

# *Stroke Center designation*

*The Role of EMS*

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So, you know, what do you think Eagles  
do in the off-season?

Dr. Fowler:

Dr. Issacs

# Corey's dog



# Marshal's dog



# Ray's dog



# Terry's dog





# Paul's dog



# Background

- The lack of necessary infrastructure to treat acute stroke is widespread.
- In North Carolina\*
  - 66% of hospitals did not have stroke protocols
  - 82 % of hospitals did not have rapid identification of acute stroke patients
- There has been limited use of t-PA.
- Nationally, only 2% to 3% of patients with stroke are being treated with t-PA.

\* *Goldstein L. Stroke. 200; 31:66-70*

# Background

- A consensus based approach to the establishment of primary stroke centers was developed by the Brain Attack Coalition (BAC) in 2000.

# Background: BAC recommendations

- Acute stroke teams
- Written care protocols
- Emergency medical services
- Emergency department
- Stroke unit
- Neurosurgical services
- Commitment and support of medical organization
- Neuroimaging services
- Laboratory services
- Outcome and quality improvement activities
- Continuing medical education

*\*Alberts MJ, Hademenos G, Latchaw RE, et al. JAMA 2000;283:3102-3109*

# Background: Trauma Center Analogy

- In both, outcome appears to be related to time to definitive therapy.
- In both, an organized and multidisciplinary approach is needed.
- Trauma centers have been associated with improved survival rates.
- Trauma centers are effective in both urban and rural settings.

# Background

- The Brain Attack Coalition (BAC)\* Primary Stroke Center concept is promising but unproven.

# Background

- The New York State Department of Health (NYSDOH) Stroke Center Designation Project
- To determine whether an integrated system linking early recognition and transport of acute stroke patients to designated stroke centers would result in improved quality of patient care.
- Collaboration
  - NYSDOH
  - FDNY EMS
  - AHA
  - NYS Quality Improvement Organization (IPRO).

# Objective

- To determine if designation of hospitals as primary stroke centers and selective triage of acute stroke patients results in an improvement in quality of care
- To determine the effectiveness of stroke center designation on ambulance response time, and utilization of a prehospital stroke scale (PPS) by EMS providers.



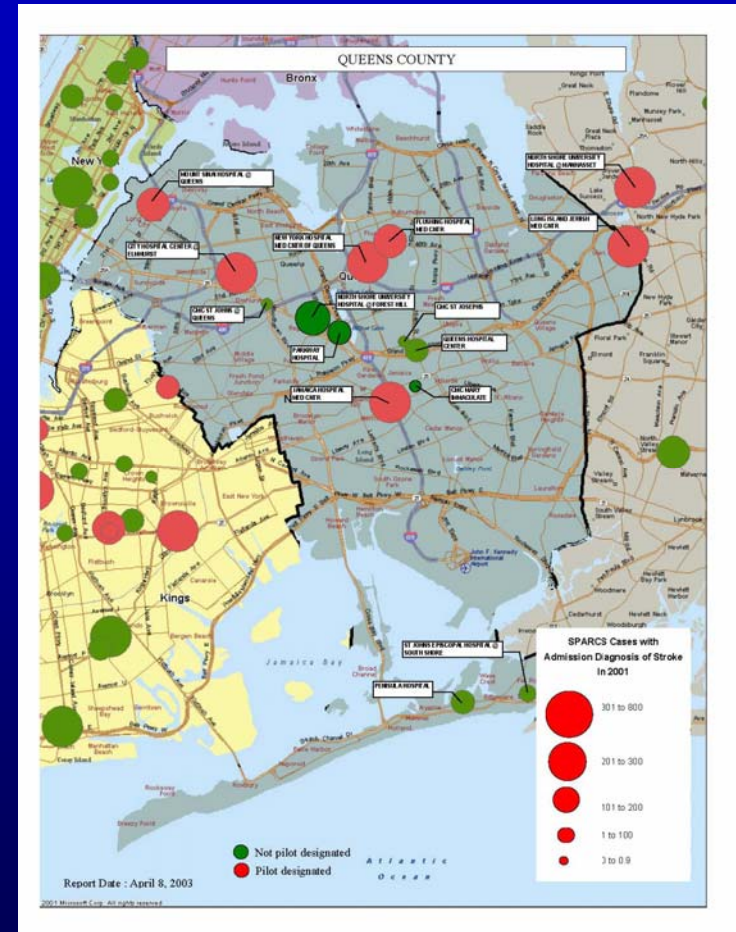
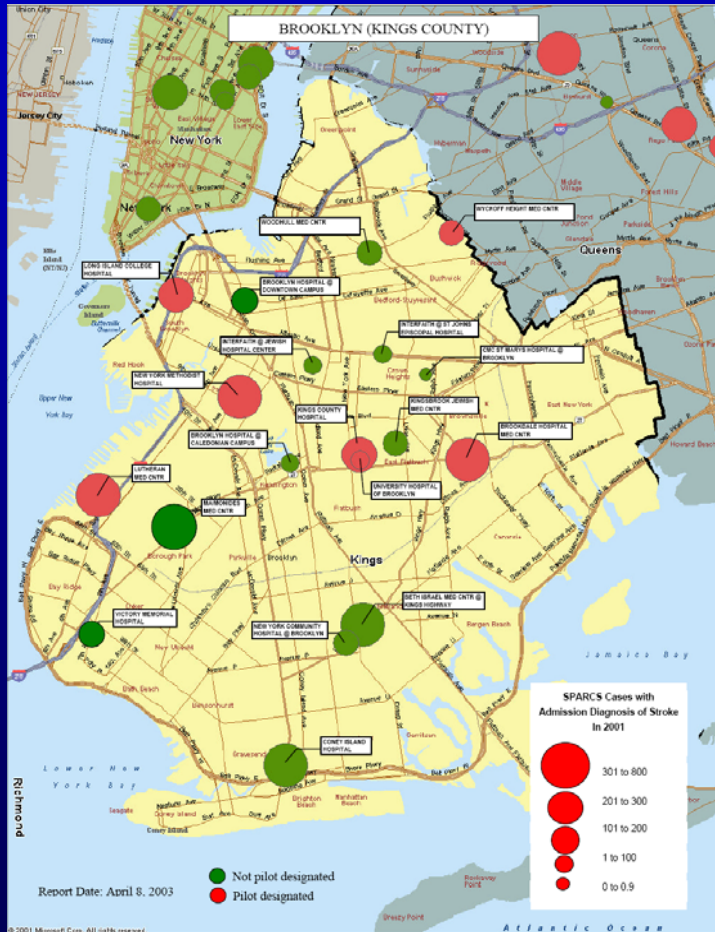
# Methods

- BAC-based stroke care survey sent to 32 hospitals
  - 14/32 hospitals had all of the core set of BAC-based criteria validated by an onsite visit
  - 14 hospitals were granted stroke center designation

# Methods: Quality Indicators

- Time to MD evaluation
- Time to stroke team
- Time to CT performed
- Time to CT read
- Time to t-PA
- Eligible patients who received t-PA
- t-PA protocol violations
- Acute stroke admitted to stroke unit
- Specific test performed
- Peristroke complications
- Post t-PA complications
- Discharge disposition

# Hospital designation





# Methods: EMS Dispatch, Triage and Transport

- 8 million residents and 3 million visitors
- 300 square mile NYC metropolitan area
- 3-tier system (ALS, BLS, first responders)
- 250 ambulances in the street at any instant
- 1.2 million calls each year to 911 for EMS assistance
- 0.75 million transports to over 90 911 receiving hospitals
- 11,000 cases dispatched as 'stroke'.



# Methods: EMS Dispatch, Triage and Transport

**USING THE PRE-HOSPITAL STROKE SCALE**  
 ANY ABNORMAL FINDING SUGGESTS A PRESUMPTIVE DIAGNOSIS OF STROKE.

**1. Facial Droop** The patient shows teeth or smiles.

	
<b>Normal</b> Both sides of face move equally.	<b>Abnormal</b> One side of the face does not move as well as the other.

**2. Arm Drift** The patient closes their eyes and extends both arms straight out for 10 seconds.

	
<b>Normal</b> Both arms move the same, or both arms do not move at all.	<b>Abnormal</b> One arm either does not move, or drifts down compared to the other.

**3. Speech** Ask the patient to say: "You can't teach an old dog new tricks."


<b>Normal</b> The patient says the correct words with no slurring of words.	<b>Abnormal</b> The patient slurs words, says the wrong words, or is unable to speak.
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**4. Time Elapsed** (from onset of symptoms)  
 Determine the time from the onset of symptoms to EMS arrival by asking the following questions:

**To bystanders or family members:**  
 "What time was \_\_\_\_\_ (the patient) last seen (in his/her usual state of health) before he/she became weak, paralyzed or unable to speak clearly."

**To patients:** "When was the last time you remember being in your usual state of health—in other words before you first noticed that you had become weak, paralyzed or unable to speak clearly."

**If TIME elapsed is 2 hours or less patient is transported to nearest stroke center**



- EMS 911 operators trained in the use of a call-taking algorithm.
- EMS crews trained to use a modified Cincinnati prehospital stroke scale (facial droop, extremity weakness, disturbance of language or speech, time from symptom onset).
- 911 calls assigned to a higher priority (CVA-C) or lesser priority (CVA) call-type depending on whether symptom onset was less or greater than 2 hours.
- CVA-C patients were preferentially transported to one of the 14 designated stroke center, while all others were transported to the nearest 911 receiving facility.
- Medical records were reviewed on all patients with an ICD-9 stroke related diagnosis, for the period of August to October 2003.

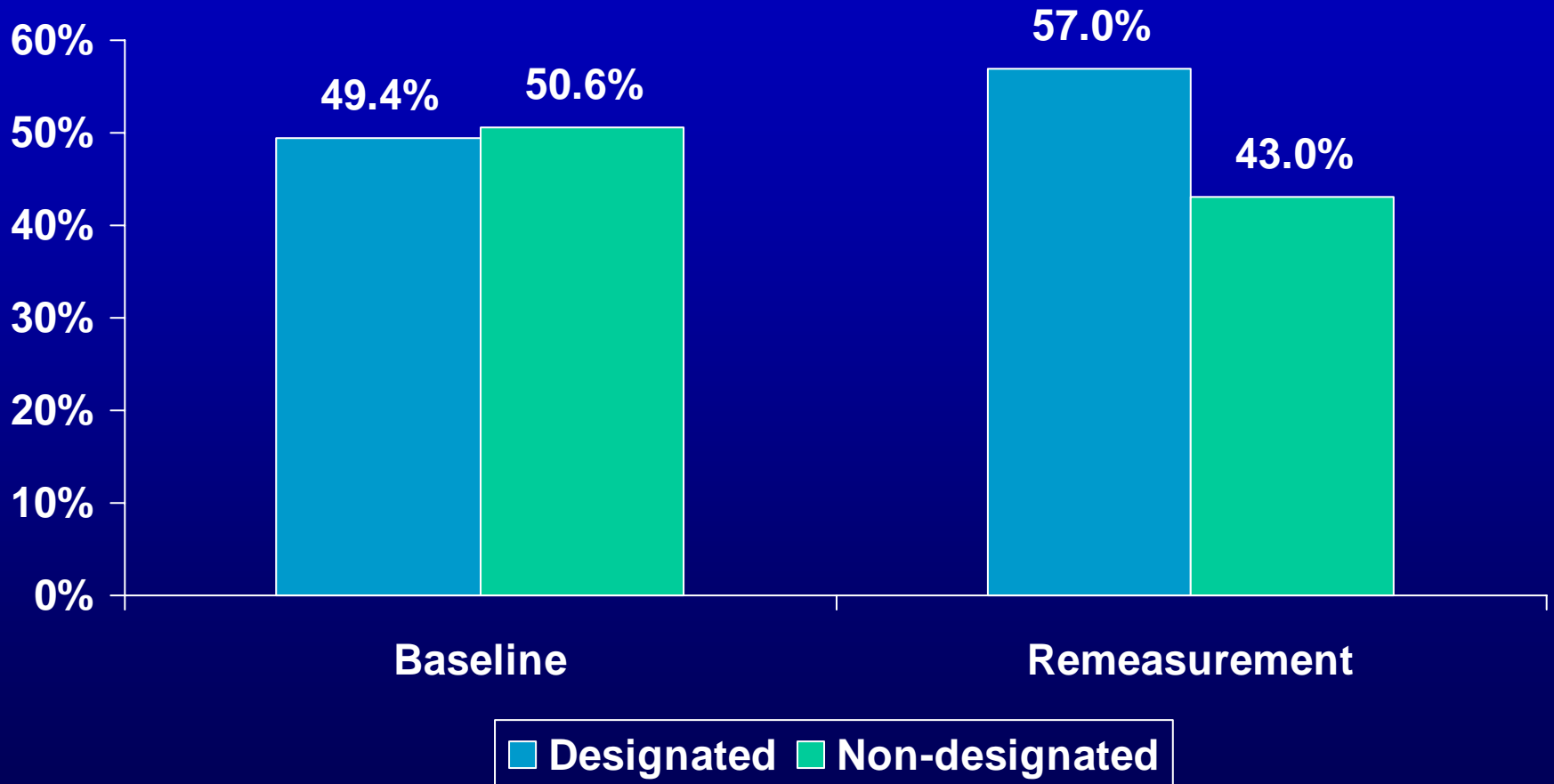
# Sample Characteristics

- Eligibility was based on admission ICD-9 codes
- Baseline period
  - 1598 stroke patients were eligible for study
    - Mean age was 72 years, 45% were male
    - ED diagnosis of stroke was made in 970 patients
      - 763 (79%) were ischemic
- Remeasurement period
  - 1442 stroke patients were eligible for study
    - Mean age was 70 years, 42% were male
    - ED diagnosis of stroke was made in 918 patients
      - 728 (79%) were ischemic

# Results

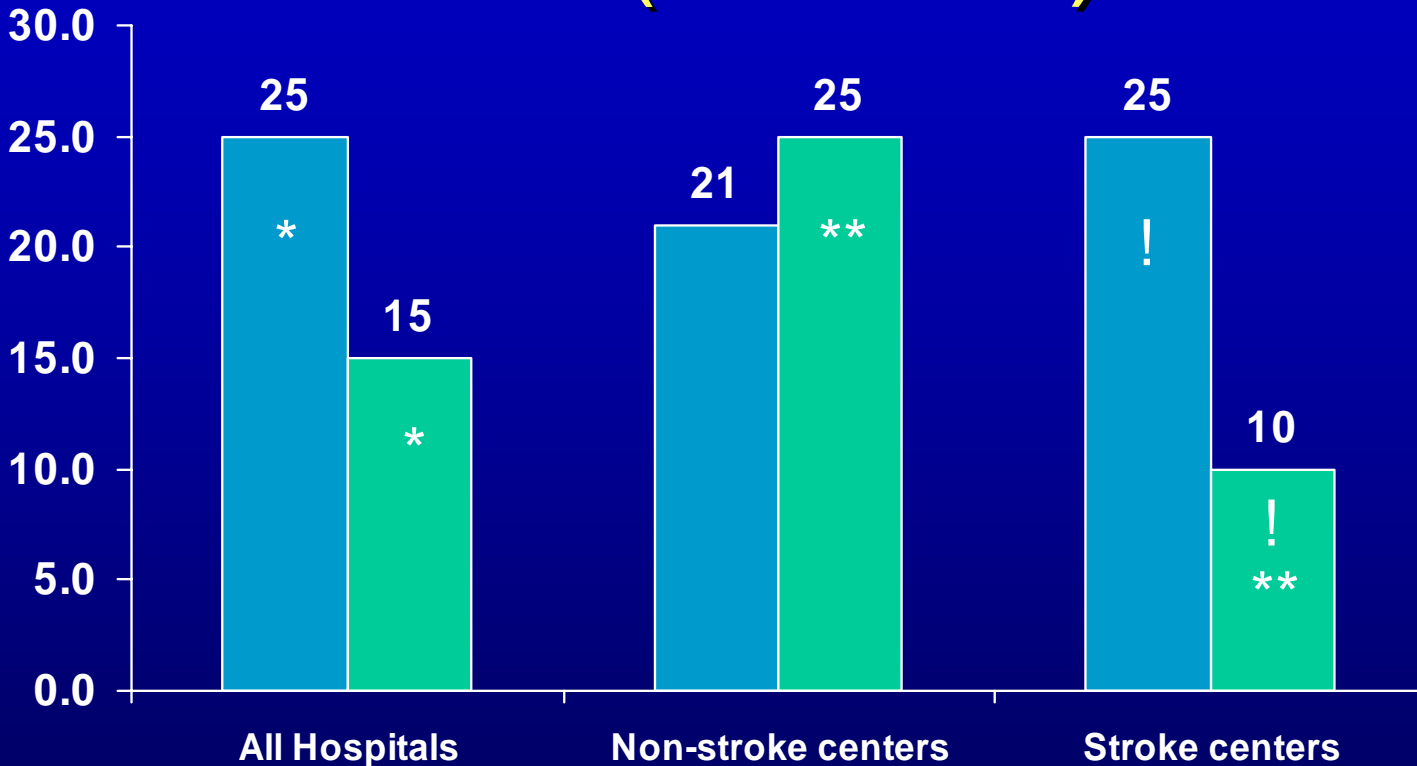
- 50% reduction in door to stroke team contact time
- Almost 40% reduction in door to CT times
- Reduction in door to t-PA time
- Increase in t-PA treatment of eligible patients

# Shift in Patient Volume





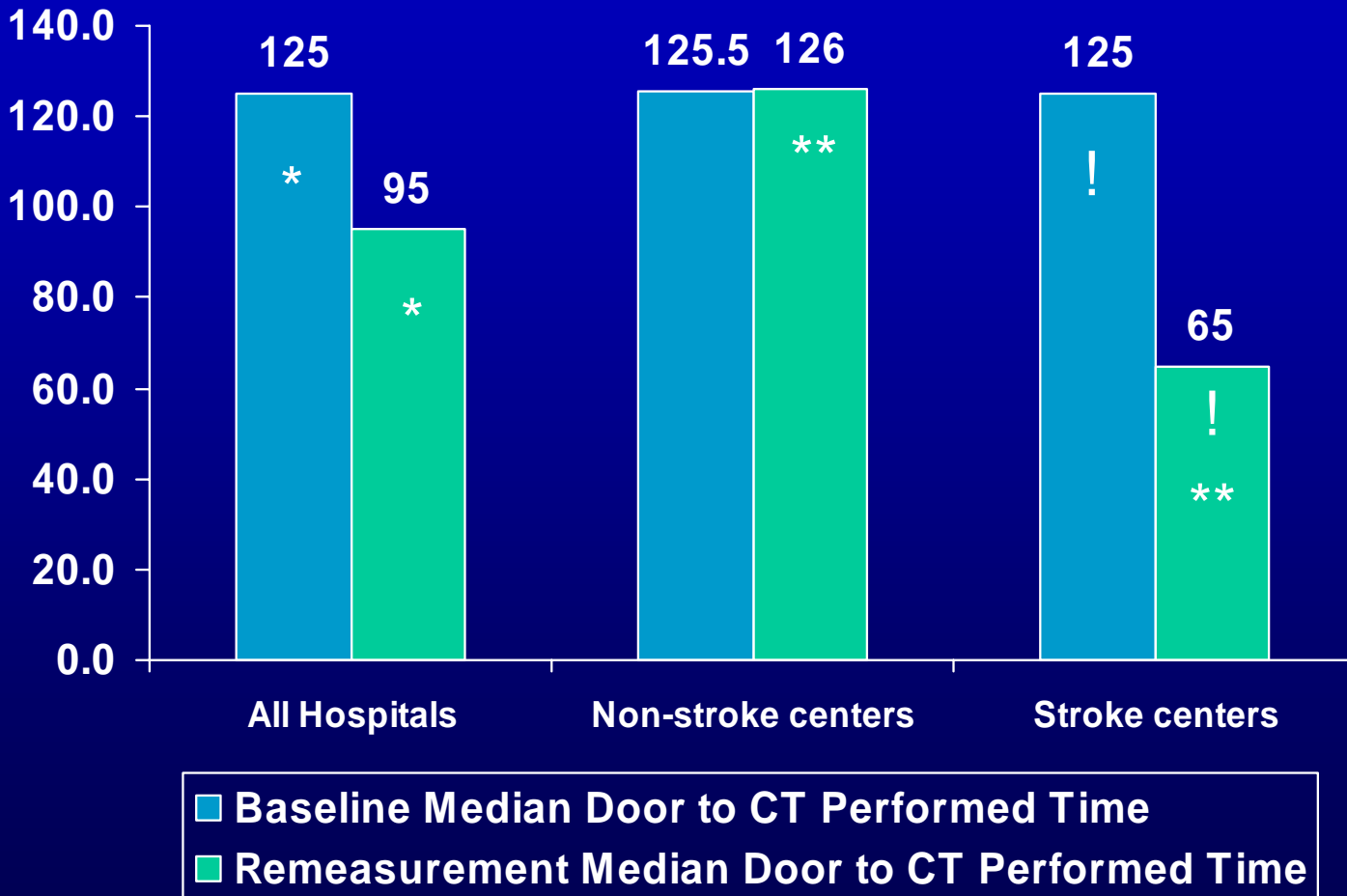
# Median Door to MD Assessment Time (Minutes)



■ Baseline Median Door to MD Assessment Time  
■ Remeasurement Median Door to MD Assessment Time

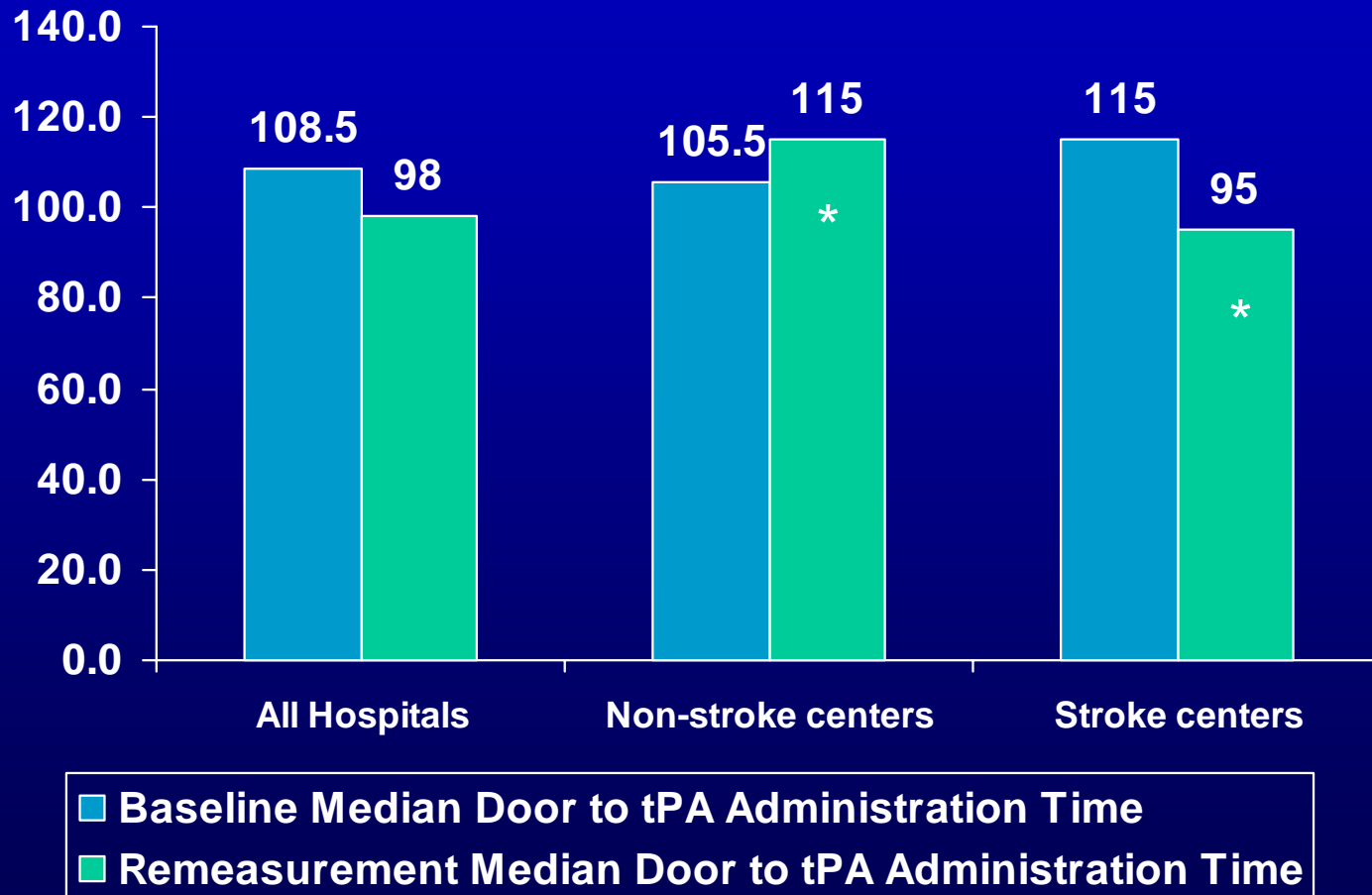
\*  $p < .001$ , \*\*  $p < .001$ , !  $p < .001$

# Median Door to CT Performed Time (Minutes)



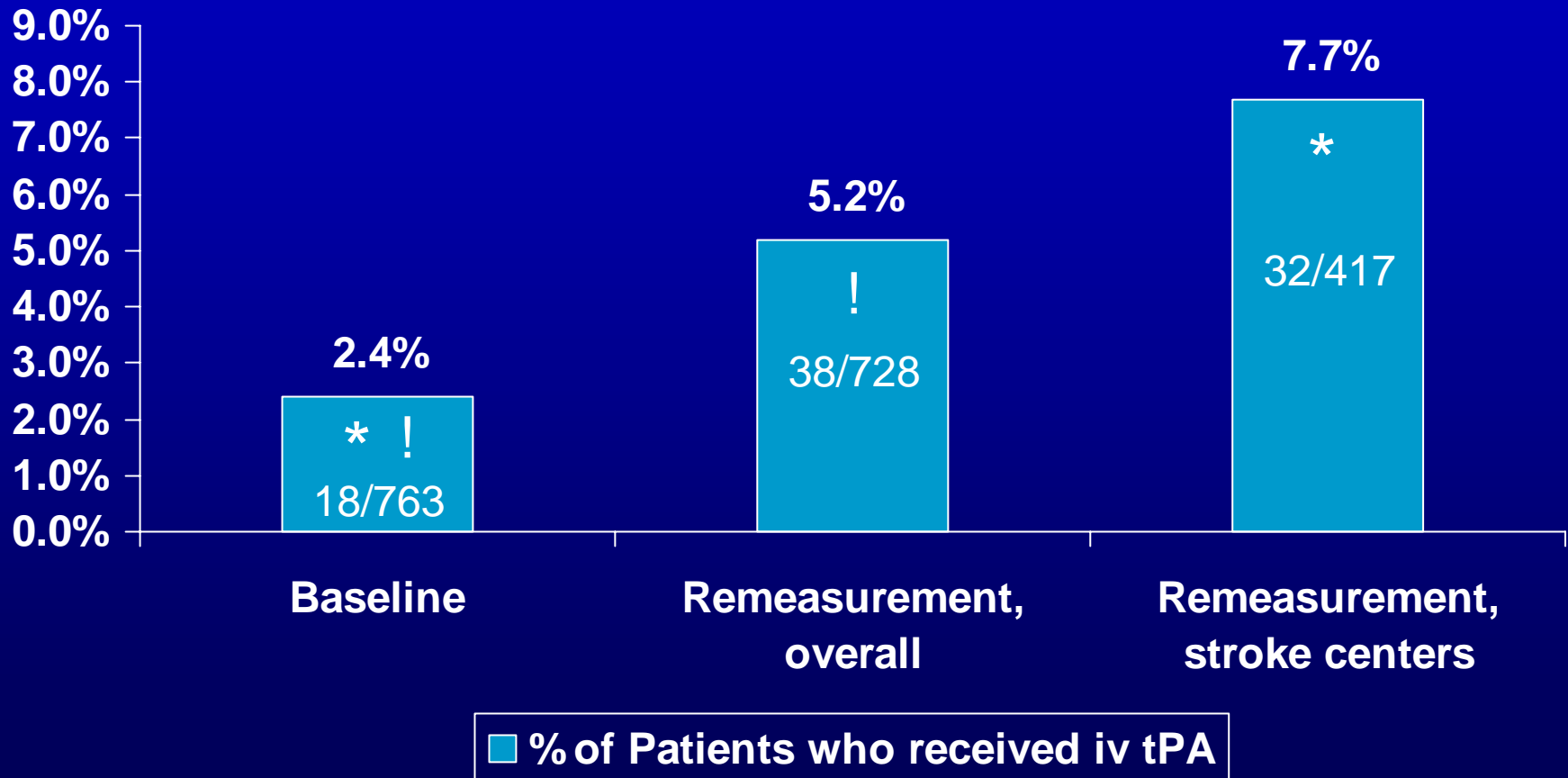
\* p<.001, \*\* p<.001, ! p<.001

# Median Door to t-PA Administration Time (Minutes)



\*  $p < .05$

# Percent of Ischemic Stroke Patients who Received t-PA



\* ! p<.05

# Results

- A total of 1442 cases were reviewed during the study period;
- Of these, 955 (66.2%) arrived by ambulance,
- EMS patient assessment data was available for review in 790 (82.7%) of cases.
  
- The mean age of those who arrived by EMS was 72.9 years, significantly older than the 65.5 years ( $p < 0.001$ ) for those who utilized other means of transportation.
  
- Field providers documented time from symptom onset and at least one clinical sign from the PSS in 50.6% of CVA and 72.1% of CVA-C call-types.

# Results

- The sensitivity of the field providers' diagnosis of stroke was 68.9% using the emergency department as a gold standard.
- The mean EMS response time (dispatch to arrival on-scene) for CVA-C (5.7 minutes) was significantly shorter than that for CVA (8.4 minutes,  $p < 0.01$ ).
- Patients who were transported by ambulance had shorter median times from door-to-physician assessment, door-to-CT scan, and door to t-PA administration.

Time (min)	Ambulance (Total = 955)				Non - Ambulance (Total = 487)				p-value*
	N	Median	Mean	Std Error	N	Median	Mean	Std Error	
Door to MD Assessment	889	25	67.4	16.6	441	47	91.2	14.6	<0.001
Door to Stroke Team	91	5	22.6	8.5	11	11	16.2	8.1	n.s.**
Door to CT Performed	644	80	127.7	5.9	265	145	155.4	7.5	<0.001
Door to CT Performed for Potential t-PA Candidates	157	31	67.1	8.8	30	40	70.4	12.8	n.s.**
Door to CT Read	507	180	252.6	11.1	220	264.5	318.5	17.2	<0.001
Door to CT Read for Potential t-PA Candidates	122	66.5	128.5	15.1	29	80	146.6	23.2	n.s.**
Door To t-PA Administration	35	102	97.9	5	3	46	60.3	17.4	<0.05

\*Wilcoxon test

\*\*n.s.: not significant

# Results

- Of those patients transported to hospitals by ambulance, 35/955 (3.7%) received thrombolytic therapy with t-PA; this is in comparison to 3/487 (0.61%) of those patients who received t-PA but arrived at the hospital by other means ( $p < 0.001$ ).
- EMS data was available in 29/35 (25.7%) of cases transported by ambulance and subsequently treated with t-PA; of these, 24/29 (82.8%) had a prehospital diagnosis of stroke.



# Conclusions

- AHA and NYSDOH collaboration facilitated stroke center designation
- Stroke center designation and selective triage of acute stroke patients improved the quality of care and access to timely thrombolytic therapy
- This is the first prospective validation of the Brain Attack Coalition Primary Stroke Center Concept.
- This data provides evidence to support stroke center designation and selective triage of acute stroke patients.

# Conclusion

- EMS plays a critical role in triage and transport of patients with stroke, and may be important for those individuals who are potential candidates for thrombolytic therapy.
- Stroke specific triage and dispatch protocols may result in improved response times for those patients whose hospital management may be time sensitive.
- Patients who are transported by ambulance may have improved door-to-assessment and treatment times.
- Further studies need to look at the use of the Prehospital Stroke Scale by EMS providers.