Sanford Chest Pain Network: Improving Rural STEMI Outcomes

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Overview

• Guidelines/benchmarks
• Case study
• Sanford CP Initiative
• STEMI outcomes at Sanford Heart Hospital
ACC-AHA guidelines for triage and transfer for Percutaneous Coronary Intervention for Patients with STEMI
Each community should develop a STEMI system of care following the standards developed for *Mission Lifeline* including:

- Ongoing multidisciplinary team meetings with EMS, non-PCI-capable hospitals (STEMI Referral Centers), & PCI-capable hospitals (STEMI Receiving Centers)
Recommendations for Triage and Transfer for PCI (for STEMI)

STEMI system of care standards in communities should also include:

- Process for prehospital identification & activation
- Destination protocols to STEMI Receiving Centers
- Transfer protocols for patients who arrive at STEMI Referral Centers and are primary PCI candidates, and/or are fibrinolytic ineligible and/or in cardiogenic shock
It is reasonable to transfer high risk patients who receive fibrinolytic therapy as primary reperfusion therapy at a non-PCI capable facility to a PCI-capable facility as soon as possible where either PCI can be performed when needed or as a pharmacoinvasive strategy.
Consideration should be given to initiating a preparatory antithrombotic (anticoagulant plus antiplatelet) regimen prior to and during patient transfer to the catheterization laboratory.
Patients who are not high risk who receive fibrinolytic therapy as primary reperfusion therapy at a non-PCI capable facility may be considered for transfer to a PCI-capable facility as soon as possible where either PCI can be performed when needed or as a pharmacoinvasive strategy.
• Terms “facilitated PCI” and “rescue PCI” no longer used for the recommendations.
• Contemporary therapeutic choices leading to reperfusion for pts with STEMI can be described without these potentially misleading labels.
EMS and a STEMI Event

**GOALS**

- **Patient**: 5 min after symptom onset
- **Dispatch**: 1 min
- **EMS on scene**: within 8 min
- **EMS transport**: Prehospital fibrinolysis: EMS-to-needle within 30 min

**EMS on scene**
- Encourage 12-lead ECGs
- Consider prehospital fibrinolytic if capable and EMS-to-needle within 30 min

**Hospital fibrinolysis**: Door-to-needle within 30 min

**STEMI-referral hospital** (non PCI-capable)

**STEMI-receiving hospital** (PCI-capable)

**EMS transport**: EMS-to-balloon within 90 min

Patient self-transport: Hospital door-to-balloon within 90 min

**Total ischemic time**: Within 120 min*

*Golden Hour = First 60 minutes*
Case Study

• Mr. Scott Hieb is a 48 year old gentleman who presented to chamberlain ED with complains of severe pain to the right side of the chest radiating down his right arm for 30 minutes.
• Pain started while he was working on a truck.
• Pain was described as heaviness 10/10 in severity, associated with nausea, vomiting and profuse diaphoresis. Never had such pain before.
• Cardiac risk factors- Heavy smoker for many years.
• No hx of DM, HTN, HLP, CAD.
EKG on arrival

Patient Type: WABWIRE

MR 74 [SR] - SINUS RHYTHM
PR 172 - STMT
QRS 86 [HRTS] - Preliminary interpretation was completed by Dr. Mohammad Khan
QT 338
Q7s 409

-- AXES --
P 19
QRS 38
T -1.5

-- ABNORMAL ECG --

Sanford Health - Sanford Health Network (1.03.13)

Device: Chamberlain > Speed: 25 mm/sec Lead: 10 mm/mV Chest: 10 mm/mV
At Chamberlain ER

- STEMI in antero-lateral and posterior leads with reciprocal changes in inferior leads.
- STEMI ordersets activated.
- Within a few minutes- V fib arrest.
- CPR for 2 minutes, 200J shock was delivered.
- ROSC
- Thrombolytics given.
- Aspirin, heparin (load and drip), metoprolol, morphine, nitrodrip started.
- Morphine, fentanyl and ativan.
- Call made to Sanford Heart Hospital, Sioux Falls.
At Sanford ER

- Patient arrived at Sioux Falls ER. Hemodynamically stable. Continuous CP.
- Patient taken to Cath Lab.
- While being prepped he developed VF requiring shock. VF changed to VT requiring multiple shocks and amiodarone infusion.
- Cardiac catheterization was performed which showed- thrombotically occluded 100% mid left circumflex.
• Balloon angioplasty, mechanical thrombectomy and stenting (DES) was performed successfully with restoration of TIMI-3 flow.

• LV gram showed preserved EF.

• Pt was given integrilin before intervention and iv heparin was used during the procedure. Prasugrel loading was done in the cath lab.
HR 86 - Atrial - Accelerated Junctional Rhythm vs Accelerated Atrioventricular Rhythm
QRS 170 - Left Axis Deviation
QT 448 - QRS - Insignificant ST depression
QTc 456

Patient Type: Adult

--- AXIES ---

QRS - 38
T - 64 Previous ECG: 06-Aug-2012 17:00:15 Abnormal Confirmed

Sanford Health - Sanford USD Medical Center (1-01-00)

Device: 4 Speed: 25 mm/sec Lead: 10 mm/mV Chart: 10 mm/mV
• Multiple runs of AIVR and PVCs during and after the procedure.
Important points to note from a STEMI systems of care perspective.

- Pt recognized his symptoms.
- Arrived in his own car.
- Chamberlain ED a STEMI referral center at 3:32pm.
- Sanford CP protocol initiated.
- EKG done and interpreted at 3:35 pm. **No delay in diagnosis of STEMI.**
  
  (3 min vs 10 mins(ACC/AHA)).
- Aspirin at arrival, at 3:35pm.
- Nearest PCI facility (SHH), ~150 miles (atleast 2 hour by helicopter). Lytics given. **Long distance.**
- Thrombolytics received at 3:46pm.
  
  (14 mins vs 30 mins(ACC/AHA)).
- Transfer to SHH initiated at 3:54 pm, flight crew arrives at 6:16 pm.
  
  (2 hours 22 mins)
  
  **DIDO 30 mins(ACC-AHA).**
  Balloon inflated- 6.42, D2B-26 minutes.

**Current challenge is to – get DIDO <30 minutes and transfer time <60 minutes for STEMI every case!**
**The biggest factor is distance and transport!**
**Even having order sets and best systems, these cannot be changed!**
Barriers to Timely Reperfusion

- The patient
  - Failure to promptly recognize symptoms
  - Hesitation to seek medical attention
- Time to transport
  - Mandated delivery to the closest hospital, regardless of PCI capabilities
  - Long transport in rural areas
  - Golden hour/ischemia time missed.
- Decision process on arrival
  - Diagnosis
  - Clot-busting drugs vs. PCI
  - Transfer to PCI facility - distance, transport - flight? Helicopter? How far? How fast?
- Time to implement treatment strategy
  - Procedural factors
  - Team assembly.
Sanford Chest Pain Network

Goals:
- Improve Mortality and Morbidity for STEMI patients
- Improve overall care
- Initiate system of care

- No delay in treatment by standardizing care/protocols
- Utilizing Sanford Cardiology and ER Programs
Sanford Chest Pain Network Protocol

Patient Presents with Chest Pain

Implement Initial Chest Pain Order Set

EKG RESULTS

Non-Cardiac Origin

STEMI

Complete TNKase Checklist Does Patient Qualify?
No

Probable Transfer

Implement “Hot Heart” Order Set

Yes

Probable Transfer

Implement Fibrinolytics Order Set

NSTEMI

Calculate TIMI Score
0-4

5-7 or + Troponin, ST/T changes

Implement Chest Pain Observation Order Set

Admit for Observation

Transfer or Admit

Implement High Risk Order Set

Refer to: Sanford One Chart Chest Pain Network Order Sets
Acute changes including, but not limited to, chest pain or pressure, aching, burning, tightness, or heaviness in chest with or without pain in arm, jaw, neck, shoulder, or back or acute dyspnea, dizziness, syncope, or weakness associated with any of the above, implement the following orders on a STAT basis.

### General

- **Vital Signs / Monitoring**
  - Cardiac Monitor - Per Unit Routine
  - Routine, CONTINUOUS HRSG First occurrence Today at 2100 for 4 hours
  - CONTINUOUS OXIMETRY
  - Routine, CONTINUOUS HRSG First occurrence Today at 2100 for 4 hours
  - VITAL SIGNS EVERY 15 MINUTES AND AS NEEDED
  - Routine, Every fifteen minutes First occurrence Today at 2100 for 4 hours

- **Nursing Assessment**
  - CONDUCT A FULL ASSESSMENT INCLUDING ASSESSING FOR ARRHYTHMIAS
  - Routine, CONTINUOUS HRSG First occurrence Today at 2100 for 4 hours
  - INITIATE CHEST PAIN FLOW SHEET
  - Routine, CONTINUOUS HRSG First occurrence Today at 2100 for 4 hours
  - COMPLETE FOCUSED ASSESSMENT EVERY 15 MINUTES AND AS NEEDED
  - Routine, CONTINUOUS HRSG First occurrence Today at 2100 for 4 hours
  - DOCUMENT THE TIME OF ONSET CHANGES WERE NOTED AND WHAT WAS OBSERVED
  - Routine, CONTINUOUS HRSG First occurrence Today at 2100 for 4 hours

### Labs

- **Hematology**
  - If positive STEMI, order the following only if not drawn in the previous 24 hours
    - COMPLETE BLOOD COUNTER WITH DIFFERENTIAL
      - STAT1 for 4 hours

- **Coagulation**
  - If positive STEMI, order the following only if not drawn in the previous 24 hours
    - PROTIME/INR
      - STAT1 for 4 hours
    - PTT
      - STAT1 for 4 hours

- **Chemistry**
  - If positive STEMI, order the following only if not drawn in the previous 24 hours
    - BASIC METABOLIC PANEL
      - STAT

- **Cardiac**
  - If positive STEMI, order the following only if not drawn in the previous 24 hours
    - CK REFLEX TO CKMB
      - STAT1 for 4 hours
    - TROTONIN I
      - STAT1 for 4 hours

### Diagnostic

- **Cardiovascular**
  - EKG
    - STAT, ONCE First occurrence Today at 2100
      - Reason For Testing: Chest pain
**Parameter Orders**
- **ORDER STAT ECG AND CALL TO ALERT TECHNICIAN THAT THIS IS A POTENTIAL HOT HEART**
  - Routine, CONTINUOUS NRSG First occurrence Today at 2100 for 4 hours, (1) Emergency Department physician to read, (2) ECG technician to call ED and notify HUC of EKG, reading provider, call back number, patient name, and E number, (3) Physician to call with read results
- **EMERGENCY DEPARTMENT PHYSICIAN TO READ EKG IMMEDIATELY**
  - Routine, CONTINUOUS NRSG First occurrence Today at 2100 for 4 hours, - IF ST elevation NOT present, primary care provider will determine further orders
- **IF STELEVATION PRESENT**
  - for 4 hours, (1) Immediately consult on-call Interventional Cardiologist; (2) Dial 0 to notify the operator to initiate the Internal Hot Heart (this triggers operator to page Cardiac Catheterization Lab) (provide operator with location and contact number); (3) Cardiac Catheterization Lab will notify patient's RN as soon as ONE member of the catheterization team is present in the catheterization lab; transport patient to the Cardiac Catheterization Lab

**Notify Provider**
- **NOTIFY PRIMARY CARE PROVIDER OF CHANGE IN PATIENT'S STATUS**
  - Routine, CONTINUOUS NRSG First occurrence Today at 2100 for 4 hours
- **NOTIFY THE RAPID RESPONSE TEAM (333 1234) FOR AN INPATIENT EXPERIENCING CHEST PAIN**
  - Routine, CONTINUOUS NRSG First occurrence Today at 2100 for 4 hours

**Respiratory**
- **Oxygen-adult and pediatrics - NC- no humidity, 2 L/min**
  - Routine, RT-Continuous, (include now) First occurrence Today at 2100 for 4 hours
- **Titrate Oxygen Adult - Keep SPO2 greater than 95% for 24 hours**
  - Routine, Daily PRN starting Today at 2057 until Tomorrow for 4 hours

**IV Fluids**

**Venas/Arterial Access**
- If positive STEMI order the following
  - PERIPHERAL IV WITH 2 EXTENSIONS IF GOING TO THE CATH LAB

**Medications**

**Pain Severe - PRN**
- **morphine 2 mg/mL injection solution**
- **Codeine**
- **Reactions: Other (specify in Comments)**
  - 1.2 mg, IV, Every five minutes prn starting Today at 2057 until Tomorrow at 0056, other (Specify), severe chest pain

**Cardiovascular Medications**
- **nitroglycerin (NITROSTAT) sublingual tablet 0.4 mg**
  - 0.4 mg, Sublingual, Every five minutes prn starting Today at 2057 until Tomorrow at 0056, chest pain

**Antiplatelet**
- If positive STEMI order the following
  - **aspirin chewable tablet - UNLESS CONTRAINDICATED by allergy, stroke symptoms or active bleeding**
  - 324 mg, Oral, Now
At sanford we practice evidence-based strategies that reduce treatment delays:

1. ED activates the cath lab
2. One call activates the cath lab
3. Cath lab team ready in 20 minutes
4. Prompt data feedback.
5. Senior management commitment
6. Team-based approach

Pre-hospital ECG to activate the cath lab if feasible
Our motto:

Time is muscle
STEML outcomes at Sanford Hospital

• Sanford’s Comparison to State and National Data for 2011Q3-2012Q2 (12 months)
• Ref: ACTION registry.
Overall AMI Performance Composite

- 98.0%
- 95.5%
- 94.8%
- 98.9%
- 92.0%
- 93.0%
- 94.0%
- 95.0%
- 96.0%
- 97.0%
- 98.0%
- 99.0%
- 100.0%

R4Q 2011Q3-2012Q2

Sanford
State Median
US 50th Percentile
US 90th Percentile
Overall Defect Free Care

R4Q 2011Q3-2012Q2

- Sanford: 88.8%
- State Median: 79.3%
- US 50th Percentile: 73.8%
- US 90th Percentile: 93.5%
STEMI Performance Composite

R4Q 2011Q3-2012Q2

- Sanford: 99.1%
- State Median: 97.5%
- US 50th Percentile: 96.7%
- US 90th Percentile: 99.6%
Acute AMI Performance Composite

- R4Q 2011Q3-2012Q2

- Sanford: 96.9%
- State Median: 90.1%
- US 50th Percentile: 96.4%
- US 90th Percentile: 99.3%
Discharge AMI Performance Composite

- Sanford: 98.5%
- State Median: 98.5%
- US 50th Percentile: 94.3%
- US 90th Percentile: 99.2%

R4Q 2011Q3-2012Q2
Aspirin at Arrival

R4Q 2011Q3-2012Q2

- Sanford: 100.0%
- State Median: 100.0%
- US 50th Percentile: 99.3%
- US 90th Percentile: 100.0%
Aspirin at Discharge

R4Q 2011Q3-2012Q2

- Sanford: 99.2%
- State Median: 98.2%
- US 50th Percentile: 99.1%
- US 90th Percentile: 100.0%
Evaluation of LV Systolic Function

Sanford State Median US 50th Percentile US 90th Percentile

R4Q 2011Q3-2012Q2

95.2% 82.2% 96.1% 100.0%
Median Time in Minutes to Primary PCI

- Sanford: 51.0
- State Median: 61.0
- US 50th Percentile: 60.0
- US 90th Percentile: 48.5
Transfer Facility Door in to Door Out Time in Minutes (STEMI)

- Sanford: 80.0
- State Median: 80.0
- US 50th Percentile: 47.2
- US 90th Percentile: 29.6
Reperfusion Therapy

Sanford State Median US 50th Percentile US 90th Percentile

R4Q 2011Q3-2012Q2

Sanford 100.0% State Median 98.7% US 50th Percentile 98.8%

US 90th Percentile 100.0%
Time to Primary PCI <=90 mins (STEMI)

- Sanford: 95.9%
- State Median: 95.9%
- US 50th Percentile: 96.1%
- US 90th Percentile: 100.0%

R4Q 2011Q3-2012Q2
Integrated health care systems improves outcomes in STEMI patients.
Sanford Chest Pain Network is a role model!
Thank you!