognition scales when applied in the prehospital or emergency room setting to adults with suspected stroke. The review was developed by the Cochrane Stroke Group and is published in the Cochrane Database of Systematic Reviews 2019, Issue 4, DOI: 10.1002/14651858.CD011427.pub2. (see www.cochranelibrary.com for information). As Cochrane Reviews are regularly updated as new evidence emerges and in response to feedback, the Cochrane Database of Systematic Reviews should be consulted for the most recent version of the review.

Both the Cochrane Corner and the visual abstract were reviewed by Dr. Greg Walker, the corresponding author of this Cochrane review.

Stroke is the number one cause of death worldwide, as well as the leading cause of disability. In 88% of strokes, a blood clot will interrupt normal blood supply to part of the brain (ischemic stroke), whereas the remaining 12% is caused by bleeding in the brain (haemorrhagic stroke). In case of ischemic stroke, the brain tissue gets irreversibly damaged if the clot is not rapidly dissolved or removed mechanically. Similarly, early treatment of haemorrhagic stroke is believed to be associated with less severe brain bleeds. A transient ischemic attack (TIA, also known as mini stroke) is caused by a temporary disruption in the blood supply to part of the brain. In this case, symptoms resolve within 24 hours without lasting consequences. As TIAs are prognosticators for future strokes, it is crucial that they are identified as quickly as possible.

Given that time is of the essence when it comes to the treatment of stroke, fast recognition is of paramount importance. To this end, multiple prehospital stroke recognition tools have been developed and implemented in different countries worldwide to support the initial triage. The use of these scales, which are not intended to differentiate ischemic from haemorrhagic stroke or stroke from TIA, is recommended by the American Heart and Stroke Association, the European Academy of Neurology and the European Stroke Organisation. However, no recommendations are made on the use of specific instruments. In addition, it is unclear if these stroke scales are accurate or not, and which one is most accurate.

Research question

How accurately can stroke recognition scales detect stroke or TIA when used by prehospital or emergency staff (including paramedics, emergency medicine technicians, nurses, emergency physicians or general practitioners)?

Literature search

The review authors searched for primary test accuracy studies that evaluated a stroke recognition scale used in a prehospital or emergency room setting against a final diagnosis of stroke or TIA made by a neurologist or stroke physician. Studies needed to have applied the scales directly and face-to-face to patients. Only adult, non-comatose, non-trauma patients suspected of stroke with symptom duration under 24 hours at the time of presentation were of interest. 'Prehospital' use covered the use in the field (i.e., the ambulance), the emergency room or primary care.

The review authors searched for studies published up to January 2018 in the Cochrane Central Register of Controlled Trials, MEDLINE, Embase and Science Citation Index. They also searched the reference lists of included studies and other relevant publications and contacted authors of known prehospital stroke scales to learn about unpublished studies.

Results

The review authors identified 23 relevant studies involving 9230 suspected stroke patients, conducted in China, the USA, the UK, Australia, Sweden, Korea, Belgium, Canada and Italy. Study sizes ranged from 31 to 1130 suspected stroke patients.

In 16 studies, scales were applied by ambulance crew clinicians in the field. Six studies investigated scale use in the emergency room, by either emergency room physicians (3 studies), emergency room physicians or nurses (2 studies), or nurses alone (1 study). One study contained data on scale use by general practitioners in a primary healthcare centre, used to decide whether or not to transfer people to a hospital with an acute stroke centre.

The 23 studies evaluated 8 different stroke scales:

1. Cincinnati Prehospital Stroke Scale (CPSS, 11 studies);

2. Recognition of Stroke in the Emergency Room (ROSIER, 8 studies);

3. Face Arm Speech Time (FAST, 5 studies);

4. Los Angeles Prehospital Stroke Scale (LAPSS, 5 studies);

5. Melbourne Ambulance Stroke Scale (MASS, 3 studies);

6. Ontario Prehospital Stroke Screening Tool (OPSST, 1 study);

7. Medic Prehospital Assessment for Code Stroke (MedPACS, 1 study);

8. PreHospital Ambulance Stroke Test (PreHAST, 1 study).

The findings reported below must be interpreted with caution, because of:

- The small number of studies per scale conducted in the same setting;

- The high or unclear risk of bias in most studies;

- The significant clinical and methodologic differences between studies;

- The large between-study differences in the reported accuracy results.

Absolute scale accuracy

When combining the results of 5 studies investigating the ROSIER scale in the emergency room, it was shown that it correctly detects on average 88 out of 100 people with stroke/TIA. Depending on the circumstances, the test will miss 5 to 25% of all people with stroke/TIA. The combined results of 5 studies on the use of LAPSS in the field indicate that the test correctly detects on average 83 out of 100 people with stroke/TIA and misclassifies 7 out of 100 people without stroke/TIA as positive. However, the included studies were of poor quality and therefore, the results may not be valid. The other 6 scales were evaluated in a smaller number of studies, or the results were too variable to be combined statistically.

Relative scale accuracy

Nine of the studies compared the accuracy of two or more scales in the same patients. These types of studies are more likely to produce valid results, as the scales are used in the same circumstances. Their results indicate that:

- In the field:

  o CPSS is better at correctly identifying adults with stroke/TIA than MedPACS and LAPSS, but as good as MASS

- o MASS, ROSIER and MedPACS are better at correctly identifying adults <u>without</u> stroke/TIA than CPSS

- o MASS is better at correctly identifying adults <u>with</u> stroke/TIA than LAPSS, but similar when it comes to correctly identifying adults <u>without</u> stroke/TIA

- In the emergency room: ROSIER and FAST are similar when it comes to correctly identifying adults <u>with, as well as without</u> stroke/TIA

- In primary care: ROSIER is better at correctly identifying adults <u>with, as well as without</u> stroke/TIA than CPSS. However, it is not clear if the differences between both tests are statistically significant.

Conclusion and implications

The available evidence suggests that, when applied by ambulance clinicians in the field, CPSS is the most sensitive stroke scale. Further research is needed to estimate the proportion of wrong results and whether alternatives scales, such as MASS and ROSIER, which might have comparable sensitivity but higher specificity, should be used instead to achieve better overall accuracy.

In the emergency room, the ROSIER scale shows consistently high sensitivity. In a group of 100 people of whom 62 have stroke/TIA, the test will miss on average 7 people with stroke/TIA (ranging from 3 to 16). It has similar accuracy to FAST but was assessed in more studies. In primary care, the ROSIER scale might be more sensitive and specific than the CPSS. In a group of 100 people of whom 71 have stroke/TIA, the test is estimated to miss 12 people with stroke/TIA and misclassify 6 out of 29 people without stroke/TIA as positive.

Because of the small number of studies evaluating the tests in a specific setting, poor study quality, substantial differences in study characteristics and high variability in the results, these findings should be treated with caution and need further verification in better-designed studies.

Conflict of Interests

Jorien Laermans and Vere Borra are Field Coordinators of Cochrane First Aid. Emmy De Buck is the director of the Field.

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References

Zhelev Z, Walker G, Henschke N, Fridhandler J, Yip S. (2019). Prehospital stroke scales as screening tools for early identification of stroke and transient ischemic attack. *Cochrane Database of Systematic Reviews, 4*. Art. No.: CD011427. https://doi/10.1002/14651858.CD011427.pub2/information

In order to complete this Cochrane Corner, we'd like to invite you or your organization to submit a response to the evidence review of prehospital stroke scales. We're keen on understanding:

- **The implication language in translating/ applying various scales**
- **Ways of teaching a scale to various groups of learners**
- **How results are interpreted and communicated to EMS**
- **System implementation of scale(s)**

Submissions may be published within this issues, if received by September 1, 2022.