

Predictive value of the Cincinnati Prehospital Stroke Scale for identifying thrombolytic candidates in acute ischemic stroke

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Cincinnati Prehospital Stroke Scale (CPSS)



Introduction

- CPSS
 - effective tool used by emergency medical service (EMS) personnel and laypersons
 - Excellent reproducibility
 - Rapid recognition
 - Assess stroke severity??
- CPSS vs. NIHSS score in patients who may be candidates for thrombolysis (< 6 hour onset)

method

- Retrospective study
 - emergency stroke therapy (BEST) program in a tertiary academic hospital
 - 2010-9-1 to 2011-9-30
 - Inclusion: Ischemic stroke/TIA < 6 hours of symptoms onset
 - Exclusion criteria
 - >6 hours after symptom onset (n = 191)
 - Hemorrhagic stroke/ brain tumor (n= 96)
 - diagnosis of other diseases such as encephalitis, seizure, hypoglycemia, or syncope after admission (n = 155)
 - inability to evaluate stroke because of life threatening disease (n = 3)
 - Transfer from other hospital after MRI or t-PA (n=3)
 - incomplete data, such as incomplete stroke scoring (n = 5)
- 284 patient

BEST program

- computerized physician order entry system
- At least One of five warning symptoms < 12 hours onset
 - sudden weakness; sudden speech difficulty; sudden visual loss; sudden dizziness; sudden, severe headache
- < 3 hours onset :Brain CT scan without contrast
- > 3hours onset/ no lasting symptoms : Head and neck CT angiography
- CPSS: One of six EMT; NIHSS: neurologisit
- < 3 hour ischemic stroke(NIHSS 5-22): iv tPA
- selected patients with major stroke (< 6 hours duration, NIHSS> 5) : Intra-arterial thrombolytic therapy (urokinase)or sequential combination thrombolytic therapy

Result

		Cut-off point
1	Actual IV-tPA usage within 3 h of onset	2
2	Actual IV-tPA or IA-UK usage within 6 h of onset	2
3	Comparison of CPSS and NIHSS score (5-22) within 3 h of onset	2
4	Comparison of CPSS and NIHSS (≥5) within 6 h of onset	2

Youden's index = sensitivity + specificity – 1; AUC, area under the curve.

	Sensitivity (95% CI)	Specificity (95% CI)	AUC (95% CI)	Youden's index
1	96.2% (90.9-100.0)	62.1% (55.8-68.3)	0.791 (0.750-0.832)	0.582
2	95.5% (90.4-100.0)	65.6% (59.3-71.9)	0.805 (0.765-0.846)	0.611
3	88.5% (82.3-94.6)	74.4% (68.1-80.8)	0.815 (0.770-0.859)	0.629
4	89.2% (83.4-95.0)	77.5% (71.2-83.7)	0.833 (0.791-0.876)	0.666

Result

	Actual IV-tPA usage		Actual IV-tPA or IA-UK usage	
	OR (95% CI)	P	OR (95% CI)	P
Age	-	-	-	-
Onset-to-door time, min	0.983 (0.976-0.980)	<.0001	0.991 (0.987-0.995)	<.0001
Hypercholesterolemia	0.124 (0.015-1.053)	.0558	0.166 (0.035-0.785)	.0235
Atrial fibrillation	-	-	-	-
CPSS score ≥ 2	34.455 (7.924-149.817)	<.0001	36.310 (10.826-121.782)	<.0001

	NIHSS score (5-22)		NIHSS score (≥ 5)	
	OR (95% CI)	P	OR (95% CI)	P
Age	1.018 (0.990-1.046)	.2047	1.025 (0.996-1.054)	.0869
Onset-to-door time, min	-	-	-	-
Hypercholesterolemia	-	-	-	-
Atrial fibrillation	2.085 (1.004-4.328)	.0487	2.206 (1.022-4.763)	.0440
CPSS score ≥ 2	20.087 (10.024-40.250)	<.0001	25.660 (12.670-51.971)	<.0001

Result

Clinical outcomes of patients with ischemic stroke according to CPSS score

	CPSS score < 2 (n = 146)	CPSS score ≥ 2 (n = 138)	P
Demographics			
Median age (IQR)	66.0 (56.0-74.0)	70.5 (62.0-76.0)	.0028
Male	91 (62.3%)	76 (55.1%)	.2143
Onset-to-door time, min (IQR)	127.0 (70.0-237.0)	76.5 (42.0-187.0)	.0001
Coronary artery disease	21 (14.4%)	25 (18.1%)	.3035
Hypertension	86 (64.4%)	99 (71.7%)	.1843
Diabetic mellitus	29 (19.9%)	42 (30.4%)	.0397
Hypercholesterolemia	18 (12.3%)	15 (10.9%)	.7013
Smoking	62 (42.5%)	54 (39.1%)	.5676
Atrial fibrillation	20 (13.7%)	40 (29.0%)	.0016
Previous cerebrovascular disease	43 (29.5%)	42 (30.4%)	.8566
Clinical outcomes			
Clinical diagnosis			<.0001
Ischemic stroke	85 (58.2%)	128 (92.8%)	
Transient ischemic attack	61 (41.8%)	10 (7.2%)	
Actual therapy			
IV-tPA	2 (1.4%)	50 (36.2%)	<.0001
IA-UK	1 (0.7%)	24 (17.4%)	<.0001
IV-tPA or IA-UK	3 (2.1%)	63 (45.7%)	<.0001
Median NIHSS (IQR)	1.0 (0.0-2.0)	10.5 (4.0-17.0)	<.0001
NIHSS score 5-22	12 (8.2%)	92 (66.7%)	<.0001
NIHSS score ≥ 5	12 (8.2%)	99 (71.7%)	<.0001

Results are expressed as n (%) or median (IQR).

Discussion

- CPSS score strongly correlates with the NIHSS score and can identify candidates for thrombolytic therapy within 3 or 6 hours of acute ischemic stroke onset
- A cut-off CPSS score of 2
 - Actual IV-tPA within 3 hours: 96.2% sensitivity; 62.1% specificity
 - Actual IV-tPA or IA-UK within 6 hours: 95.5% sensitivity; 65.6% specificity
 - IV-tPA usage: 50/138 CPSS ≥ 2 , 2/146 CPSS < 2
 - TIA: 7.2 % CPSS ≥ 2 , CPSS < 2 (41.8%)

limitation

- CPSS is a prehospital stroke scale, the CPSS score was determined by EMTs in the ED in this study
- inter-observer reliability was not evaluated
- assessments by CPSS and NIHSS were not performed at the same time (possible changes in symptoms was not considered)
- IV-tPA usage in patient with 3 to 4.5 hours onset of symptoms was not including in this study

conclusion

- The CPSS is an effective prehospital stroke scale among patients with acute ischemic stroke within 6 hours of symptom onset in
 - assess stroke severity
 - identify candidates for thrombolytic therapy

Clinical features of patients inappropriately undiagnosed of pulmonary embolism

Introduction

- Prompt recognition of pulmonary embolism (PE) remains a challenge
 - acute PE often have nonspecific symptoms
- Diagnosed within 48 hours of arrival at the emergency department (ED) had better outcomes
- Factors associated with the timing of diagnosis
 - only in patients who were admitted to hospital
 - sent home with a wrong diagnosis have **not been included** in these previous studies

purpose

- identify
 - the prevalence and clinical factors associated with a delayed diagnosis
 - Whether patients with a delayed diagnosis showed more severe PE or worse outcomes

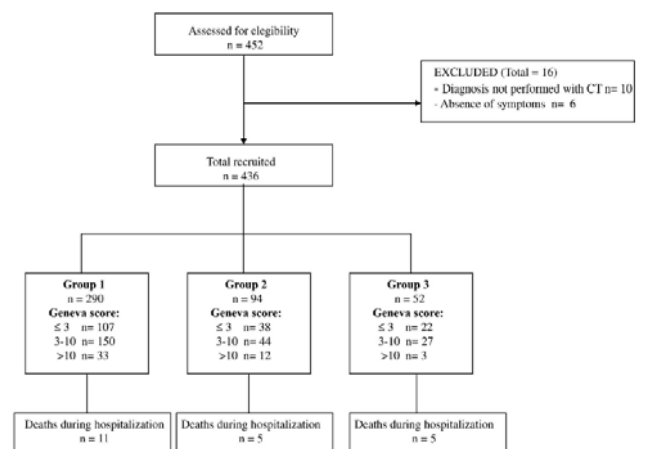
Method

- retrospective observational study,
- 3 University affiliated Hospitals in Madrid, Spain
- April 2008 to December 2011
- diagnosis of acute symptomatic PE as confirmed by chest computed tomography (CT)
- Inclusion criteria
 - > 18 y/o
 - symptoms compatible with acute PE
 - diagnosed with chest CT that radiologist felt it was consistent with an acute process
- Exclusion criteria
 - Asymptomatic pulmonary embolism

Method

- Time to diagnosis the time (in hours) from first evaluation in the ED for that symptom to chest CT diagnosis
- Category
 - group 1: ED diagnosis at first visit
 - Group 2: chest CT ordered during hospitalization (required one symptom consistent with PE written on the ED chart)
 - Group 3: discharge with a wrong alternative diagnosis and returned to the ED with the same complaints and were diagnosed of PE

Result



Revised Geneva Score

Variable	Score
Age 65 years or over	1
Previous DVT or PE	3
Surgery or fracture within 1 month	2
Active malignant condition	2
Unilateral lower limb pain	3
Haemoptysis	2
Heart rate 75 to 94 beats per minute	3
Heart rate 95 or more beats per minute	5
Pain on deep palpation of lower limb and unilateral oedema	4

- 0 - 3 points indicates low probability (8%)
- 4 - 10 points indicates intermediate probability (28%)
- 11 points or more indicates high probability (74%)

	Group 1 (n=290)	Group 2 (n=94)	P	Group 3 (n=52)	P
Male gender (%)	51.4	49.4	.3	38.4	.06
Mean age (y)	67.3 (13.7)	71.5 (15.2)	.04	61.4 (12.4)	.2
Risk factors for PE (%)					
Active neoplasia	12.4	7.4	.1	15.3	.3
Recent major surgery	7.5	2.1	.04	3.7	.2
Immobilization	19.3	10.6	.03	12.9	.3
Previous DVT/PE	12.9	13.1	.4	11	.4
Oral contraceptives	3.4	5.3	.2	11.1	.2
Comorbidities (%)					
COPD	7.2	29.7	<.001	13	.2
Asthma	4.1	11.7	.01	3.7	.6
Heart failure	3.1	8.5	.03	5.5	.2
Coronary artery disease	6.5	10.6	.1	11.1	.1
Active nicotine use	8.3	22.3	<.001	3.7	.2
Duration of symptoms (h)	107.3 (252.2)	152.2 (299.1)	.2	249.1 (473.8)	.002
Clinical presentation (%)					
Dyspnea	72.9	84	.01	42.5	<.001
Cough	13.4	35.1	<.001	25.9	.01
Centrothoracic pain	15.5	2	.92	.1	.1
Pleuritic chest pain	26.6	17	.03	22	.3
Pleuromechanic pain	5.1	6.5	.3	29.6	<.001
Syncope	15.1	3	.01	13	.4
Fever	5.1	13.8	.007	18.5	.002
Hemoptysis	3.3	2.1	.5	12.9	.005
Electrocardiogram (%)					
Sinus tachycardia	26.5	40.6	.01	28.6	.4
RBBB	15.1	16.8	.4	7.4	.1
S1Q3T3	9.3	7.2	.3	0	.01
Negative T waves	12.8	18	.2	9.2	.3
Chest x-ray (%)					
Pulmonary infiltrate	11	24.4	.03	34	<.001
Atelectasis	6.1	9.5	.2	12.9	.08
Pleural effusion	18.1	18.6	.1	29.6	.07

Time to diagnosis:
Group 1: 3.9 ± 3.2 hours
Group 2: 56.6 ± 56 hours
Group 3: 180.3 ± 173 hours

multivariate analysis

Table 2
Logistic regression analysis showing independent predictors of a delayed diagnosis of pulmonary embolism

Group 2			
Variables	OR	95% CI	P
COPD	4.3	2.2-8.6	.00
Asthma	3.4	1.2-9.7	.01
Cough	2.5	1.4-4.7	.002
Absence of Syncope	4.3	1.2-14.7	.02
Group 3			
Variables	OR	95% CI	P
Absence of dyspnea	2.3	1.1-4.8	.02
Pleuro-mechanic pain	3.6	1.3-9.5	.01
Fever	2.7	1.2-7.8	.04
Hemoptysis	5	1.4-9-17.1	.009
Pulmonary infiltrate	2.5	1.1-6.2	.04

	Group 1	Group 2	Group 3
Troponin I (ng/mL) ^a	0.26 (0.5)	0.22 (0.3)	0.1 (0.1) ^d
D-Dimer (ng/mL) ^b	7131 (8021)	8440 (7300)	4920 (7760) ^d
RVD on TTE (%) ^c	30	29.6	25.7
Chest CT clot location (%)			
Proximal unilateral	16.9	23.9	17.6
Proximal bilateral	29	25.3	20.5
Distal unilateral	21.8	19.7	41.1 ^d
Distal bilateral	32.1	30.9	20.5

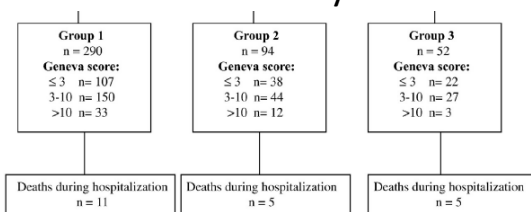
^a n = 143 in group 1, 41 in group 2, and 17 in group 3.

^b n = 256 in group 1, 63 in group 2, and 58 in group 3.

^c n = 190 in group 1, 54 in group 2, and 28 in group 3.

^d P < .05 in univariate analysis.

Mortality



- Group 1: 2:3= 3.7%: 5.3%: 9.2%, no statistic significant difference
- Patients die from group 3
 - older (86.8±5.8 years vs 64.3±7.2 and 71.1±8.5, from groups 1 and 2 respectively)
 - a higher prevalence of active neoplasia (80%) and heart failure (60%)

Discussion

- significant percentage of patients (more than one third) with a delayed diagnosis of acute PE in the ED
 - 12% to 50% according to previous study
- delayed diagnosis of PE who were admitted to hospital
 - more complex clinical presentation
 - lower rate of typical risk factors for PE
 - higher prevalence of prior cardiopulmonary disease
 - unspecific symptoms like dyspnea, cough, or fever

Discussion

- Earlier diagnosis
 - transient risk factors (recent surgery, severe medical diseases, immobilization, pregnancy) *Thromb Res 2008;121:751–6.*
 - surgical risk factors *Thromb Res 2007;121:153–8*
- clinicians commonly attribute their symptoms to their known cardiopulmonary disease rather than acute PE
 - PE diagnosis was made less accurately in patients with coronary artery disease or COPD. *Chest 2001;120:791–5; Ann Intern Med 2006;144:165–71*

Discussion

- Patient who sent home with a wrong diagnosis and diagnosed of PE while return
 - absence of risk factors for PE (younger age, less comorbidities, or the absence of a history of previous major surgery)
 - distal PE without dyspnea and S/S with other clinical situations like respiratory tract infection or mechanical chest pain
 - presence of a radiological infiltrate was an independent predictor of misdiagnosis

Discussion

- multiple biomarkers and imaging parameters
 - statistically significant lower mean values of Troponin I and D-dimer and a more frequent distal clot distribution in group 3
- → discharged from the ED show a less severe form of the disease

limitation

- Not including the Wells score (cannot determine clinically suspected PE)
 - Doctor delay(diagnosis of PE was not considered at presentation, or inadequate tests were performed to rule out acute PE) ?
 - failure of the standardized diagnostic work-up of patients with suspected acute PE ?
- Not including patient that sent home with a wrong diagnosis
 - died before they arrived
 - attended in other hospitals not included in the study

Conclusion

- delay in diagnosis of acute PE is frequent despite current diagnostic strategies
- Delay in diagnosis is not an independent predictor of a more severe disease or death
- These findings support the **need for a high degree of vigilance** for PE in this subgroup of patients, and clinicians should be aware of these factors to provide expedited management of acute PE