

# **The Emergency Response to Acute Stroke**

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# **Recommendations for Primary Stroke Centers**

**Organized around 11 major aspects of  
stroke care**

**Focus is clearly on acute aspects of care**

**Such acute care significantly influences  
subsequent care and outcome**

# Major Elements of a Primary Stroke Center

## Patient Care Areas

Acute Stroke Team

Written Care Protocols

## Emergency Medical Services

Emergency Department

Stroke Unit

Neurosurgical Services

## Support Services

Commitment and support of medical organization;  
a stroke center director

Neuroimaging services

Laboratory services

Outcome and quality improvement activities

Continuing medical education

# Emergency Medical Services

Must be an integral component of the  
Primary Stroke Center / System

1. **Dispatch:** Calls should be assigned a high priority
2. **Education:** Protocols should ensure rapid evaluation and transport
3. **Communication:** The Stroke Center and EMS should be able to communicate during transport – “**prenotification**”
4. **CME:** Stroke Center Staff should participate in EMS educational activities at least twice a year

# Emergency Medical Services

## Areas of “Presumed” Expertise

1. Accurate Dispatch
2. EMS provider (EMT / paramedic)  
recognition of stroke

## AUTHORIZED CALL TYPES – LISTED BY PRIORITY

ARREST	1	DUAL	CFR	OBOUT	3	BLS	CFR	INHALE	5	BLS
CHOKER	1	DUAL	CFR	PEDSTR	3	BLS	Rescue	INJURY	5	BLS
DROWN	2	DUAL	CFR	GYNMAJ	3	BLS		OBLAB	5	BLS
ANAPH	2	ALS	CFR	PD13C	3	BLS		MEDRXN	5	BLS
STATEP	2	ALS	CFR	SHOT	3	BLS		CHILDA	6	BLS
UNC	2	ALS	CFR	STAB	3	BLS		MVA	6	BLS
UNCRF	2	ALS	CFR	CVA	4	BLS		OTHER	6	BLS
ASTHMA/C	2	ALS	H/CFR	DRUG	4	BLS		RAPE	6	BLS
DIFFBR	2	ALS		FIRE75	4	BLS		SEIZR	6	BLS
DIFFRF	2	ALS		FIRE76	4	BLS		SICK	6	BLS
MEDVAC	2	ALS		FIRE77	4	BLS		SICKRF	6	BLS
TRAUMA	2	BLS	Rescue	HEAT	4	BLS		BURNMI	7	BLS
JUMPDN	2	BLS	CFR	MVAINJ	4	BLS		DOA	7	BLS
VENOM	2	BLS	CFR	RESPIR	4	BLS		EDP	7	BLS
CVAC	2	BLS		OBMIS	4	BLS		INJMIN	7	BLS
OBCOMP	2	BLS		PEDRF	4	BLS		JUMPUP	7	BLS
ALTMEN	3	ALS		SICPED	4	BLS		PD13	7	BLS
BURNMA	3	ALS	CFR	ABDPN	5	BLS		SICMIN	7	BLS
CARD	3	ALS	CFR	AMPMIN	5	BLS		SPEVNT	8	BLS
ELECT	3	ALS	CFR	COLD	5	BLS		STNDBY	8	BLS
INBLED	3	ALS		GYNHEM	5	BLS		STRANS	8	BLS
AMPMAJ	3	BLS	CFR	GYNMIN	5	BLS		DDOA	9	BLS
INJMAJ	3	BLS	CFR	HYPTN	5	BLS				

CALL TYPES

03/03

### CVA / STROKE

1. Does the patient exhibit any of the following:
  - a. Any paralysis or drooping of one side of the face?
  - b. Any paralysis or weakness of one arm or leg?
  - c. Any speech abnormality or slurring of words?

**If Yes to any of the above:**

What time (How long ago) was the patient seen in their usual state of health *BEFORE* he/she showed drooping of one side of face, paralysis or weakness of one arm or leg, or any speech abnormality or slurring of words?

Within the last 2 hours? BLS	( < 2 hrs)	<b>CVAC 2</b>
Greater than 2 hours? BLS	( > 2 hrs)	<b>CVA 4</b>

**NOTE:** THE **CVAC** CALL TYPE SHOULD ONLY BE USED WHEN THE SIGNS AND SYMPTOMS OCCUR WITHIN THE LAST 2 HOURS OF OBSERVING THE PATIENT. THE **CVA** CALL TYPE MUST BE USED IF THE PATIENT HAS NOT BEEN SEEN FOR SOME TIME (I.E. OVERNIGHT).

# Accuracy of an EMS Dispatch Algorithm for the Identification of Stroke Center Candidates



**John Freese, MD**  
New York City Fire Department

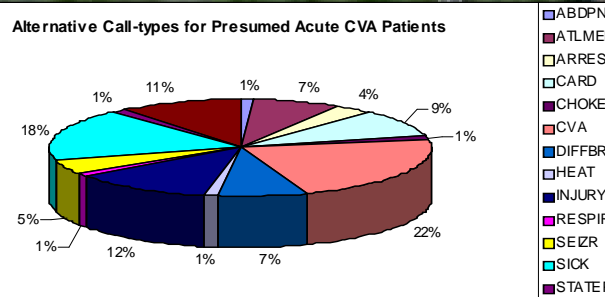


**Introduction:** In New York City, the receipt of 911 calls of a medical nature and the subsequent assignment of EMS resources to those emergencies is the responsibility of the New York City Fire Department (FDNY). Utilizing a dispatch algorithm based on the Cincinnati Prehospital Stroke Scale, FDNY dispatchers attempted to identify patients demonstrating symptoms consistent with an acute cerebrovascular accident, defined as less than two hours duration. Such patients would be classified as candidates for selective transport to the newly designated stroke center in the borough of Manhattan. Patients with stroke symptoms in excess of two hours would be given a lower priority call-type and would be transported in accordance with standard Department policy.

**Objective:** To evaluate the ability of assignment receiving dispatchers (ARDs) to assess patients believed to have suffered a cerebrovascular event (call-type = CVA) and classify them as exhibiting symptoms of an acute nature (call-type = CVA-C).

**Methods:** A retrospective review was performed for all computer-aided dispatch (CAD) records and FDNY prehospital care reports for patients with call-types or prehospital presumptive diagnoses consistent with acute CVA during the first three months following the designation of the borough's first stroke center.

Alternative Call-types for Presumed Acute CVA Patients



**Stroke Card**

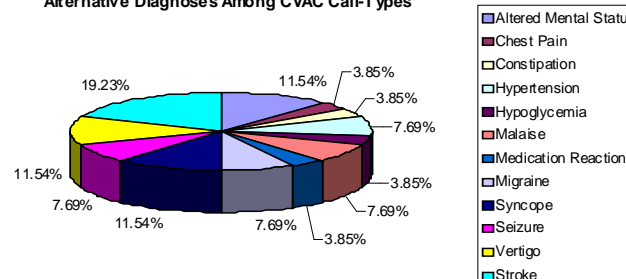
- “Does the patient exhibit any of the following:
- Any paralysis or drooping of one side of the face?
  - Any paralysis or weakness of one arm or leg?
  - Any speech abnormality or slurring of words?

If Yes to any of the above:

What time (How long ago) was the patient seen in their usual state of health BEFORE he/she showed drooping of one side of the face, paralysis or weakness or one arm or leg, or any speech abnormality or slurring of words?

Within the last two hours?		
CVAC	2	BLS
Greater than 2 hours?		
CVA	4	BLS

Alternative Diagnoses Among CVAC Call-Types



**Results:** A total of 111 patients to whom FDNY ambulances were assigned were given a call-type of CVAC during the study period. Seventy-five stroke center candidates were independently identified by prehospital providers as demonstrating signs and symptoms consistent with an acute CVA based on their performance on the Cincinnati Prehospital Stroke Scale. When compared to the presumptive prehospital diagnosis provided by the EMS personnel on scene, the sensitivity of the call-type assigned by the ARD was found to be 34.7% with an accuracy of 23.4%. The up-triage rate - those patients designated by ARDs as having an acute stroke with a subsequent prehospital providers description of symptoms of greater than two hours duration - was 19.2%. Inaccurate, lower priority call-types were assigned to 18.9% of acute stroke patients.

**Conclusions:** The majority of stroke center candidates were identified by the EMS crew on scene rather than by the emergency medical dispatchers. Further work will be required to improve upon the accuracy of the call-type assignments in this population of patients in order to allow for the appropriate prioritization.

# Accuracy of EMS Dispatch for Identification of Stroke Center Candidates

## Dispatch Algorithm

- Cincinnati Prehospital Stroke Scale
- Stroke symptoms less than 2 hours

## Three month review of CVA-C calls \*

### 111 cases identified by dispatch

Accuracy 24%

Other diagnoses:

altered mental status, chest pain, hypertension, migraine, syncope, seizure etc.

### 75 cases identified on scene by EMS personnel

**Conclusion:** Majority of acute CVA patients identified by EMS on scene, not by EMS dispatchers

## USING THE PRE-HOSPITAL STROKE SCALE

ANY ABNORMAL FINDING SUGGESTS A PRESUMPTIVE DIAGNOSIS OF STROKE.

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



**Normal**

Both sides of face move equally



**Abnormal**

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.



**Normal**

Both arms move the same, or both arms do not move at all.



**Abnormal**

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."

**Normal**

The patient says the correct words with no slurring of words.

**Abnormal**

The patient slurs words, says the wrong words, or is unable to speak.

### 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

# PREHOSPITAL STROKE SCALE

## POCKET CARD

QUEENS HOSPITALS  
Elmhurst (H32)  
Flushing (H33)  
Jamaica (H34)  
Long Island Jewish (H35)  
Mt. Sinai Queens (H71)  
NY Hospital Medical Center (H31)  
North Shore University Hospital (H78)

BROOKLYN HOSPITALS  
Brookdale (H41)  
Long Island College Hospital (H49)  
Lutheran Medical Center (H51)  
New York Methodist (H54)  
University Hospital of Brooklyn - SUNY (H44)  
Wyckoff (H58)  
Kings County (H48)

### PARTICIPATING HOSPITALS



**PRE-HOSPITAL  
STROKE SCALE**



# Stroke Center Designation: The First 100 Days

John Freese, M.D.<sup>1</sup>, Maria Brilliant, R.N.<sup>2</sup>, Robert Rothberg, M.D.<sup>2</sup>

<sup>1</sup> New York City Fire Department, <sup>2</sup> New York University Medical Center

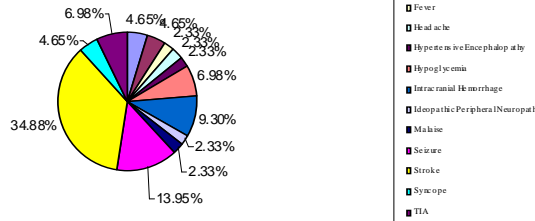


**Introduction:** On May 1, 2005, New York City's 911 system enacted the State Department of Health's designation of New York University Medical Center as a certified stroke center, making it the only such center in the borough of Manhattan.

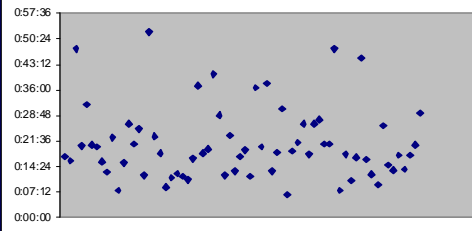
**Objective:** To evaluate the impact of this designation and a related prehospital protocol on the out-of-hospital evaluation, management, and transportation of presumed acute cerebrovascular accidents (CVAs) in central and southern Manhattan, the defined catchment area for the stroke center.

**Methods:** This descriptive study was accomplished via a retrospective review of electronic prehospital care reports (ePCR) and hospital records for all patients transported to New York University Medical Center by New York City Fire Department (FDNY) ambulances in the 100 days prior to and after the recognition of this center's designation by the 911 system.

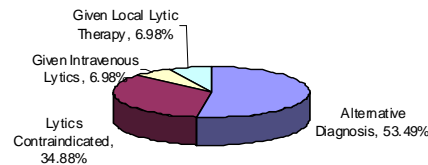
ED Diagnosis of Presumed CVA Patients



Scene Times for Acute CVA Patients



Outcome of stroke center patients



**Results:** As compared to 126 patients during the preceding 100 days, 130 patients in central and southern Manhattan were described by EMS personnel as having a presumed prehospital diagnosis of CVA or transient ischemic attack. Among those patients, significant increases were seen in the documentation of the Prehospital Stroke Scale following this designation ( $p < 0.001$ ). Seven presumed stroke patients (5.6%) were transported to the New York University Medical Center prior to its designation. Following the designation, 28.5% of stroke patients were transported to the stroke center, while 32.3% of all acute strokes were transported there. Of these acute stroke patients, 37 hospital records (86.0%) had a documented contraindication to thrombolytic administration. All of the remaining patients were administered either intravascular thrombolytics or underwent invasive treatment (i.e. local intra-arterial thrombolytic administration). Among this group, there were no adverse outcomes related to the CVA-specific therapy.

**Conclusions:** The designation of a receiving stroke center resulted in a demonstrable increase in the prehospital assessment of acute CVAs, allowing for the delivery of these patients to a center capable of providing timely, definitive care.

# Stroke Center Designation

## The First 100 days

May 1, 2005 – First Stroke Center designated in Manhattan

### Prior 100 days:

5.6% CVA's → Stroke Center

### Post designation – first 100 days:

28.5% CVA's → Stroke Center

7% IV lytic therapy

7% IA lytic therapy

34% lytics contraindicated

52% alternate diagnoses eg ICH, TIA, headache, syncope, fever, altered mental status

Also, improved prehospital documentation of stroke scale post designation

# Stroke Center Designation

## The First 100 days

1. Stroke center designation resulted in increased numbers of stroke patients being diverted to a stroke center, not only acute stroke patients
2. In this small study, only about 50% of patients diagnosed with CVA by EMS in the field actually had a CVA
3. Resulted in ↑ acute treatment (IV and IA therapy)
4. No data on ED **pre-notification**

# Emergency Department

ED personnel trained in diagnosis/treatment of all types of acute stroke

Direct contact with EMS

Familiar with stroke team members, stroke team activation process

**Note: ED staff may be members of stroke team**

Written protocols for ischemic stroke, hemorrhagic stroke, use of t-PA

Stroke educational activities at least twice yearly

# **NINDS Recommended Stroke Evaluation Targets**

<b>Door to MD evaluation</b>	<b>10 minutes</b>
<b>Door to Stroke Team contact</b>	<b>15 minutes</b>
<b>Door to CT</b>	<b>25 minutes</b>
<b>Door to CT interpretation</b>	<b>45 minutes</b>
<b>Door to drug treatment</b>	<b>60 minutes</b>

# Realistic EMS Time Frames

Call to Dispatch	5 minutes
Vehicle response time	10 minutes
On scene time	15 minutes
Transport to hospital	10 minutes
<b>Total EMS Time</b>	<b>40 minutes</b>

# Time From 911 Call to Drug Administration

EMS	40 minutes
ED	60 minutes
<b>Total</b>	<b>1 hr 40 minutes *</b>

\* To be eligible for treatment in a three hour time window, 911 must be called within an hour or so of the onset of symptoms

# Summary: Emergency Medical Services

**Minutes** count at every step of process

**Dispatch algorithms** need further study

**EMT Education** has been effective

Regional standards could be developed

**Prenotification** is important and must be emphasized

**Emergency Department Issues**

eg. overcrowding, diversion

- need to be addressed for the success of  
Regional Stroke Systems of Care

Is **two hour** stroke center diversion rule appropriate?