Identification and pre-notification using 12-Lead

Why this so important to our STEMI System
Jim Smith, MD
Great Plains Health, North Platte

* Chair, NE State EMS Board
* Medical Director, Emergency Services, GPH
* Medical Director, GPH LifeNet, NPFD, Maxwell, Tryon, Chase County, NP Rec Center
* Member Board of Directors, GPH
* Co-Owner/Medical Director, Priority Medical Transport
Recognize how identification of a STEMI (or other critical heart rhythms), transmission of an EKG, and hospital notification impact the care of the patient in a STEMI system of care.
Acute Coronary Syndrome (ACS) Facts

* The actions of healthcare providers during the first several hours of a heart attack determine the magnitude of any benefit from treatment and intervention.

* A system that works together efficiently is paramount in reducing mortality and optimizing the benefit from any acute cardiac care strategy.
The “traditional” STEMI system

- **Onset of CP S/S 30 minutes**
- **EMS Transport to hospital ~30 Minutes**
- **~ 60 Minute ED Evaluation to “Confirm” STEMI**
- **Cardiology Consult ~30-60 Minute Wait**
- **At least 30-45 Minutes to arrive and ready the cath lab**

**Patient** → **EMS** → **ED** → **Cardiology** → **Cath lab**

*Back In The Day - Time from onset to treatment could exceed 200 Minutes (Non-Transfer Patients)*
EMS identifies STEMI patient, early acquisition on 12 Lead, early notification

Cath Lab team is activated and prepares for patient arrival

Patient arrives to hospital, direct to Cath Lab when ready

Today’s STEMI System
Calling 911 in Rural Areas Leads to Faster Heart Attack Care
* 30% of STEMI patients receive no reperfusion therapy despite availability, and the absence of contraindications

* < 50% of patients treated with fibrinolytics have a door to needle time within 30 minutes

* Only 35% of patients treated with PCI have a door-to-balloon time within 90 minutes
20% of STEMI patients have contraindications to fibrinolytic therapy, but 70% of those do not receive reperfusion with PCI.

EMS activation of the cardiac cath lab speeds the time to diagnosis and reperfusion therapy, but, 50-75% of patients drive themselves or are transported by family or friends to the hospital.
The 12-Lead is the central component for triage of patients with chest discomfort.

Physicians NEED the 12-Lead to determine whether or not STEMI is present, so they can activate their internal STEMI Alert Team.

Time is muscle!!! Every minute counts!
Who should get a 12-lead ECG?

- Any patient who has signs of AMI, NOT just patients with “Chest Pain”
- Unexplained fatigue
- Sometimes the only signs are syncope, diaphoresis, and or weakness
- Patients who “just don’t feel right”
- Patient complaint of palpitation or irregular heart beat

Consider 12-Lead on ALL of your MEDICAL patients!
BLS Scope of practice in NE

* Acquisition and transmission of a 12-Lead ECG is an allowed skill for all EMT level and above providers in NE.

* Procedure for acquisition should be developed under the direction of each agency’s medical director.

* You do NOT need to read & interpret the 12-lead or diagnose the patient
12 Lead ECG

Does NOT have to increase scene time!
Think about this...

“Bag of Tricks”

“Tool Box”
Nebraska Mission: Lifeline EMS STEMI Guideline #1

Statewide guideline approved by the EMS Advisory Committee, Hospital Advisory Committee and Task Force

Defines who should receive a 12-Lead

ALS and BLS - Obtain 12 L ECG with Initial Vital Signs

Goal: First Medical Contact (FMC) to ECG <10 min, Scene time: < 15 minutes *to provide early identification and prehospital arrival notification for suspected myocardial infarction or STEMI.

- Chest pain, pressure, tightness or persistent discomfort above the waist in pts. ≥ 35 yrs. of age
- "Heartburn" or epigastric pain
- Complaints of "heart racing" (HR >150 or irregular and >120) or "heart too slow" (HR < 50 and symptomatic)
- A syncopal episode, severe weakness, or unexplained fatigue
- New onset stroke symptoms (< 24 hours old)
- Difficulty breathing or shortness of breath (with no obvious non-cardiac cause)
- ROSC (return of spontaneous circulation) post cardiac arrest
- Recent Cocaine, stimulant and/or other illicit drug use (pts. of any age)
- If initial ECG is not diagnostic but suspicion is high for MI and symptoms persist, obtain serial ECG’s at 5-10 minute intervals
Nebraska Mission: Lifeline EMS STEMI Guideline #2

- When should we call a “STEMI Alert”
- 3 options, call alert when any of the three are met
- Work with your medical director and local hospitals for feedback
- Some over-triage is expected and appropriate

**PRE-HOSPITAL STEMI ALERT Activation Criteria:**

**Goal:** Identify STEMI, Alert receiving facility- do not delay transport. Activate STEMI Alert when any one of the following criteria met & signs & symptoms suspect of (AMI) acute myocardial infarction including chest discomfort as described below are demonstrated with a duration of >15 minutes <24 hours

**BLS –**
- Transmit 12 Lead ECG and obtain interpretation by hospital staff or other qualified ALS personnel
- Alert hospital staff or qualified ALS personnel if ECG Monitor interpretive statement infers: “Acute Myocardial Infarction” and patient has signs & symptoms suspect of acute myocardial infarction including chest discomfort and symptoms listed above

**ALS –**
- 12 L ECG trained ALS EMS recognize ST segment elevation of ≥ 1 mm in 2 contiguous leads
- Confirmed Interpretation of STEMI transmitted and reviewed by a Practitioner (Physician, NP, PA)
- ECG Monitor interpretive statement infers: “Acute Myocardial Infarction” with signs & symptoms suspect of acute myocardial infarction including chest discomfort and symptoms listed above
- ACI-TIPI score of 75 or greater
Nebraska Mission: Lifeline EMS STEMI Guideline #3

**Determine Transport Destination**

- If FMC to PCI can be achieved in <90 minutes, arrange for ALS (air or ground) intercept and transport directly to PCI Capable Receiving Hospital for Primary PCI
- Activate STEMI Alert, transmit 12 L ECG as able, provide report to receiving hospital

- If FMC to PCI is > 90 minutes, transport to the closest appropriate non-PCI capable referring hospital for possible fibrinolytic therapy and urgent transfer to a PCI capable Receiving Facility for reperfusion
- Activate STEMI Alert, transmit 12 L ECG as able, provide report to receiving hospital

**Diversion Criteria:**
If patient demonstrates instability and/or has any one of the following Diversion Criteria requiring ED evaluation by a practitioner proceed to closest appropriate hospital:

- Possible need of head CT or neurological intervention / Confusion
- Emergent intubation Immediate circulatory stabilization
- Chest trauma or MVC victims
- Consider DNR Status
- Consider scoring with Sgarbossa Criteria

EMS services should be empowered to make these choices
Nebraska Mission: Lifeline EMS STEMI Guideline #4

- **Top section** – recommended ALS & BLS Treatment
  - Administer O2 starting at 2 L/Min per nasal cannula, titrate as needed to maintain SpO2 > 92%
  - Obtain Systolic/Diastolic blood pressure (BP) in both arms
  - Administer Chewable Aspirin 324 mg by mouth or rectally
  - Administer Nitroglycerin Sublingual 0.4 mg every 5 minutes up to 3 doses if chest discomfort present and SBP > 100. Check BP prior to each administering dose. Hold if SBP < 100 mm HG (Note: BLS providers are only able to assist patients with self-administration of their own prescribed sublingual nitroglycerin)
  - Evaluate if Erectile Dysfunction or Pulmonary hypertension medications taken in the past 24 hours including: Sildenafil (Viagra, Revatio), Vardenafil (Levitra, Staxyn), or Avanafil (Stendra), Tadalafil (Cialis, Adcirca). Hold nitrates for 48 hours following the last dose
  - BLS only: Request ALS Intercept per local protocol
  - Establish large bore IV (L) upper extremity preferred) access per protocol – Normal Saline 500ml KVO Establish a 2nd IV line as time allows

- **ALS**
  - Clopidogrel (Plavix) 300 mg by mouth if transferring for PPCI after confirmation by PCI Receiving Facility and local medical control per protocol
  - Establish a Nitroglycerine IV Drip (if appropriate) if chest discomfort is unrelieved. Delivered via pump only, initiate @ 5 mcg/min & titrate in increments of 5mcg/min to maintain a systolic BP of 100 mm/Hg or greater. Hold nitrates as indicated
  - Administer Analgesia as needed for discomfort per protocol
Nebraska Mission: Lifeline EMS STEMI Guideline #5

- Documentation is key to determining treatment for STEMI patients. Hospitals need this information ASAP.
- STEMI patients are very time-critical. Goals should be kept in mind at all times to reduce total time from onset to definitive treatment.

**Documentation Reminders:**

- Provide Copy of eNARSSIS report with verbal report to RN or MD
- If STEMI/AMI alert is requested of the receiving hospital, document the time
- Provide a Printed or Electronic Copy of Pre-Hospital 12 L ECG with Report to RN or MD

**Patient Care Goals:**

- Provide early identification of patients and early notification of the hospital for suspected AMI or STEMI
- Utilize an assessment tool that may reduce the time from onset of symptoms to receiving definitive cardiac interventions at the receiving hospital
- Prepare patient for immediate transport with indicated medications administered en route to hospital. Attempt to limit the scene time to the shortest time possible
Nebraska Mission: Lifeline EMS STEMI Guideline #6

- NE Mission: Lifeline goals will result in better outcomes for STEMI Patients
- Our statewide data collection tool will look at the reporting measures to determine where more effort and education is needed

### AHA Mission: Lifeline EMS Best Practice Goals

1. All patients with non-traumatic chest discomfort, ≥ 35 yrs. of age, treated and transported by EMS receive a pre-hospital 12-lead electrocardiogram
2. All STEMI patients transported directly to a STEMI receiving center, receive a first (pre-hospital) medical contact to PCI time ≤ 90 minutes directly or ≤120 minutes for Interfacility hospital transfers
3. All lytic eligible STEMI patients treated and transported to a referring hospital for fibrinolytic therapy receive a door to needle time ≤ 30 minutes

### AHA Mission: Lifeline EMS Reporting Measures:

1. Time from symptom onset to EMS dispatch
2. Time from dispatch to EMS vehicle arrival at receiving or referring hospital door
3. Number of suspected AMI/STEMI patients treated and transported by EMS who receive a 12-lead ECG
4. Number of STEMI patients treated and transported to a referring hospital for potential reperfusion by fibrinolysis therapy who receive a Fibrinolytic Checklist Screening enroute to identify possible contraindications
5. Number of STEMI patients who received a pre-hospital ECG, recognized STEMI, and called for a STEMI Alert at the receiving or referring hospital prior to arrival
What we’re hearing from EMS...

• Can’t treat them any different anyhow, what’s the point?
• What if I mess it up and the patient doesn’t have a bad rhythm?
• Hospital doesn’t act on my call/transmission anyhow
• ALS – my medical director/hospital doesn’t let me make the call
• I’m just 5 minutes from the hospital...
Let’s walk through this…

“5 Minutes”

- Patient to cot: 3 minutes
- Patient secured and moved outside: 4 minutes
- Patient moved to ambulance, loaded, and secured: 5 minutes
- Patent vitals and radio report: 4 minutes
- Transport time: 5 minutes
- Park, unload, and move to ER: 4 minutes
- Move patient to ER bed, expose and apply 12-lead: 4 minutes

STEMI identified 29 minutes after FMC by EMS!!
* My EMS agency is BLS, they can’t do 12-lead or can’t interpret
* Transmissions are not diagnostic quality
* The physician (other provider) doesn’t want/use EMS 12-lead
* Getting it before patient arrival doesn’t do us any good anyhow
* Can’t give lytics without chest x-ray first
Statewide STEMI Guideline

**STEMI Criteria:**

- **ST elevation at the J point in**
  - **Men:** at least 2 contiguous leads of ≥2 mm (0.2 mV) in leads V2–V3 and/or ≥1 mm (0.1 mV) in other contiguous chest leads or the limb leads.
  - **Women:** ≥1.5 mm (0.15 mV) in leads V2–V3 and/or ≥1 mm (0.1 mV) in other contiguous chest leads or the limb leads.

- Signs & Symptoms of discomfort suspect for AMI (Acute Myocardial Infarction) or STEMI with a duration >15 minutes <12 hours.

- Although new, or presumably new, LBBB at presentation occurs infrequently and may interfere with ST-elevation analysis, care should be exercised in not considering this an acute myocardial infarction (MI) in isolation. If in doubt, immediate consult with PCI receiving center is recommended.

- If initial ECG is not diagnostic but suspicion is high for STEMI, obtain serial ECG at 5-10 minute intervals.

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**If ECG is transmitted from the field (EMS) and a STEMI is identified, the following should be done prior to patient arrival:**

- Alert on-call provider if not in-house
- Notify Receiving PCI Hospital Emergency Dept. Physician
- Activate Transferring agency (Air or Ground)
- If Arrived by EMS, Leave Patient on Ambulance Cot

**1st ECG time goal: 10 minutes from patient arrival**
PRIMARY PCI Pathway – FMC to PCI less than 120 minutes – ACTIVATE CATH LAB
Goal: Door-in to Door-out in < 30 minutes

FIBRINOLYSIS Pathway - FMC to PCI anticipated to be > 120 min
Goal: Door to Needle < 30 minutes followed by immediate transfer to Closest PCI hospital

Patient Care Priorities Prior to Transport or During Transport
- Titrate oxygen (starting at 2L/min) to maintain SpO2 between 90%-94%
-☐ Aspirin 324 mg PO chewable
-☐ Cardiac Monitor & attach hands-free defibrillator pads
-☐ Obtain vital signs and pain scale
-☐ Analgesia (Morphine sulfate or Fentanyl) IV PRN for pain
-☐ Establish Saline Lock #1 large bore needle

Administer one of the following:
-☐ Heparin - IV loading dose (70 Units/kg - max 4,000 units)

Optional to Heparin:
-☐ Enoxaparin (Lovenox):
  - Age < 75: 30mg IV plus 1 mg/kg SC (max 100mg)
  - Age > 75: No bolus. 0.75 mg/kg SC (max 75mg)

Then administer one of the following:
-☐ Clopidogrel (Plavix) 600 mg PO, or
-☐ Ticagrelor (Brilinta) - 180mg PO

If Patient is contraindicated for Fibrinolysis,
Follow Transport Guidelines for Primary PCI

ABSOLUTE CONTRAINDICATIONS FOR FIBRINOLYSIS (TNK) IN STEMI
1. Any prior intracranial hemorrhage
2. Known structural cerebral vascular lesion (e.g., arteriovenous malformation)
3. Known malignant intracranial neoplasm (primary or metastatic)
4. Ischemic stroke within 3 months EXCEPT acute ischemic stroke within 3 hours
5. Suspected aortic dissection
6. Active bleeding or bleeding diathesis (excluding menses)
7. Significant closed-head or facial trauma within 3 months
8. Current use of oral anticoagulants (Warfarin, Dabigatran, Rivaroxaban, Apixaban, etc.)

RELATIVE CONTRAINDICATIONS FOR FIBRINOLYSIS: (TNK) IN STEMI
1. History of chronic severe, poorly controlled hypertension
2. Severe uncontrolled hypertension on presentation (SBP more than 180 mm Hg or DBP more than 110 mm Hg)
3. History of prior ischemic stroke more than 3 months, dementia, or known intracranial pathology not covered in contraindications
4. Traumatic or prolonged CPR (over 10 minutes)
5. Major surgery (within last 3 weeks)
6. Recent internal bleeding (within last 2-4 weeks)
7. Noncompressible vascular punctures
8. For streptokinase/anal strepase: prior exposure (more than 5 days ago) or prior allergic reaction to these agents
9. Pregnancy
10. Active peptic ulcer
PRIMARY PCI Pathway – FMC to PCI less than 120 minutes – ACTIVATE CATH LAB (continued)

Goal: Door-in to Door-out in < 30 minutes

Patient Care when time allows — Do Not Delay Transport

- Establish large bore IV with NS @ TKO, left arm preferred
- Heparin IV Drip (15 Units/kg/hr - max 1,000 units/hr)
- Obtain Labs: cardiac markers (CKMB, Trop I), CBC, BMP, PT/INR, PTT, and pregnancy serum if childbearing age (do not delay transport waiting for results)
- NTG 0.4mg SL every 5 min or Nitropaste PRN for chest pain (hold for SBP < 90)
- Analgesia (Morphine sulfate or Fentanyl) IV PRN for pain
- Consider Metoprolol (Lopressor) if patient hypertensive (>160/90).
  - 50 mg PO or;
  - 5mg IV x 1
  May consider additional doses if clinically indicated. Hold if SBP < 120, Pulse ox < 92%, HR < 60 or active CHF or Asthma
- Atorvastatin (Lipitor) 80 mg PO

Goal: Door-in to Door-out in < 30 minutes
Transport to Closest PCI Hospital Immediately

Do not give Fibrinolytics (TNKase, rPA, or TPA) for Primary PCI Patients

FIBRINOLYSIS Pathway - FMC to PCI anticipated to be > 120 min (continued)

Goal: Door to Needle < 30 minutes

Tenecteplase (TNKase) IV over 5 seconds:

<table>
<thead>
<tr>
<th>Patient Weight</th>
<th>TNKase</th>
<th>Reconstituted</th>
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<tbody>
<tr>
<td>kg</td>
<td>lbs</td>
<td>mg</td>
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<tr>
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<td>&lt;132</td>
<td>30</td>
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<tr>
<td>60 to &lt;70</td>
<td>132 to &lt;154</td>
<td>35</td>
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<tr>
<td>70 to &lt;80</td>
<td>154 to &lt;176</td>
<td>40</td>
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<tr>
<td>80 to &lt;90</td>
<td>176 to &lt;198</td>
<td>45</td>
</tr>
<tr>
<td>&gt;90</td>
<td>≥198</td>
<td>50</td>
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</tbody>
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Unfractionated Heparin (UFH):

- Heparin IV Bolus (60 Units/kg, max 4,000 Units)
- Heparin IV Drip (12 Units/kg/hr, max 1,000 Units/hr)

Optional to Heparin:

- Enoxaparin (Lovenox):
  - Age < 75: 30mg IV plus 1 mg/kg SC (max 100mg)
  - Age > 75: No bolus. 0.75 mg/kg SC (max 75mg)

Titrate oxygen (starting at 2L/min) to maintain SpO2 between 90%-94%

Aspirin 324 mg PO chewable times 1 dose (if not already given)

Clopidogrel (Plavix)

- age ≤75 300 mg loading dose
- age >75 only 75 mg total

Repeat EKG 30 minutes after fibrinolytics administration if possible

Transport to Closest PCI Hospital Immediately
What we’re hearing from PCI Capable Hospitals

* My EMS agency doesn’t do a good job at interpretation
* Patients need to be evaluated in ER anyhow
* “Just ship them”
* Rural providers are scared to give lytics anyhow
Summary
Keep the STEMI system working

* Use the tools – 12-lead and transmission
  * Identify
  * Pre-notify down-stream care teams

* Use the guidelines that have been developed

* Use FEEDBACK to enhance the system

* Use education and drills to enhance care

* Use outreach to share outcomes and reinforce guideline based care
Questions?