

# LVO Screens in EMS

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# Disclosures

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None

# Objectives

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- Review Pre-Hospital LVO Screens
- Overview of JOCO EMS System Experience with implementing LVO Screen
- Discuss challenges with EMS identification of LVO's and Stroke Routing

# Johnson County EMS System

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## Johnson County:

Population: 597,555

480 sq. mi

**Comprehensive Stroke Centers: 3**

**Number of Hospitals: >20**

## EMS System:

One Medical Director for EMS System

9 Fire Departments

1 County Ambulance Service (MED-ACT)

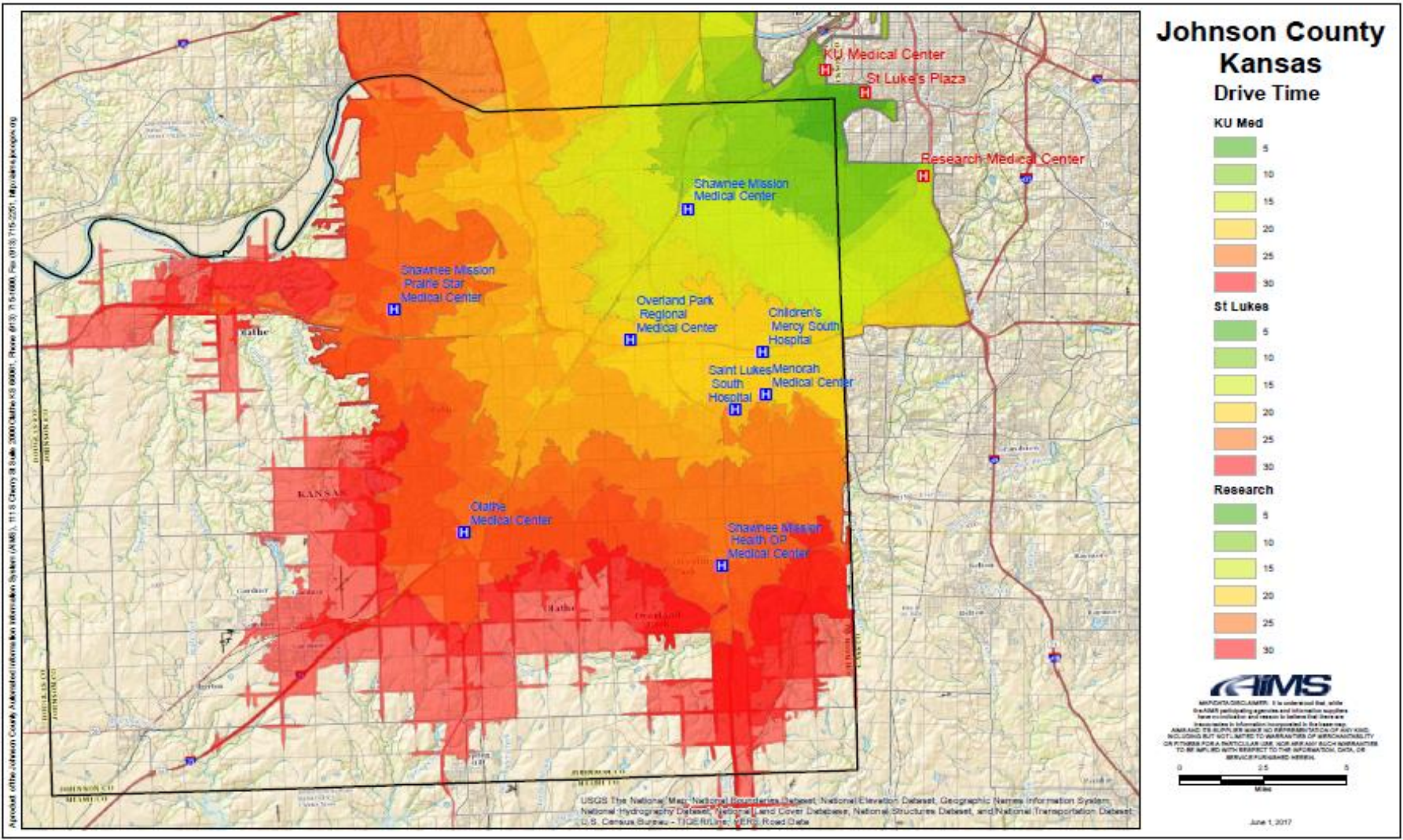
1 dispatch center for medical calls (MPD)

# JOCO Experience: Process for Changing Protocol

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- Review of literature
- Reviewed own System data
- Discussed with other EMS Agencies
- Discussed with neurologists at CSC and stroke programs at local hospitals
- Johnson County Medical Society
- Death by protocol
- Educate EMS System/EMS Partners





# New Stroke Protocol

CVA 2018

Procedures / Interventions	Med Doses	EMT	AEMT	PM
<ul style="list-style-type: none"><li>• Key priorities for CVA patients are efficient scene times and transport to the closest appropriate stroke facility. For stroke routing, please refer to the Stroke Routing Checklist.</li> <li>• Do not lower blood pressure.</li> <li>• Do not routinely apply supplemental oxygen unless patient's oxygen saturation is &lt;94% or patient has respiratory distress, or there is concern for potential loss of airway where pre-oxygenation for more invasive airway management may be considered.</li> <li>• Assessment should include performing a Cincinnati Stroke Scale by evaluating the following (See <a href="#">Appendix M</a>):<ul style="list-style-type: none"><li>➢ Facial Droop</li><li>➢ Abnormal Speech</li><li>➢ Arm Drift</li></ul>Any one of the above three tests shows abnormal findings indicates a POSITIVE Cincinnati Stroke Screen.</li> <li>• If Cincinnati Stroke Screen is POSITIVE, then assessment should include FAST-ED/Large Vessel Occlusion Screen (See <a href="#">Appendix N</a>).</li> <li>• Providers should assess the patient for the following:<ul style="list-style-type: none"><li>➢ Last known well time</li><li>➢ Head injury</li><li>➢ Recent surgery</li><li>➢ On any anti-coagulation/anti-platelet medication</li><li>➢ Pregnancy</li></ul></li> <li>• <b>Obtain a 12-lead ECG</b> on any patient whom you suspect to be having a stroke as a cause for their complaint unless doing so might cause a significant delay in emergent intervention (urgent airway or perfusion issues, etc.).</li></ul>				



## Stroke Assessment

### The Cincinnati Prehospital Stroke Scale

**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



*Left: Normal. Right: Stroke patient with facial droop (right side of face).*

**Arm Drift** (patient closes eyes and extends both arms straight out, with palms up, for 10 seconds):

- Normal—both arms move the same or both arms do not move at all (other findings, such as pronator drift, may be helpful)
- Abnormal—one arm does not move or one arm drifts down compared with the other



*Left: Normal. Right: One-sided motor weakness (right arm).*

**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

**Interpretation:** If any 1 of these 3 signs is abnormal, the probability of a stroke is 72%.

Modified from Kohner RM, Fanciulli A, Liu T, Betti T, Broderick J. Cincinnati Prehospital Stroke Scale: reproducibility and validity. *Ann Emerg Med.* 1990;22:273-278. With permission from Elsevier.



FAST-ED Assesses:

Facial Weakness/Asymmetry

Arm Weakness

Speech Output

Speech Comprehension

Eye Deviation

Denial/Neglect

**Screening Process for Stroke Routing**

*This Checklist applies ONLY to adult patients (≥18 years old) with signs and symptoms of a CVA and **POSITIVE** Cincinnati Stroke Screen.*

- FAST-ED/Large Vessel Occlusion Screen (LVO). Document score (≥ 4 = **positive** LVO screen) \_\_\_\_\_
- Notify dispatch on radio of “code stroke”
- Determine Last known well time and document \_\_\_\_\_
  - o This is the last confirmed time the patient was symptom free, NOT the time symptoms were first noticed.]

**LKWT**

	<u>LVO &lt; 4</u>	<u>LVO ≥ 4</u>
<b>0-3.5 hrs</b>	CLOSEST	CLOSEST
<b>3.5-8 hrs</b>	CLOSEST	COMPREHENSIVE
<b>&gt;8 hrs</b>	CLOSEST	CLOSEST
<b>unknown</b>	CLOSEST	COMPREHENSIVE
<b>Wake-up 0-3.5 hrs</b>	CLOSEST	CLOSEST
<b>Wake-up &gt;3.5 hrs</b>	CLOSEST	COMPREHENSIVE

COMPREHENSIVE= KUMC, Research, St. Luke's Plaza

CLOSEST= closest stroke center regardless if primary stroke center or comprehensive stroke center

\*Primary stroke centers: Advent Shawnee Mission, Menorah, Olathe, OPR, St. Luke's South, St. Joseph

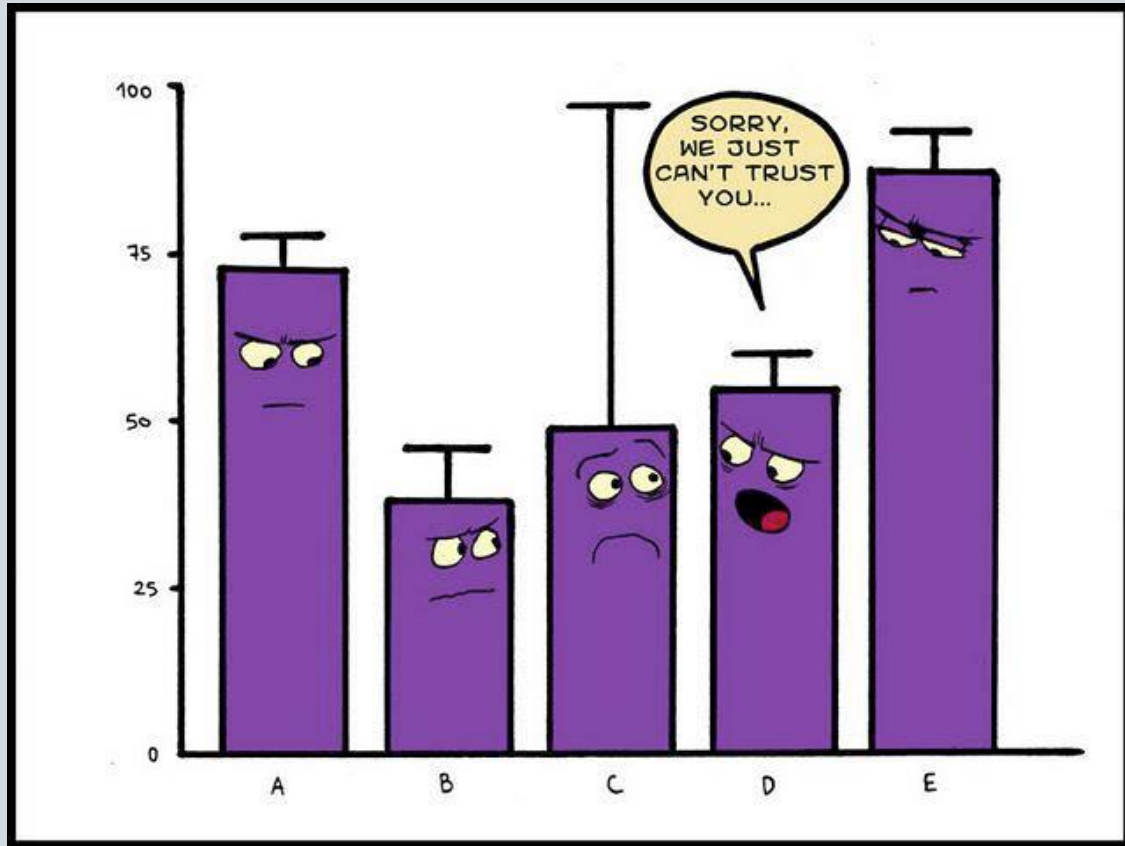
\*Patients <18 years old with signs and symptoms concerning for CVA should be transported to Children's Mercy Hospital-Main.

# Intent of Protocol

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Capture LVO's and take them to a comprehensive if outside of tPA window or contraindicated for tPA (by time).

# Data (Jan-Jun 2018)

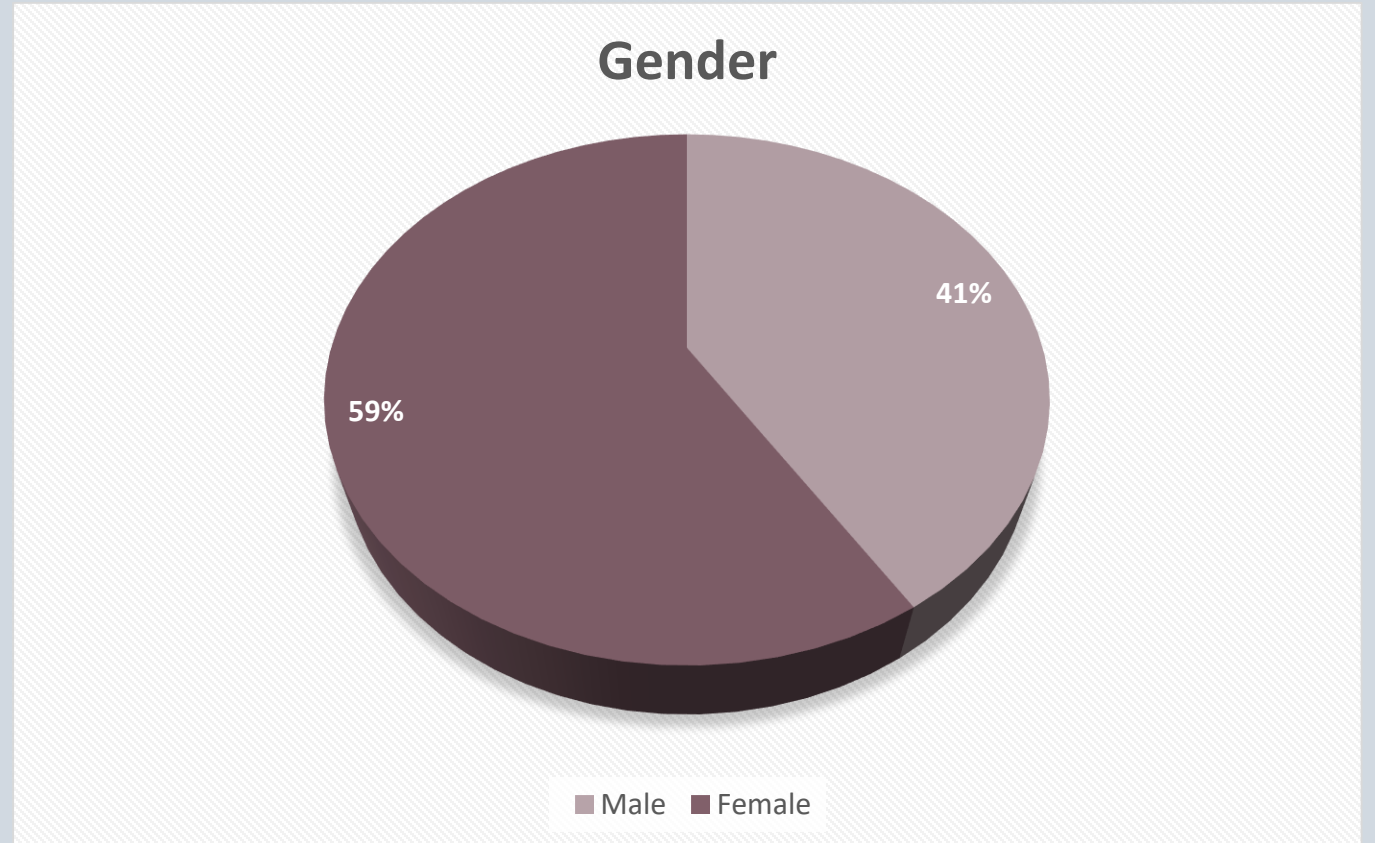


# Demographics

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Total Number of Stroke  
Patients- **360**

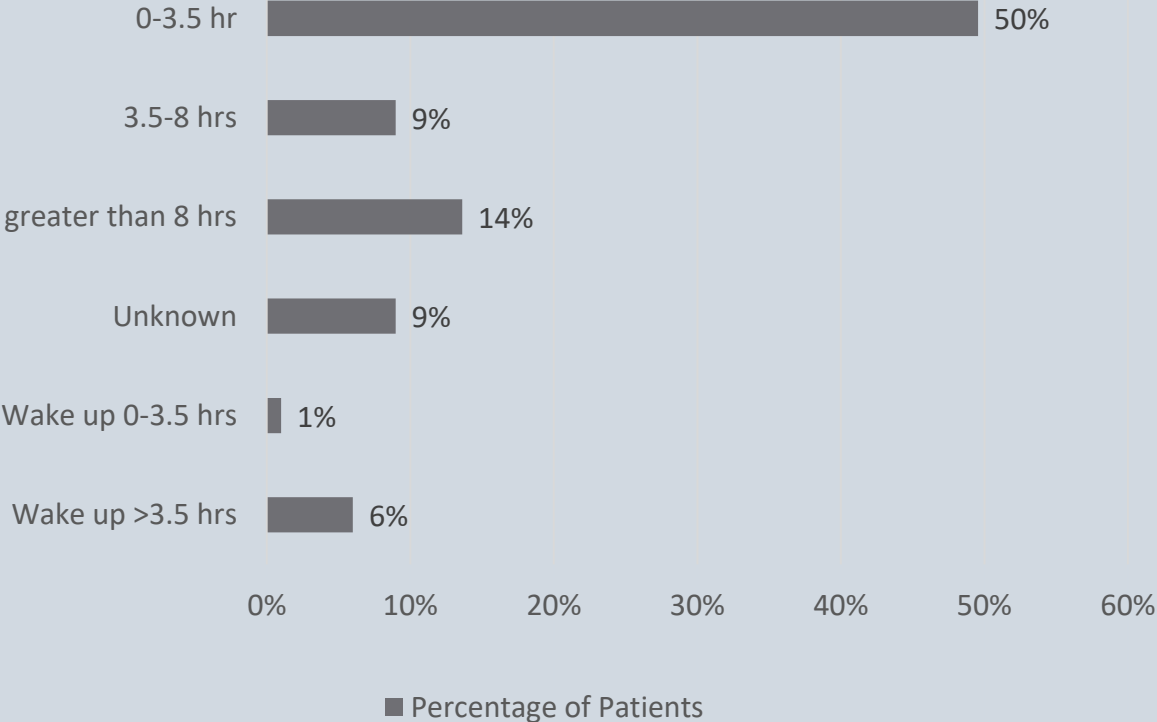
Average Age- **75**



# Last Known Well

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Percentages of Last Known Well Times



# EMS Times

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Average Scene Time- **14:24**

Average Transport Time- **11:38**

Average Patient Contact Time- **26:02**

(FMC to hospital arrival)



# Primary Hospitals Bypassed

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- **22** PSC's bypassed for CSC

Out of 360 Stroke patients



# Transfers to CSC (DIDO Times)

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Arrived by EMS to PSC then transferred by EMS to CSC = **31** patients

Mean Door in Door Out Time: **117 minutes**

Median Door in Door Out Time: **90 minutes**

Range=**18-440min**

# How did we do?

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Cincinnati Screen: Stroke (yes/no)?

**Sensitivity: 79.4%**

(actual positives are not overlooked or the avoiding of false negatives)

**Specificity: 32.6%**

(actual negatives are classified as such or the avoiding of false positives)

**Missed 31 patients in 6 months who we thought were negative that HAD actual CVA**

# How did we do? LVO?

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229 patients had completed LVO screen

▪ **Sensitivity: 73.7%**

(actual positives are not overlooked or the avoiding of false negatives)

▪ **Specificity: 74.3%**

(actual negatives are classified as such or the avoiding of false positives)

# How did we do? All-comers?

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**Positive Predictive Value: 56.7%**

**Negative Predictive Value: 59.2%**



If the test is positive, how likely is it that he really has the disease? How worried should he be?



If the test is negative, how likely is it that he really does NOT have it? How reassured should he be?



# Did it matter?

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We had **16 Falsely negative** LVO's (we missed **16** people who actually had an LVO)

# Bypassed Primary to Comprehensive for positive LVO screen AND had mechanical thrombectomy

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**#1: 3.5-8 hours LKTW: MCA LVO positive taken to CSC instead of PSC from field with successful mechanical thrombectomy and full recovery.**

#2: wake-up >3.5 with direct to PSC instead of PSC with EVT for cardio-embolic stroke with A-fib.  
(poor outcome, rehab, mute, NIHSS 16)

#3: unknown LKWT: MCA thrombectomy at CSC instead of PSC with dc to hospice

#4: hospice

#5: poor functional outcome/mechanical ventilation

# 5 patients

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5 out of 360 patients in 6 month period were triaged to CSC center appropriately after bypassing PSC



**1 Good outcome**



# Long-term implementation of a prehospital severity scale for EMS triage of acute stroke: a real-world experience

Mouhammad A Jumaa,<sup>1,2</sup> Alicia C Castonguay,<sup>1</sup> Hisham Salahuddin,<sup>1</sup> Julie Shawver,<sup>2</sup> Linda Saju,<sup>1</sup> Richard Burgess,<sup>1</sup> Vieh Kung,<sup>1</sup> Diana E Slawski,<sup>1</sup> Gretchen Tietjen,<sup>1</sup> David Lindstrom,<sup>3</sup> Brent Parquette,<sup>3</sup> Andrea Korsnack,<sup>1</sup> Kimberly Cole,<sup>4</sup> Ehad Afreen,<sup>1</sup> Kunaal Bafna,<sup>1</sup> Syed F Zaidi<sup>1,2</sup>

Prospective, 5 hospital system in Ohio

RACE score >5 taken directly to MT center as RA (Race Alert) OR closest stroke hospital as SA (Stroke Alert) if RACE score <5

38% of Race Alerts were actual AIS secondary to LVO

# Did it matter?

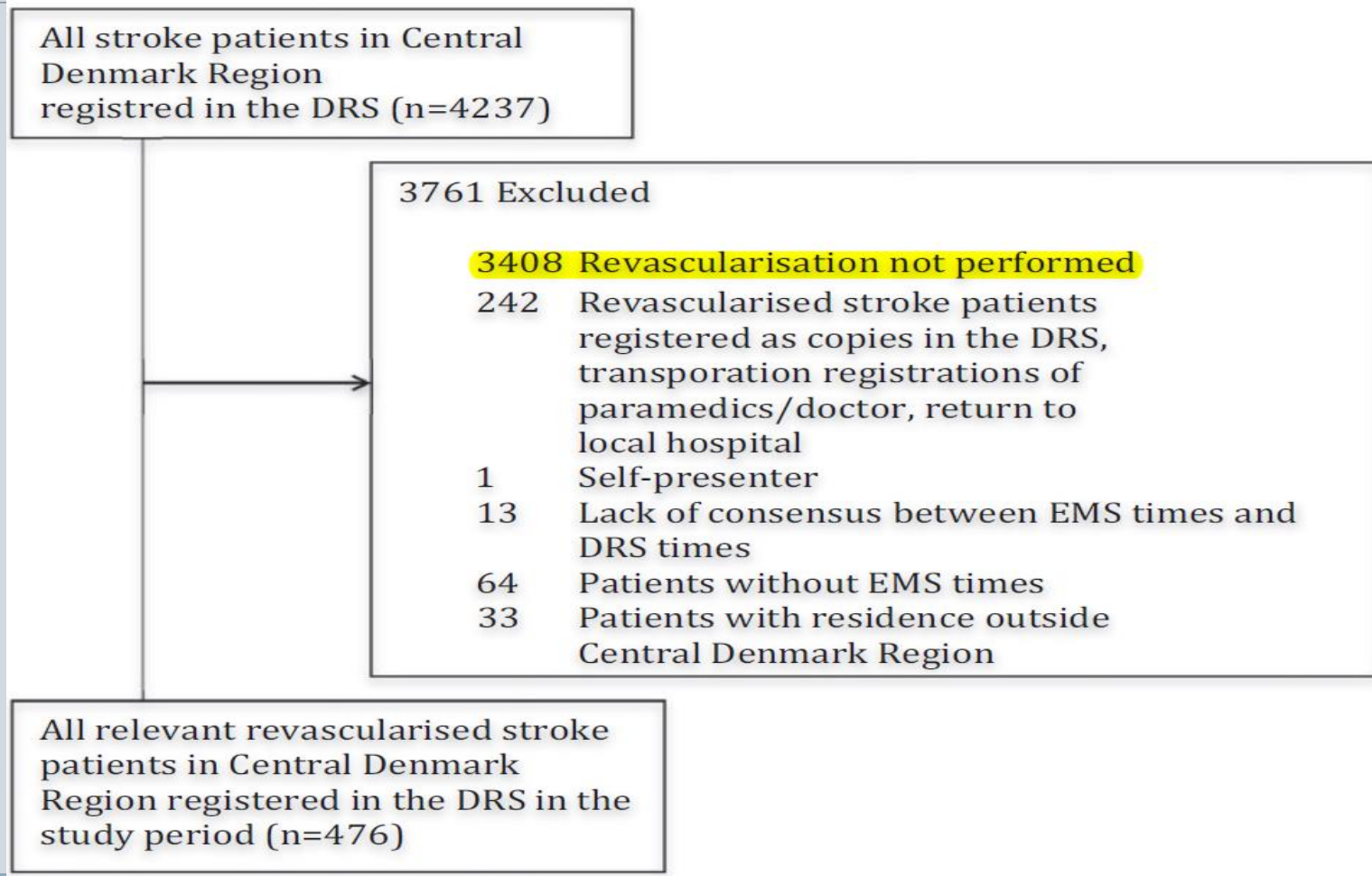
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## Angiographic and clinical outcomes

No difference was seen in the rates of successful revascularization between the RA-MT and SA-MT cohorts (84.0 vs 78.9%,  $p=0.47$ ) (Table 2). Ninety-day favorable functional outcome was numerically higher in the SA-MT group, but did not reach statistical significance (63.2% vs 46.4%,  $p=0.10$ ). The rate of mortality was similar between the cohorts (15.8% vs 24.8%,  $p=0.37$ ).

# Bypassing primary stroke centre reduces delay and improves outcomes for patients with large vessel occlusion

Niwar Faisal Mohamad et al.  
European Stroke Journal 2016



# It mattered!!!

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We found a significantly higher chance of functional independence (mRS 0–2) after 90 days among EVT patients treated in the post-interventional period than among the pre-interventional patients with a total of 62% (40/65) versus a total of 43% (15/35) achieving functional independence. This corresponded to an

# No it didn't.....

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For patients treated with EVT, shift analysis using multivariate ordinal logistic regression showed a non-significant difference between the post-interventional and the pre-interventional group in terms of overall distribution of mRS scores; adjusted common OR 1.88 (0.88–4.02).

# Pre-Hospital LVO Screening Tools

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- CSTAT- Pre-Hospital Acute Stroke Severity Scale

- FAST-ED- Field Assessment Stroke Triage for  
Emergency Destination

- LAMS- Los Angeles Motor Scale

- RACE- Rapid Arterial Occlusion Evaluation Scale

- **UP to 30 more!!!**

- Many not designed for LVO triage, but rather stroke recognition only



# Challenges

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- EMS LVO scoring systems are subjective and numerous
- Very hard to get providers up-to-speed on LVO screening (inter-rater reliability)
- Screening pts with AMS, old deficits, nursing home patients, demented, etc.
- Outcomes?
- Time Consuming





# What is Next?

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- More research to be done in LVO screening tools for EMS
- Now have baseline data
- Increased Collaboration
- Focus system education



