Performance Characteristics of the Modified Rapid Arterial Occlusion Evaluation Scale (mRACE) to Predict Large Vessel Occlusion

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DISCLOSURES

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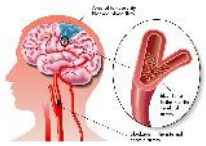
Stroke

- A leading cause of adult disability
- ~800,000 ischemic strokes per year
- Large vessel occlusions (LVO)



Time-sensitive illness, EMS must act FAST

- Small window for IV-tPA or intra-arterial (IA) therapy

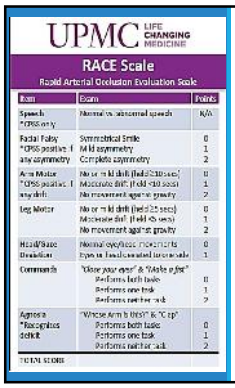
RACE Scale

Design and Validation of a Prehospital Stroke Scale to Predict Large Arterial Occlusion
The Rapid Arterial Occlusion Evaluation Scale

RACE (**R**apid **A**rterial o**C**clusion **E**valuation) **Scale**

- Introduced in 2014 from Barcelona, Spain
- Specifically designed for EMS
- Identifies LVO patients, helps facilitate triage

A <u>modified version</u> was implemented and assessed to determine feasibility and performance of this scale in identifying LVO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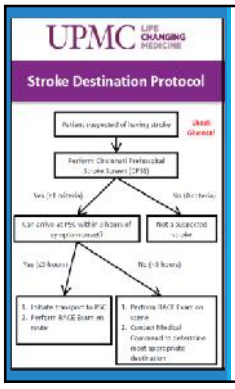
RACE Scale

Rapid Arterial Occlusion Evaluation Scale

Item	Exam	Points
Speech *CPSS or ↑	Normal vs. abnormal speech	N/A
Facial Palsy *CPSS positive, ↑ asymmetry	Symmetrical Smile Mild asymmetry Complete asymmetry	0 1 2
Arm Motor *CPSS positive, ↑ any drift	No or mild drift (held ≥10 secs) Moderate drift (held <10 secs) No movement against gravity	0 1 2
Leg Motor	No or mild drift (held ≥5 secs) Moderate drift (held <5 secs) No movement against gravity	0 1 2
Head/Gaze Deviation	Normal eye/head movements Eyes or head deviated to one side	0 1
Commands	"Close your eyes" & "Make a fist" Performs both tasks Performs one task Performs neither task	0 1 2
Agnosia *Recognizes deficit	"Whose arm is this?" & "Point to me" Performs both tasks Performs one task Performs neither task	0 1 2
TOTAL SCORE		

Modified RACE Scale (mRACE)

- Scores both Aphasia and Agnosia regardless of laterality
- Easier to perform through single exam
- Considers that language and special relationships may be controlled by either side of brain
- Paramedics trained from 12 EMS agencies in SW PA
- Training → video and hands-on demonstrations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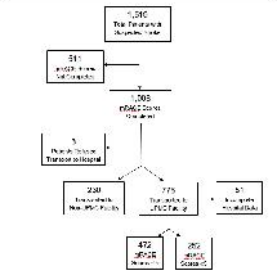
Stroke Destination Protocol

Objective

- Feasibility and performance of mRACE to detect LVO
- Data from December 2015 to December 2017
- Collected prospectively
- Large vessel occlusion suspected if mRACE score ≥5

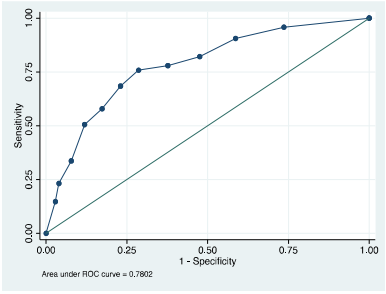


Consort Diagram

Summary Statistics for UPMC Cohort (N=724)

	Total RACE ≥5 (n=252)	Total RACE <5 (n=472)
Male n (%)	102 (40)	209 (44)
Age median (IQR)	72 (62-84)	69 (59-80)
NIHSS median (IQR)	13 (8-19)	3 (1-5)
LVO n (%)	72 (29)	23 (5)
IV-tpa n (%)	38 (15)	22 (5)
IA n (%)	41 (16)	8 (2)

*tPA = tissue plasminogen activator
**IA = intra-arterial therapy (stentriever or thrombectomy)



ROC Area = 0.780 (0.730-0.830)

mRACE Score Characteristics

Cutpoint	Sensitivity	Specificity
≥4	77.9%	62.3%
≥5	75.8%	71.4%
≥6	68.4%	77.0%

Predictive Value of mRACE ≥5

	Percentage	95% CI
PPV	28.6%	23.1-34.6%
NPV	95.1%	92.8-96.9%

DISCUSSION

- Compared to RACE, mRACE performs similarly
- Prevalence of LVO in the mRACE cohort differed from that of the RACE Derivation set (Perez de la Ossa et al. 2014)
  - SW Pennsylvania Cohort 13%
  - Barcelona Cohort 21%

Next Steps

UPMC Stroke Alert System (Mercy, Presbyterian, Shadyside)

	Time since last known well			
	< 6 Hours	6 – 12 Hours	12 – 24 Hours	>24 Hours
RACE score ≥5 or NIHSS ≥8	Level 1	Level 1	Level 2	No Alert
RACE score <5 and NIHSS <8 Or Unknown Values	Level 1	Level 2	Level 2	No Alert

* At the discretion of the Medical Command or Emergency Department Physician, an alert may be modified based on patient presentation, such as in patients who have complete resolution of symptoms.

Anticipated Treatment Goals:
Level 1 Alert → Direct to CT if available
Level 2 Alert → Prompt evaluation in room

Stroke Scale Scoring
RACE score ≥5 or NIHSS of ≥8 suggest a large vessel occlusion and potential need for endovascular therapy

LIMITATIONS

- Limited access to in-hospital data
- Unable to obtain time last known well or past medical history for all patients
- Missing data

CONCLUSION

- mRACE scale is feasible and generalizable
- mRACE has similar performance to RACE without the need to assess laterality

Identify patients with a high chance of LVO, more stroke patients may be transported to a center with the level of care matching their needs

Stroke

American Heart Association | American Stroke Association

Design and Validation of a Prehospital Stroke Scale to Predict Large Arterial Occlusion: The Rapid Arterial Occlusion Evaluation Scale

Natalia Pérez de la Ossa, David Carrera, Mònica Gorchs, Manuel Quintana, Mònica Millán, Meritxell Gomis, Laura Dorado, Elena López Cancio, María Hernández Pérez, Vicente Chicharro, Xavier Escalada, Xavier Jiménez and Antoni Dávalos

Incidence of LVO in Barcelona study: 21%
Race ≧5

Sensitivity	0.85
Specificity	0.68
PPV	0.42
NPV	0.94
ROC AUC	0.82 CI (0.77-0.87)

Why is the PPV different?

PPV=Sensitivity x Prevalence

Sensitivity x Prevalence + (1-Sensitivity) x (1- Prevalence)

*PPV and NPV related to Prevalence
Prevalence: SW PA 13%; Barcelona 21%

PPV=.76 x .21 / .16

.76 x .21 + .24 x .79 = .16 + .19 = 45.7%

NPV=Specificity x (1-Prevelance)

Specificity x (1-Prevelance) + (1-Specificity) x Prevalence

NPV=.71 x .79 / .56

.71 x .79 + 0.29 x .21 =.56 + 0.06 = 90.3%

Comparison of Summary Statistics for Patients Transported to UPMC and Non-UPMC Hospitals

N= 724 to UPMC Hospitals	Total RACE ≥5 (n=252)	Total RACE <5 (n=472)
LVO n (%)	72 (29)	180 (38)
Male n (%)	102 (40)	209 (44)
Age n (IQR)	72 (62-84)	69 (59-80)
NIHSS n (IQR)	13 (8-19)	3 (1-5)
*IV-tpa n (%)	38 (15)	22 (5)
**IA n (%)	41 (16)	8 (2)

N=230 to Non UPMC Hospitals	Total RACE ≥5 (n=67)	Total RACE <5 (n=158)
LVO n (%)	--	--
Male n %	26 (39)	72 (46)
Age mean (IQR)	82 (68-86)	77 (62-85)