Systems of Care for Time Dependent Emergencies

Claire M Corbett, MMS, NRP
Manager of Neurodiagnostics and Stroke Center
New Hanover Regional Medical Center
Wilmington, NC

Duke Life Flight

Disclosures

• Clinical background spent as a paramedic
• I am a Systems of Care Activist
• Stroke & STEMI mix up

Disclosures

• Clinical background spent as a paramedic
• I am a Systems of Care Activist
• Stroke & STEMI mix up
Time Dependent Emergencies

**Trauma: Golden Hour**

80% Trauma deaths occur within first hour

**STEMI: Time is Muscle**
System Delay and Mortality Among Patients With STEMI Treated With Primary Percutaneous Coronary Intervention

System delay independently associated with mortality

Terkelsen, et al
JAMA 2010

Each hour of delay associated with 10% ↑ risk of death

STEMI Time to Treatment

Rapid Reperfusion Saves Lives

Through organized systems of care, patients can receive timely reperfusion

Death according to treatment within guideline goal

P < 0.001

**Stroke: Time is Brain**  
**Door to tPA**  
Shorter onset to tPA times associated with:  
- Improved functional outcomes  
- Lower complications  
Every minute of a large vessel stroke, the average patient loses 1.9 million neurons

---

**Stroke: Time is Brain**  
**Thrombectomy**

**Outcomes Best if Done within 2.5 Hours**
- Reperfusion within 2.5 hours → 91% functionally independent  
- Additional hour delay → 10% lower likelihood of functional independence  
- Every 60 minute delay after 3.5 hours is 20% lower likelihood of functional independence.

**SWIFT PRIME Sub analysis**

---

**Audience Response**

Do you think there is a positive correlation between hospital performance on door to balloon time for STEMI and door to needle time for Stroke?  
- Yes  
- No

---

"We found no correlation between hospital’s observed or risk-adjusted DTN and D2B times. Opportunities exist to improve hospital’s performance of time-critical care processes for AIS and STEMI in a coordinated approach"
Time Dependent Emergencies

- Outcomes are dependent on time to treatment
- Require regionalized systems of care

Implement evidence based plans for direct presenters and transfers:
- rapid identification
- treatment
- transfer

What is most important is establishing a standard plan. The details of the plan are less important than the establishment of a plan.

STEMI System Plans

Stroke System Plans
**Direct Presenters**

Patients present directly to a STEMI, Stroke, Trauma or Cardiac Arrest Center by EMS or as Walk-in

---

**Direct Presenters: Key Systems of Care Elements**

- Rapid identification & standardize criteria
- Short scene times
- Early notification & activation
- Destination plans
- Use of air ambulance
- Pit-Stop with hand-off

---

**Rapid Identification & Standardized Criteria**

- Specific, agreed upon, criteria

**Criteria for STEMI**

1. ST elevation > 1 mm in two or more contiguous leads **And**
2. Presence of chest pain or chest pain equivalent
Direct Presenters:  
**Key Systems of Care Elements**
- Rapid identification & standardize criteria
- Short scene times
- Early notification & activation
- Destination Plans
- Use of Air Ambulance
- Pit Stop with hand off

**Short Scene Times**
- Trauma: “Load and Go”
  - Scene time 10 minutes
- STEMI:
  - Scene time < 15 minutes
- Stroke:
  - Scene time < 15 minutes

**STEMI**
EMS: Prehospital Activation

12 lead ECG

Method for STEMI Diagnosis & Activation
1. Paramedic read
2. Algorithm interpretation statement
3. Algorithm + Paramedic confirmation
4. Transmit for Physician read

Goal: Notification within 5 minutes of positive EKG.
**STEMI**

EMS: Prehospital Activation

- Hospitals activate their STEMI team immediately
  - Clear the cath lab table
  - Activate team → Interventional Cardiologist, Cath Lab Team, ED physician and nurses

---

**Stroke: Early Hospital Notification with Pre-activation of System**

- Early notification to hospital
  - Within 5 minutes of positive assessment
- Hospitals activate their stroke team immediately
  - Clear the CT table
  - Expect patient in EMR
  - Activate team → neurologist, pharmacist, stroke nurse are waiting in the ED for pt arrival
  - Initiate Code Stroke protocols and stroke packets
  - Have tPA ready
Impact of Pre-hospital Activation

Number Treated with t-PA and Median Door to Needle

Direct Presenters:
Key Systems of Care Elements

- Rapid identification & standardize criteria
- Short scene times
- Early notification & activation
- Destination Plans
  - Use of Air Ambulance
  - Pit Stop with hand off

Destination Plans: Defining a Region

- How do patients present?
  - Walk-in
  - EMS
  - Transfer from referral hospitals

- Where do they present from?
  - What EMS agencies
  - Which counties
  - What hospitals
  - Distance to PCI or stroke Centers

- Maintain referral patterns
STEMI: Destination Plans

- Key: Develop a Plan
- Is bypass to a PCI center appropriate?
  - How far is too far?

  *What is possible?*
  - Evaluate resources and distance to PCI hospitals and referral hospitals
  - Can primary PCI be achieved < 90 minutes most of the time?
    - Yes, strategy => transfer to PCI Center
    - No, strategy => transfer to non-PCI center (for lytic eligible pts)
**Stroke: Destination Plans**

- Transfer acute stroke patients to stroke capable hospitals
  - Even if drip and ship to larger stroke center

- Transfer to Comprehensive Stroke Centers?
  - Consider transfer of patients with potential large vessel occlusion (LVO) to a CSC

**Direct Presenters:**

**Key Systems of Care Elements**

- Rapid identification & standardize criteria
- Short scene times
- Early notification & activation
- Destination Plans
- Use of Air Ambulance
- Pit Stop with hand off

---

**Scene Flights**

- In Trauma we fly patients from field, why not STEMI & Stroke?
  - Can save time by EMS hand off to air for transfer?

**Direct Presenters:**

**Key Systems of Care Elements**

- Rapid identification & standardize criteria
- Short scene times
- Early notification & activation
- Destination Plans
- Use of Air Ambulance
- Pit-Stop with hand-off
STEMI: Pit-stop

EMS Presenters
- Direct to Cath Lab Strategy
- Minimize or eliminate ED evaluation
- Patient remains on EMS Stretcher
- Quick pit stop in ED
  - < 5 mins
  - Ensure cath lab ready
  - Quick registration
  - Don’t repeat EKGs

Stroke: Pit Stop and Handoff

Procedure in place for EMS transfer straight to CT
- Improve door to CT
- Improve door to tPA
- “Pit Stop”
  - Rapid assessment ABCs
  - Handle any quick registration requirements
  - Hand off blood drawn by EMS, or draw labs if needed
  - Begin neuro exam as patient is moved to CT

Transfers

Patients present to a hospital and require transfer to another hospital for additional care.

Transfers

Key Systems of Care Elements

- Rapid identification & standardize criteria
- Early notification to one call center
- Treatment protocol
- Rapid handoff at transfer hospital
- Focus on “DIDO” reduction
- Rapid handoff at receiving hospital with immediate treatment initiated
Transfers

Key Systems of Care Elements

- Rapid identification & standardize criteria
- Early notification to one call center
- Treatment protocol
- Rapid handoff at transfer hospital
- Focus on “DIDO” reduction
- Rapid handoff at receiving hospital with immediate treatment initiated

Criteria Standardized Across Region

STEMI Hotline 1-877-NHSTEMI

Regional Communications will:

- Connect Cardiologist and ED MD
- Page STEMI team
- Obtain Bed Assignment & Register the Patient
- Keep STEMI team updated on any changes

Criteria for STEMI

1. ST elevation > 1 mm in two or more contiguous leads
2. Presence of chest pain or chest pain equivalent
Stroke Hotline
Regional Communications will:

- Connect Neurologist and ED MD
- Dispatch transfer unit
- Obtain Bed Assignment & Register the Patient
- Keep team updated on any changes

Transfers
Key Systems of Care Elements

- Rapid identification & standardize criteria
- Early notification to one call center
- Treatment protocol
- Rapid handoff at transfer hospital
- Focus on “DIDO” reduction
- Rapid handoff at receiving hospital with immediate treatment initiated

Treatment Protocols
Assess region
- How many hospitals & EMS agencies?
- What transfer resources are available?
- Distance to PSC?
- Distance to CSC?

Develop treatment and transfer protocols

STEMI
Referral Hospital Treatment Protocols

- Develop protocols supported by guideline recommendations
  - Determine a single reperfusion strategy
  - Thrombolytics or Transfer for pPCI
  - Distance to PCI Center?
  - Resources available for rapid transport?
  - Determine therapeutic regimens
- Set benchmark goals
**STEMI Treatment Protocols**

Southeastern RACE Region

- Zone 1: Brunswick
  - Columbus
  - Dosher
  - NHRMC
  - OH

- Zone 2: Naval
  - Bladen
  - Onslow
  - Duplin

**Zone 1:**
- Brunswick
- Columbus*
- Dosher
- NHRMC
- OH

**Zone 2:**
- Naval
- Bladen
- Onslow
- Duplin

*Southeastern RACE Region

* If AL2 is not available at Columbus, follow Zone 2 protocol

**Stroke**

*Referral Hospital Treatment Protocols*

- Rapid identification of Acute Stroke patients
- Treatment protocols in place for treating with IV tPA
- Telestroke?
- Screen for LVO

**Transfers**

*Key Systems of Care Elements*

- Rapid identification & standardize criteria
- Early notification to one call center
- Treatment protocol
- Rapid handoff at transfer hospital
- Focus on “DIDO” reduction
- Rapid handoff at receiving hospital with immediate treatment initiated
Rapid Handoff to Interfacility Transfer Team

- Rapid Handoff – treat like a load and go scene
- Paperwork
  - Don’t delay transfer waiting on paperwork

Goal: interfacility transfer agency
at-hospital < 10 minutes
Goal: Door-in Door-out < 45 minutes?
“DIDO”

Ways to Decrease Door In-Door Out

- Prehospital EKG and activation
- EMS education
- Keeping on stretcher
- Door to ECG<10 minutes
- Single call to PCI center
- Dedicated team at PCI center
- Hospital Specific reperfusion
- Rec. direct transport to PCI center if <50 miles away

Transfers
Key Systems of Care Elements

- Rapid identification & standardize criteria
- Early notification to one call center
- Treatment protocol
- Rapid handoff at transfer hospital
- Focus on “DIDO” reduction
- Rapid handoff at receiving hospital with immediate treatment initiated

Transfers

Key Systems of Care Elements

- Rapid identification & standardize criteria
- Early notification to one call center
- Treatment protocol
- Rapid handoff at transfer hospital
- Focus on “DIDO” reduction
- Rapid handoff at receiving hospital with immediate treatment initiated

Rapid Handoff & Treatment at Receiving

- Straight to Lab (STEMI or Stroke)
- Streamline handoff

Elements of Continuous Improvement

- Data collection and analysis
  - Set benchmark goals for each step in the process
- Feedback to team – internal and external
- Multidisciplinary Case Review and Steering Committees
- Education
- Standard terminology
- Standardized roles/responsibilities
- Share success stories -> Recognize the teams
Thank you