



# Population-Based Comparison of the Cincinnati and Los Angeles Prehospital Stroke Screens

David L. Tirschwell<sup>1</sup>, Glenn B. Schubert<sup>1</sup>, W.T. Longstreth, Jr.<sup>1,2</sup>, Leonard A. Cobb<sup>3</sup>, Michael K. Copass<sup>1,3</sup>  
 Departments of Neurology<sup>1</sup>, Epidemiology<sup>2</sup>, and Medicine<sup>3</sup> – Harborview Medical Center, University of Washington, Seattle, WA



## Background and Purpose

- ◆ The Cincinnati and Los Angeles Prehospital Stroke Screens (CPSS, LAPSS) have been well-described and validated<sup>1,4</sup>
- ◆ The purpose of prehospital stroke patient identification may help determine the best approach
  - ◆ triage in a community vs.
  - ◆ research related identification
- ◆ We compared the diagnostic characteristics of the CPSS and LAPSS on a population based sample of possible stroke patients evaluated by the Seattle Fire Department

## Methods

- ◆ Patients
  - ◆ A population-based sample identified from Seattle Fire Department records from 9/2000 – 9/2002
  - ◆ All patients with a possible stroke prehospital diagnosis
    - ◆ Comatose patients excluded (cannot be evaluated on the CPSS or LAPSS)
- ◆ Data Collection and Definitions
  - ◆ Hospital records reviewed for
    - ◆ final diagnosis (ischemic stroke, intracerebral hemorrhage, subarachnoid hemorrhage, TIA or “not a stroke”) and
    - ◆ Signs and symptoms used to classify positive or negative screens using the CPSS and LAPSS
  - ◆ tPA eligible = ischemic stroke final diagnosis, called 911 within 100 minutes of stroke onset and retrospective NHSS<sup>5</sup> > 4
- ◆ Analytic Approach
  - ◆ Descriptive and nonparametric statistics were used to compare tPA eligible and ineligible patients
  - ◆ Standard definitions of sensitivity, specificity, positive predictive value and negative predictive value
    - ◆ First using original CPSS, LAPSS definitions to identify all ischemic strokes
    - ◆ Then using CPSS, LAPSS definitions plus “called 911 within 100 minutes of symptom onset” to identify all tPA eligible ischemic stroke patients
  - ◆ Area under the ROC curve (C statistic) used to compare performance of the CPSS and LAPSS
  - ◆ Analyses performed using STATA statistical software (version 7, College Station, TX)
- ◆ This study was approved by the Human Subjects Research Committee of the University of Washington and a similar committee at each of the 10 Seattle area hospitals.

## Results

Table 1. Characteristics of all non-comatose patients, and then broken down by final diagnosis, with a possible prehospital stroke diagnosis. Comparison P values are across 5 final diagnosis categories.

Characteristic	All Patients (N = 1293)	TIA (N = 234)	Ischemic Stroke (N = 334)	ICH (N = 49)	SAH (N = 8)	Not a Stroke (N = 668)	P Value
Median Age (IQR)	80 (70-86)	81 (74-87)	80 (71-86)	81 (66-85)	75 (63-78)	80 (69-87)	NS
% Female	59	59	58	53	50	60	NS
Race, %							0.004
Caucasian	72	83	69	69	87	69	
African American	12	8	11	4	13	14	
Asian American	7	4	8	10	0	8	
Other/Unknown	10	6	12	16	0	10	
Time to 911 call							0.001
median hrs. (IQR)	48 (2-48)	9 (0-48)	10 (1-48)	7 (0-8-48)	48 (24-48)	48 (9-48)	
% called 911 within 100 minutes	24	36	28	33	25	16	<0.001
Prehospital Time <sup>†</sup>							NS
median min. (IQR)	49 (42-58)	49 (41-55)	50 (42-59)	49 (44-58)	51 (38-58)	49 (42-59)	
median nNHSS (IQR)	3 (0-6)	0 (0-3)	7 (4-12)	4 (2-6)	2 (0-4)	2 (0-4)	<0.001
% nNHSS > 4	35	14	68	76	38	23	<0.001
% tPA candidate <sup>‡</sup>	-	-	19	-	-	-	<0.001
% tPA Rx	-	-	54	-	-	-	<0.001
% CPSS (+)	51	35	90	90	24	34	<0.001
% LAPSS (+)	30	18	64	65	13	11	<0.001

<sup>†</sup> Time from symptom onset until 911 call was made. Patients without time data assumed to have arbitrarily long time to call 911 of 48 hours.  
<sup>‡</sup> Time from 911 dispatch until hospital arrival.  
<sup>§</sup> See methods section for definition.

Table 2. Diagnostic characteristics of the CPSS and LAPSS

	CPSS	LAPSS	P Value for difference
<b>All Ischemic Strokes</b>			
Sensitivity (95% CI)	90 (86-93)	64 (58-69)	
Specificity (95% CI)	63 (59-66)	85 (82-87)	
Positive Pred Value (95% CI)	45 (42-48)	59 (54-64)	
Negative Pred Value (95% CI)	94 (92-96)	87 (85-89)	
C statistic (95% CI)	0.76 (0.74-0.78)	0.74 (0.71-0.77)	0.17
<b>tPA Eligible Ischemic Strokes</b>			
Sensitivity (95% CI)	98 (92-100)	83 (73-91)	
Specificity (95% CI)	92 (90-93)	96 (94-97)	
Positive Pred Value (95% CI)	39 (32-47)	50 (41-60)	
Negative Pred Value (95% CI)	100 (100-100)	99 (98-100)	
C statistic (95% CI)	0.95 (93-97)	0.89 (85-94)	0.01

## Conclusions

- ◆ The CPSS and LAPSS had similar overall diagnostic performance for the identification of all ischemic stroke patients. The main difference was that the CPSS was more sensitive, and the LAPSS was more specific and had higher positive predictive value.
- ◆ The CPSS with a 100 minute time limit showed a slight superiority in the identification of tPA eligible ischemic stroke patients, largely due to enhanced sensitivity.
- ◆ The CPSS with a 100 minute time limit is a more appropriate tool for community based prehospital screening of potential stroke patients; it is highly sensitive and reasonably specific for identifying patients who will be eligible for IV tPA therapy. It also is simpler to administer.
- ◆ The LAPSS has greater specificity and positive predictive value. As acute stroke therapy research moves into the prehospital setting, such a screening tool will be an key aspect of initial patient identification.
- ◆ Limitations
  - ◆ Our CPSS and LAPSS classifications were based on symptoms observed during initial hospital evaluation, so generalization to EMS field performance is not guaranteed
  - ◆ Our data do not capture whether the patients fulfilled all eligibility criteria for IV tPA, thus our diagnostic accuracies may not reflect real world tPA eligibility
  - ◆ Our data did not have grip strength included, thus we may have underestimated the sensitivity of the LAPSS; the lack of blood glucose information may have overestimated the sensitivity and underestimated specificity

**The Cincinnati Prehospital Stroke Scale**  
 American Stroke Association  
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**Facial Droop** (Have patient show teeth or smile)  
 • Normal — both sides of face move equally  
 • Abnormal — one side of face does not move as well as the other side

**Arm Drift** (Patient closes eyes and holds both arms straight out for 10 seconds)  
 • Normal — both arms move the same or both arms do not move at all (other limbs rigid, such as pronator grip, may be helpful)  
 • Abnormal — one arm does not move or one arm drifts down compared with the other

**Abnormal Speech** (Have the patient say “you can’t teach an old dog new tricks”)  
 • Normal — patient uses correct words with no slurring  
 • Abnormal — patient slurs words, uses the wrong words, or is unable to speak

**Los Angeles Prehospital Stroke Screen (LAPSS)**

1. Patient Name: Last: \_\_\_\_\_ First: \_\_\_\_\_  
 2. Information/History from: Patient, Family Member, Other. Phone: \_\_\_\_\_  
 3. Last known time patient was at baseline or deficit free and awake: Arrival Time: \_\_\_\_\_ Date: \_\_\_\_\_

**SCREENING CRITERIA:**

4. Age > 45  
 5. History of seizures or epilepsy absent  
 6. Symptom duration less than 24 hours  
 7. At baseline, patient is not wheelchair bound or bedridden

8. Exam: **LOOK FOR OBVIOUS ASYMMETRY** (Face, Arm, Leg) — Yes/Unknown/No  
 9. **Face:** Smile/Inferior/smile, Normal/Right/Left, Drift/Down, Falls/Rapidly/Falls/Rapidly  
 10. **Arm:** Arm Strength, Drifts/Down, Falls/Rapidly  
 11. **Leg:** Leg Strength, Drifts/Down, Falls/Rapidly

Based on exam, patient has only unilateral (and not bilateral) weakness: Yes/No

11. Items 4, 6, 7, 8, 9 all YES (or unknown) → LAPSS screening criteria met: Yes/No

Table 3. Details of false positive and false negative cases from identification of non-comatose ischemic stroke patients using the CPSS and LAPSS.

	CPSS			LAPSS		
	False Positive	False Negative	tPA eligible	False Positive	False Negative	tPA eligible
N	35	309	1	100	121	11
Median Age (IQR)	84(71-87)	79(69-86)	93	81(73-88)	76(65-85)	81(69-82)
% previously disabled	3	20	100	4	17	9
% Seizure History	3	11	0	8	7	18
% tPA History	27	46	100	43	42	45
% most recent < 24 hrs onsets	1 (0-2)	5 (3-9)	20	4 (2-7)	5 (3-11)	17 (9-20)
<b>% NHSS Symptom Present</b>						
1a. Level of consciousness	3	20	100	8	16	16
1b. Orientation	11	36	0	17	36	24
1c. Comprehension	5	30	100	14	17	18
2. Gaze	3	7	0	7	18	6
3. Visual Fields	14	0	0	0	0	0
4. Facial Paresis	3	20	0	48	24	62
5a. Motor - Arm - Right	9	31	100	27	35	82
5b. Motor - Arm - Left	9	31	100	27	45	55
6a. Motor - Leg - Right	14	27	100	24	32	82
6b. Motor - Leg - Left	14	21	100	31	29	55
7. Limb Ataxia	6	4	0	4	2	0
8. Sensory	18	13	0	15	19	21
9. Language	6	48	0	17	45	28
10. Dysarthria	0	21	0	26	19	18
11. Extinction	0	0	0	0	0	0
<b>Final Diagnosis</b>						
% TIA	23	13	29	25	28	30
% Ischemic Stroke	100	0	100	100	0	100
% Intracerebral Hemorrhage	0	12	0	15	15	23
% Subarachnoid Hemorrhage	2	0	0	1	0	0
% Spontaneous aSAH	0	5	0	5	3	6
% Cryptogenic	3	2	1	1	2	2
% tPA	0	0	9	4	2	2
% tPA Rx	0	0	17	6	6	6
% Other Intoxication	0	0	0	1	0	0
% Other	0	0	17	14	16	10

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