Pre-Hospital and In-Hospital Systems of Care in Endovascular Therapy for Stroke-Radical Change is Needed

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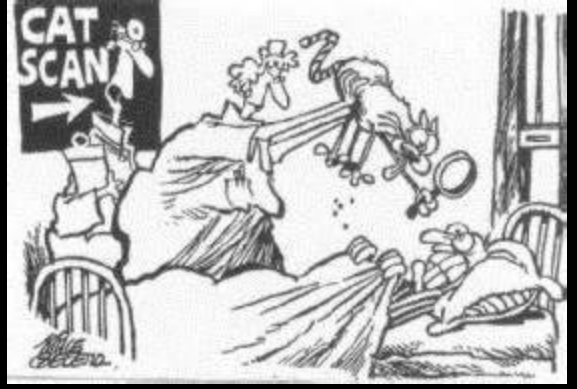
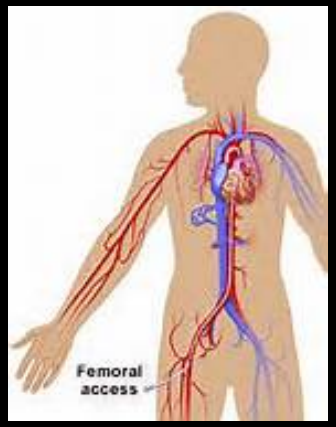
Onset

FMC



First Image

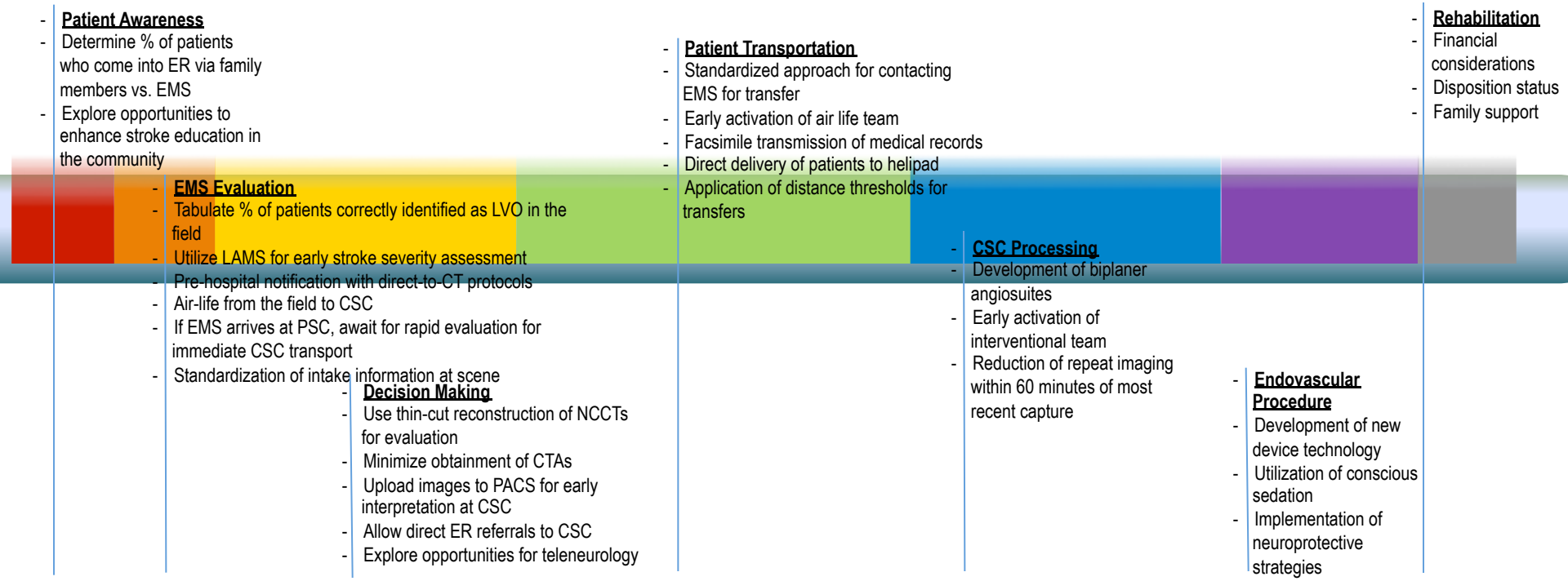
Endovascular

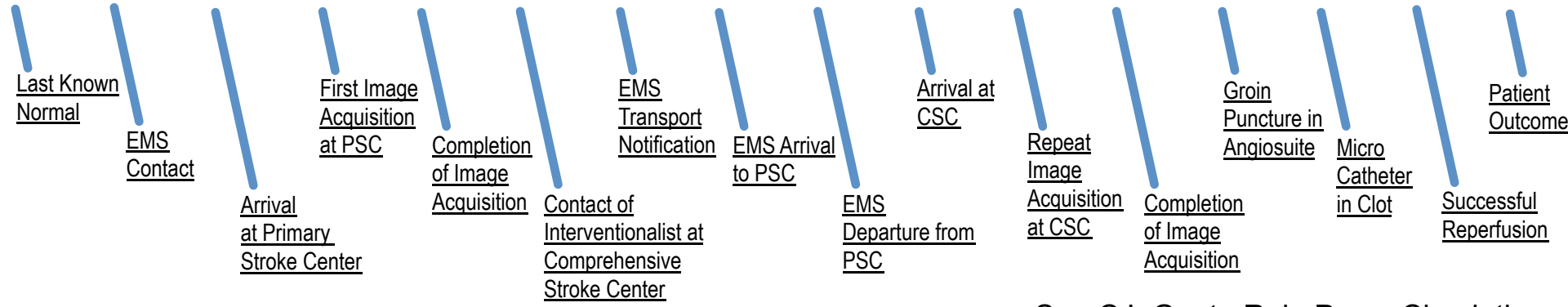


Groin Puncture

Reperfusion

Systems of Care for Stroke





Sun CJ, Gupta R, in Press Circulation

Distinguishing Two Patient Groups

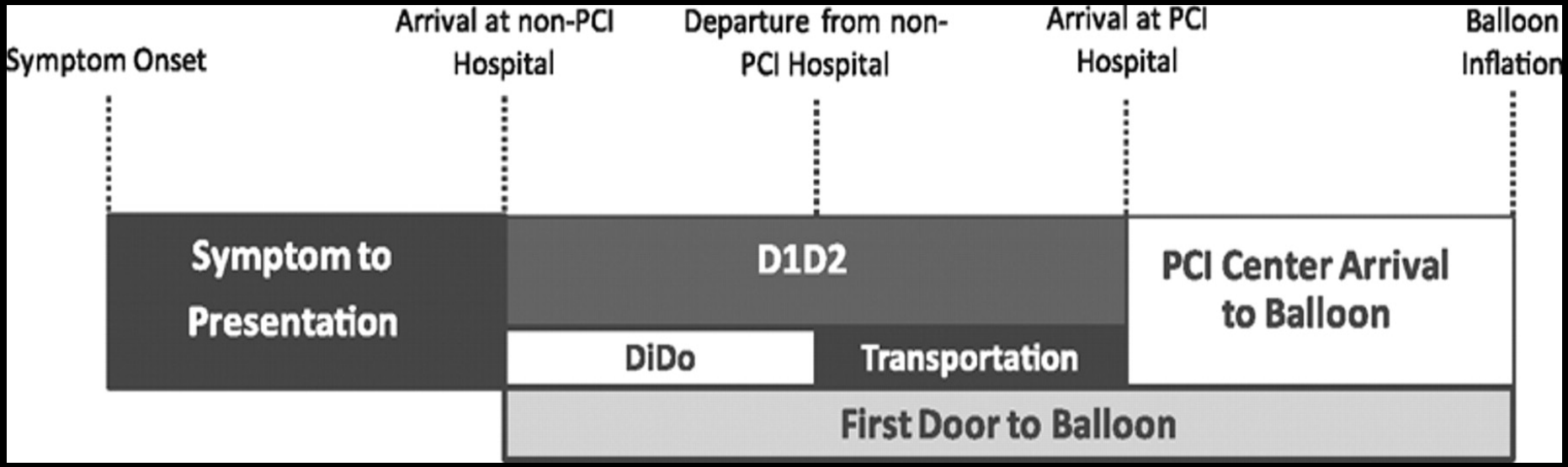
- Patients brought directly to the ER

  - FMC to CT
  - FMC to Endovascular Contact
  - FMC to Groin Puncture

- Inter-facility transfers

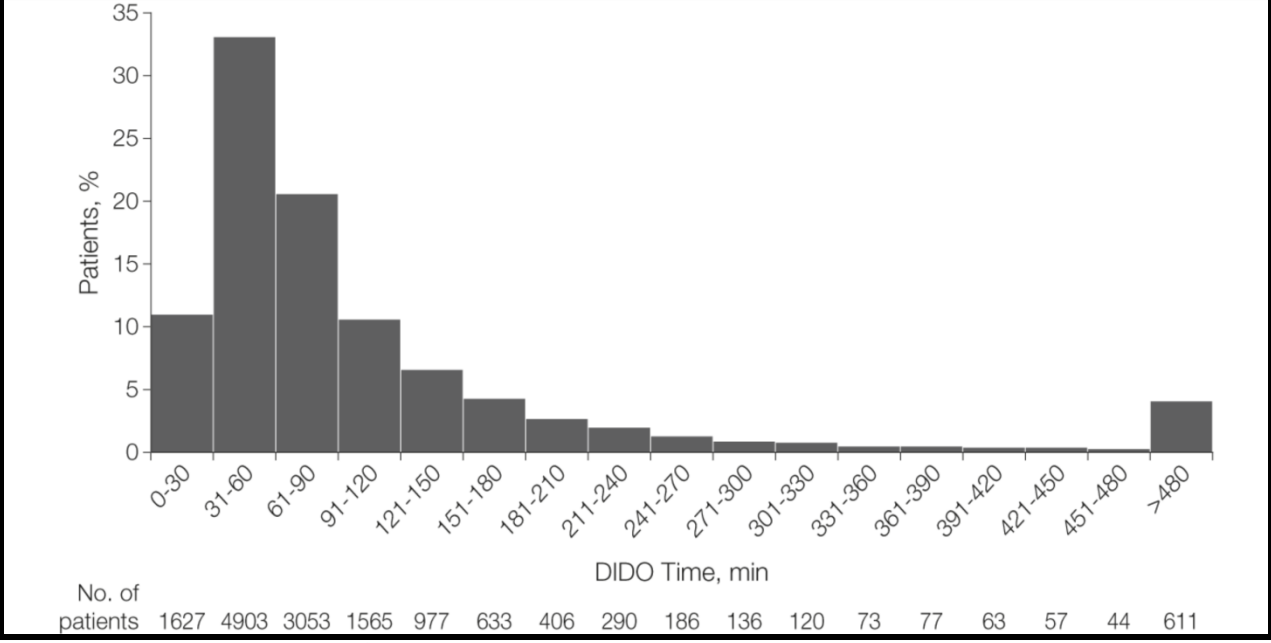
  - Door in to Door out
  - D1 to D2
  - P2P

Defining Time Metrics and Process Improvement Strategies

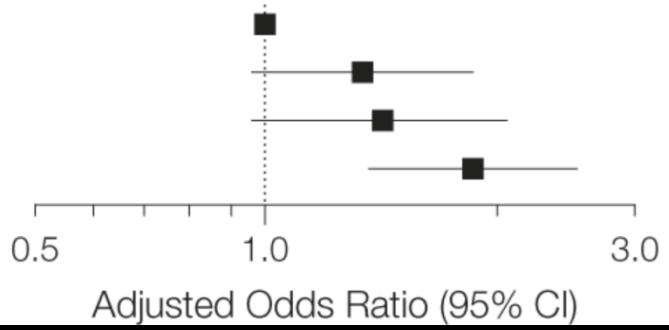


van Diepen S et al. Circ Cardiovasc Qual Outcomes 2012;5:437-444

Impact of Door In to Door Out to Mortality in STEMI

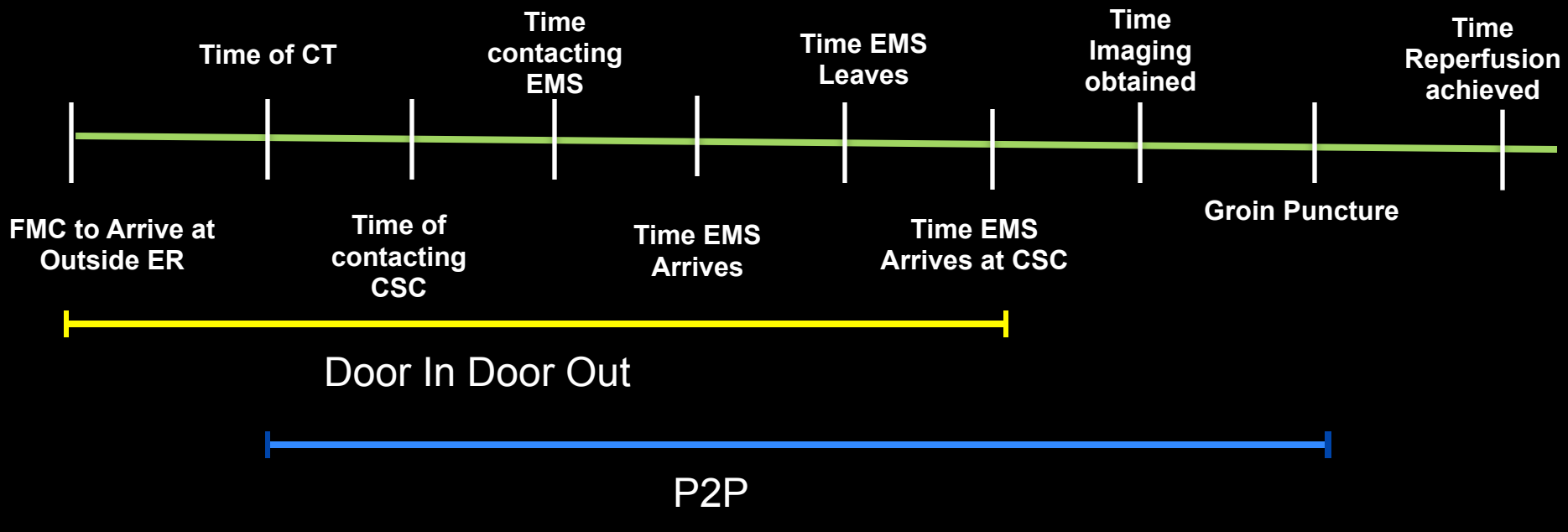


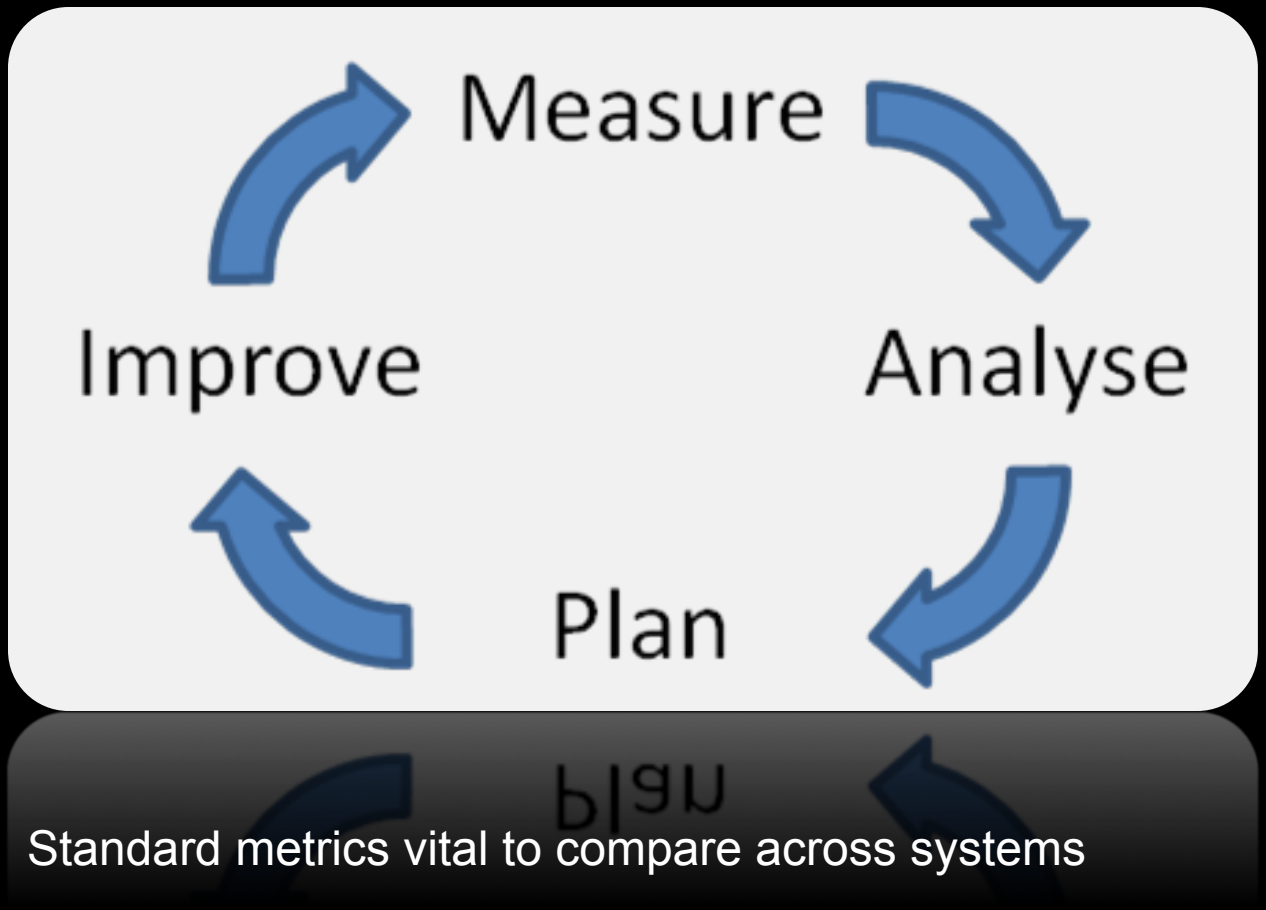
DIDO Time, min	Mortality, No. of Patients/Total (%)	Adjusted Odds Ratio (95% CI)
≤30	43/1600 (2.7)	1.0 (Reference)
31-60	192/4841 (4.0)	1.34 (0.96-1.86)
61-90	146/3013 (4.9)	1.41 (0.96-2.06)
>90	430/5176 (8.3)	1.86 (1.36-2.54)



Wang TY, et al. JAMA. 2011;305(24):2540-2547

Standardize Metrics





Standard metrics vital to compare across systems

Quality Assurance registries required to identify opportunities for process improvement.

Rapid Reperfusion Registry

- 478 consecutive patients from 9 hospitals treated between July 1, 2012 – December 31, 2012
- A QI project to assess door to groin puncture times and impact on outcomes . Second goal was to determine which metrics being captured.
- Prospective study being developed to integrate multiple centers across the country to standardize metrics

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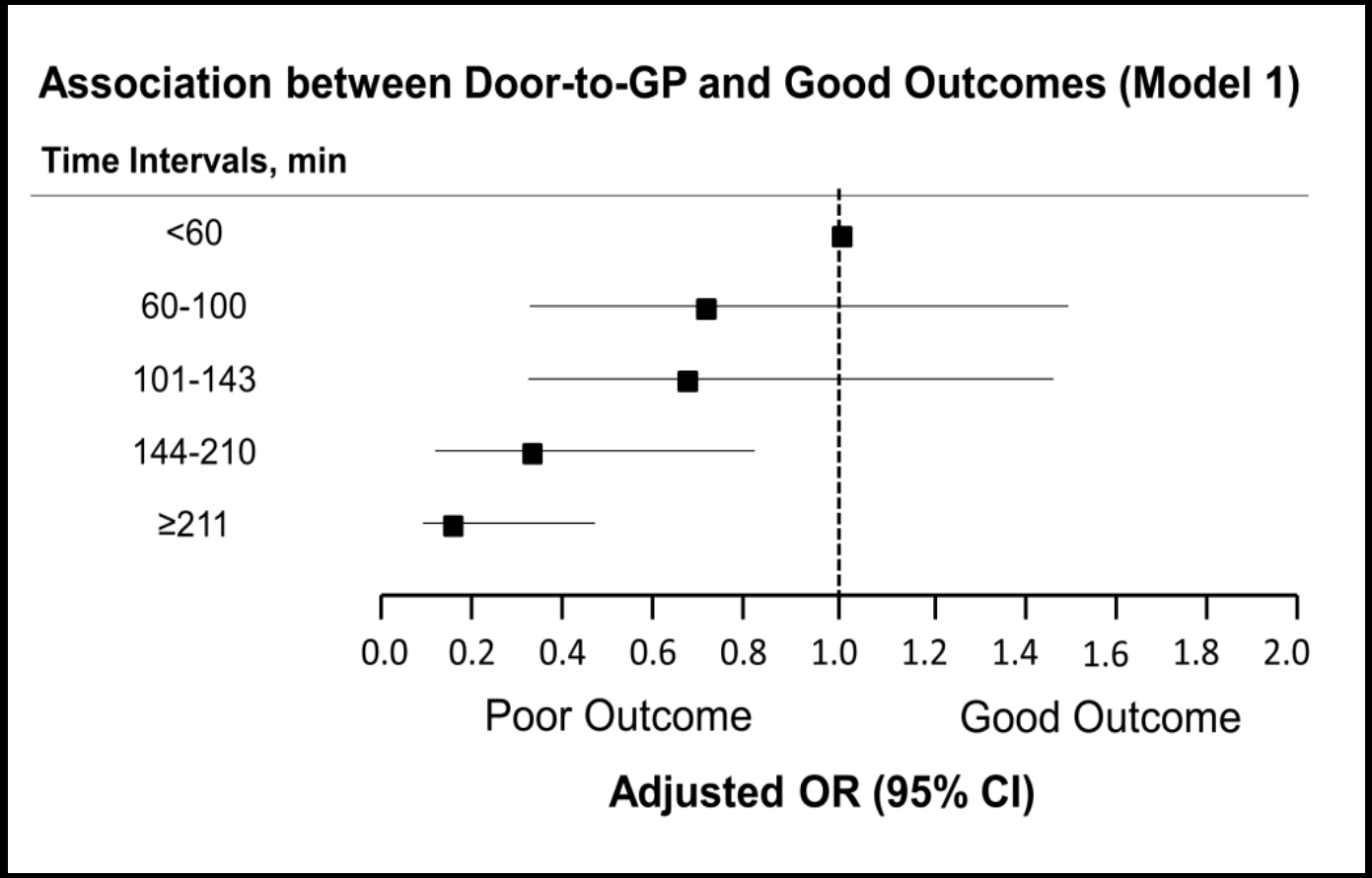
Door to GP times and impact on outcome



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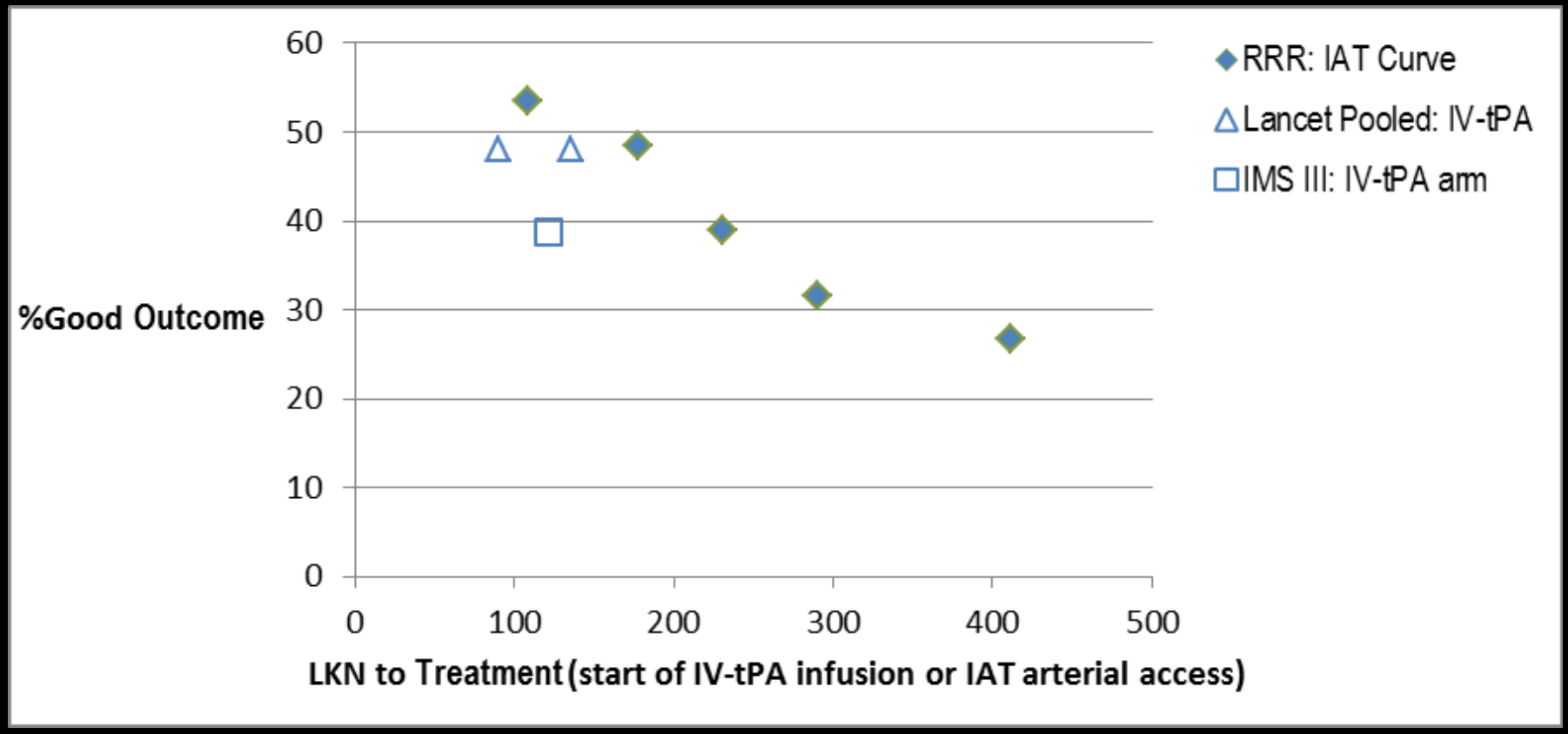
LKN to treatment times comparing IV to IAT



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Picture to Puncture (P2P)

- Retrospective study performed at Grady Memorial Hospital from 2010-2012 comparing transferred patients to patients presenting in our ER
- Aim was to determine if transfer delays impacted neurological outcomes and opportunities to reduce transfer delays
- Defining a new metric “Picture to Puncture” (P2P) defined as time from CT to groin puncture

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Flow of Patients

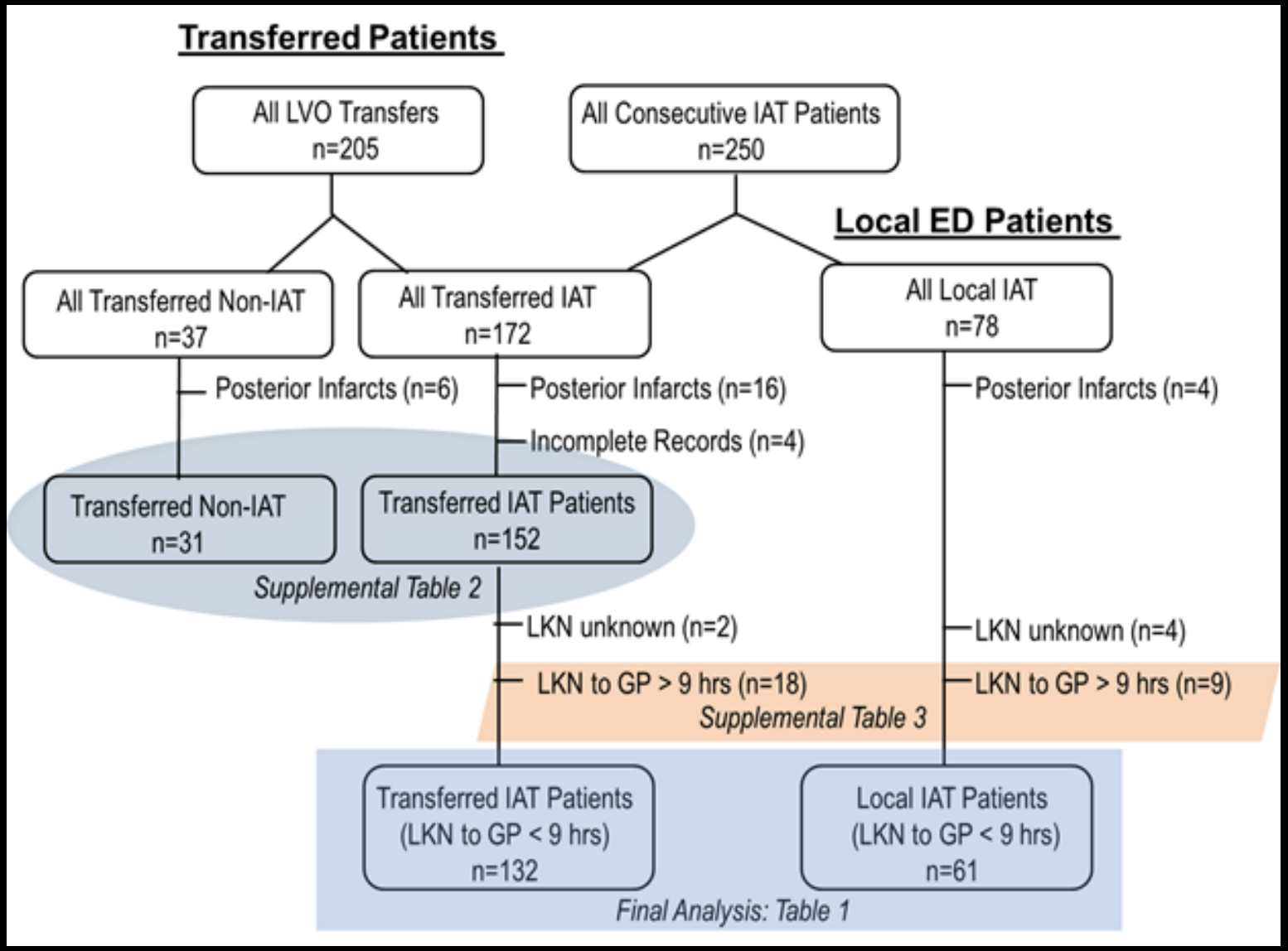

Table 2. Binary Logistic Regression Model Identifying Factors Associated With Good Outcome After Endovascular Treatment for Acute Ischemic Stroke

Variable	OR(95% CI)	P value
NIHSS Score	0.88 (0.82-0.95)	0.001
Successful Reperfusion	3.68 (1.42-9.53)	0.007
Picture to Puncture "P2P"	0.994 (0.990-0.999)	0.009
Age	0.972 (0.947-0.998)	0.032
Hypertension	0.49 (0.23-1.06)	0.070
Procedure Time	0.996 (0.988-1.004)	0.299
Male Gender	1.45 (0.70-2.98)	0.315
Symptomatic Hemorrhage	0.55(0.09-3.44)	0.522

CI, confidence interval; OR, odds ratio; LKN, last known normal; Homser-Lemeshow test depicts goodness of fit to the model (P>0.05).

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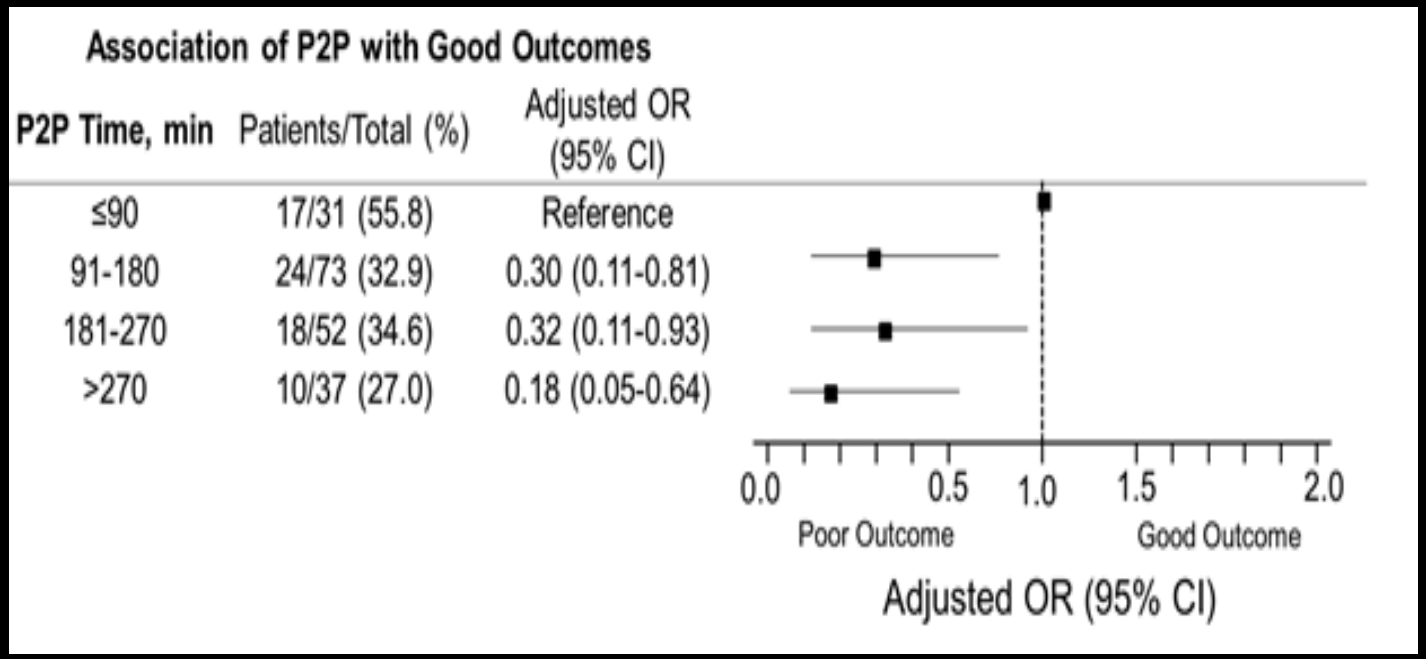

Figure 2a: Depiction of good outcome rates at differing time intervals of "Picture-to-Puncture". Unadjusted good outcome rates and adjusted Odds Ratios are shown.

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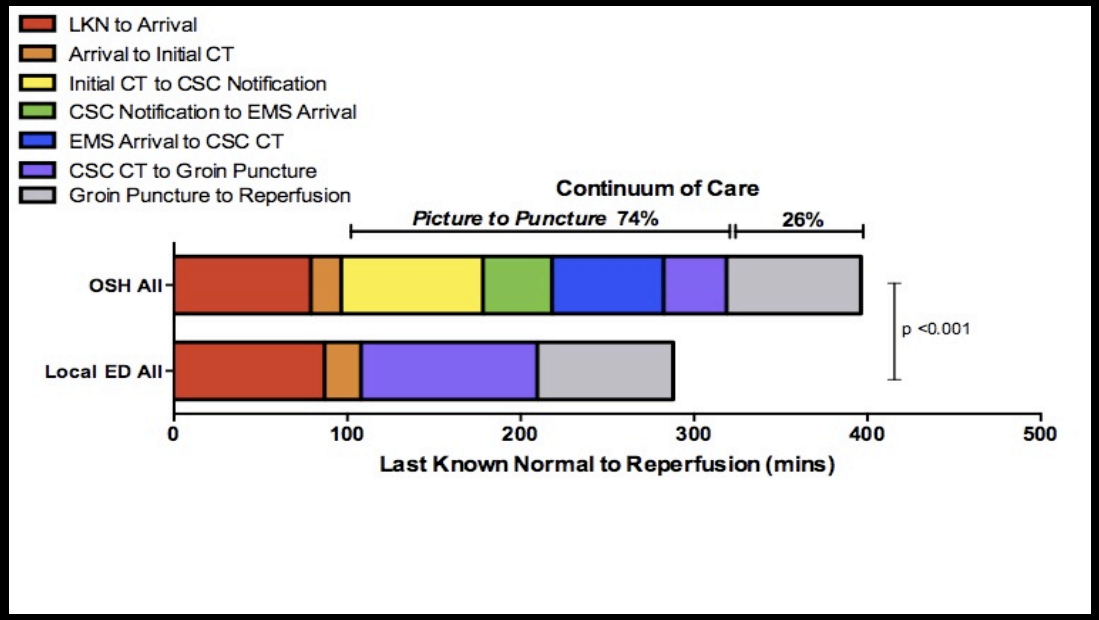

Figure 3a: Graph depicting the time continuum from last known normal to reperfusion. Comparison is made between outside hospital transfers (OSH) and local emergency room (ED) admissions at the Comprehensive Stroke Center (CSC).

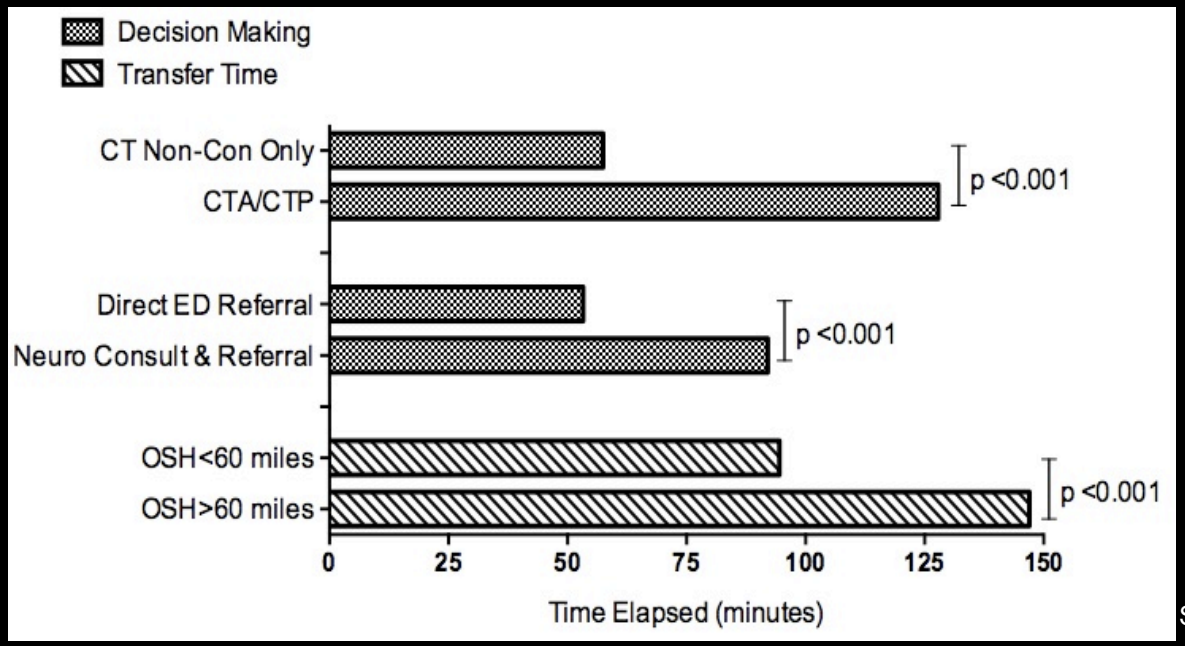

Figure 3b: Graph depicting areas of potential delays occurring at outside facilities prior to patient arrival at the Comprehensive Stroke Center. Referring physician data was not available for 13 patients; Only two patients at OSHs received CTP.

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Opportunities to Improve Systems of Care: A Pragmatic Guide

Cincinnati stroke scale

Interpretation: if any of these 3 signs is abnormal, the probability of a stroke is 72%

Arm Drift

The 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 downward**

Facial Droop

The patient shows teeth or smile

- Normal – both sides of the face move equally
- **Abnormal – one side of the face does not move as well as the other side**

Abnormal Speech

The patient repeats "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**

First Medical Responders

- Identification of the severity of the stroke not just that it is a stroke
- Simplified scale such as hemiplegia/gaze preference or LAMS
- Direct contact from field to endovascular centers
- Direct to CT upon arrival

Hospital Evaluation

- Evaluation of patient in the CT scanner
- If NIHSS > 14 and CT negative for blood activate Endovascular team
- Concomitant evaluation with additional imaging, neurology consult, IV tPA evaluation, etc.

Suggested Time Metrics

- Door to CT: 5 minutes
- Door to Endovascular Contact: 30 mins.
- Door to Groin Puncture: 90 mins.
- Door to TICI 2B Reperfusion: 120 mins.

- Door at PSC to Groin Puncture at CSC < 120 mins. (Inter-facility transfer)

Conclusions

- With data convincingly showing impact of time on outcomes, reappraisal of endovascular pathway required
- Standardization of data being captured nationally
- Participation in a prospective national registry being supported through multi-industry initiative imperative
- Potentially linking systems of care to CMS reimbursement may drive rapid adoption