Setting the Standard in MN for Optimal Chest Pain and Heart Attack Care

Richard Mullvain RPH, BCCP, BCPS (AQC), CCCC- Essentia Health

American Heart Association.

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9:40 am – 10:20 am

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Former Co-Chair of the Minnesota Mission:LifeLine Minnesota STEMI Project

Essentia Health

Presenter Disclosure Information

Richard Mullvain, RPH, BCCP, BCPS (AQC), CCCC

FINANCIAL DISCLOSURE:
No relevant financial relationship exists

Certain Brand Names may be mentioned along with Generic Names to assist the audience in identification of different medications

Objectives & Content:

- Appraise and Integrate assessment, risk stratification, treatment and follow up strategies recommended by the Minnesota statewide Chest Pain/ Acute Coronary Syndrome Toolkit…
- …based on the ACC/AHA STEMI, NSTEMI, and ACS treatment guidelines…
- …with the hope to improve patient outcomes

My Background:

- Clinical Pharmacist for 28 years
  - Board Certified Cardiology Pharmacist
  - Board Certified Pharmacotherapy Specialist
    - -With Added Qualifications in Cardiology
  - Certified Cardiac Care Coordinator

- STEMI Program Manager
  - Essentia Health / St. Mary's Medical Center
- Co-Chair of the AHA Mission:Lifeline Minnesota STEMI Project
- 18 publications related to heart attack care

- Fishing Problem
  - Founder of the Duluth Area Fishing League

Rough History of Minnesota STEMI Systems of Care Collaboration

2007

Tim Henry, MD gathered a workgroup of Minnesota cardiologists at the TCT meeting

2008

The Minnesota STEMI Workgroup first assembled in St. Paul

2009

AHA hosted meetings, Ganesh Raveendran, MD coordinated

2011

"Things" stalled out…

2013

The American Heart Association Mission Lifeline Rural STEMI Project began

- AHA: Mindy Cook, Gary Meyers, Michelle (Gardner) Scharnott
- Co-Chairs: Scott Mikesell, Richard Mullvain, John Gallagher

2014

Minnesota EMS & Inter-Facility STEMI Guidelines Created

2016

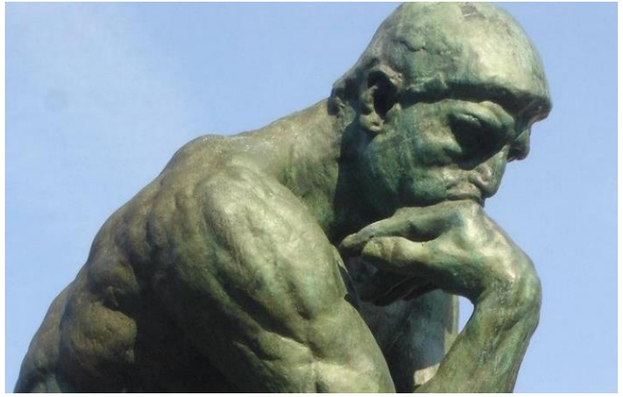
Handoff "project" to the Minnesota Department of Health

2018

MDH supporting Minnesota ACS & Chest Pain Consensus Guideline

- Jim Peacock & MDH staff
- Created Non-STEMI Guideline and Low Risk Chest Pain Guideline
- Minnesota Chest Pain/ Acute Coronary Syndrome "Tool-Kit"

Thoughts



Minnesota STEMI care has improved with standardized protocols and algorithms

Non-STEMI and Low Risk Chest Pain can also benefit from collaborative standardized algorithms for care

Minnesota had an opportunity to create a consensus based "***tool kit"*** to standardize, streamline, and simplify process for the care of ACS and Low Risk Chest Pain patients

KEEP
CALM
AND
Standardize

CHECKLIST

Goals of the “MN ACS/Chest Pain Workgroup”

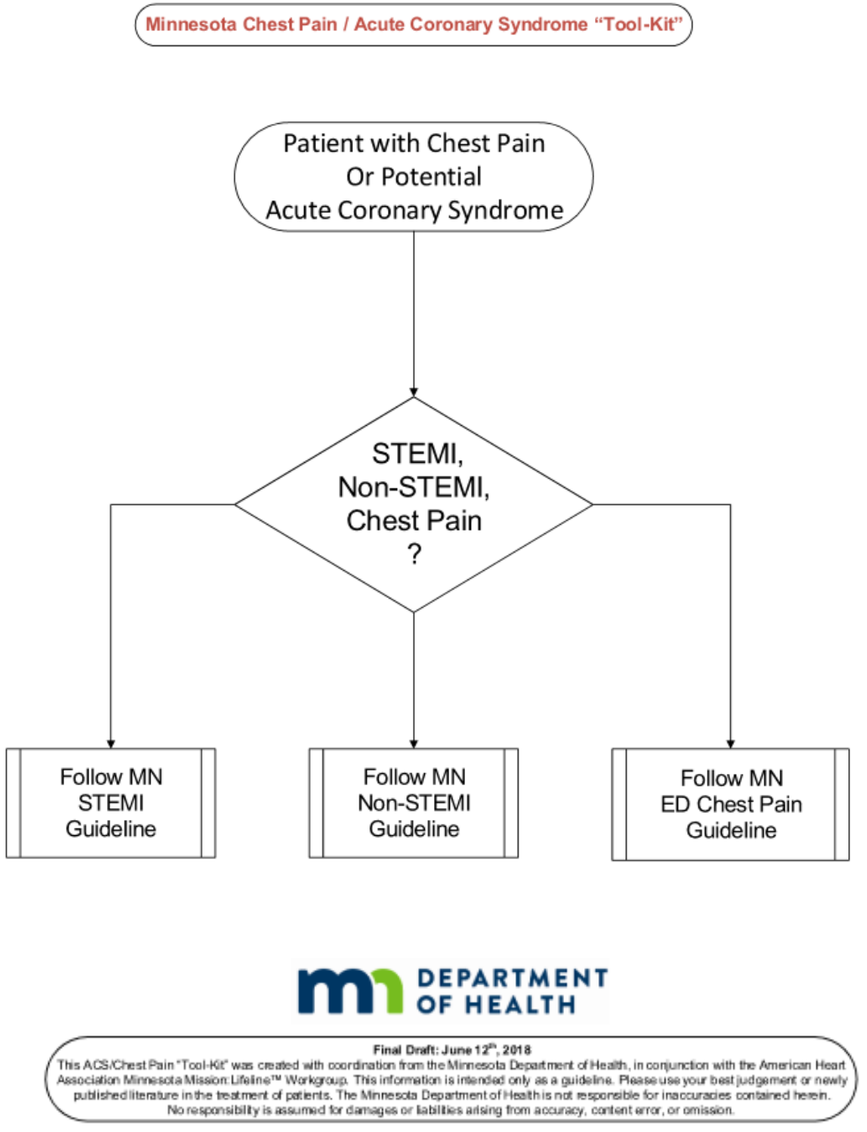
- Minnesota Department of Health (MDH) Cardiovascular Unit facilitated this work group in 2017 and in 2018 began work around **developing a Non-STEMI ACS toolkit for the state**

- There was representation from both rural and metro areas, with a goal of defining an algorithm and supportive decision making tools to guide care of patients presenting with acute coronary syndrome and Non-STEMI

- The scope of this project expanded to include:
  - Chest pain stratification and triage (**including low risk**)
  - Shared decision making resources
  - NSTEMI Treatment Guideline
  - Future STEMI Guideline update if/when national guidelines are updated

Vision for Minnesota ACS/Chest Pain Care:

- STEMI
  - Primary PCI
  - Fibrinolytics
- Non-STEMI
  - Early Invasive Strategy
  - Conservative / Medical Strategy
- Chest Pain
  - Moderate to High Risk
  - Low Risk



https://www.health.state.mn.us/diseases/cardiovascular/stemi/stemicenters.html

Minnesota Chest Pain / Acute Coronary Syndrome "Tool-Kit"

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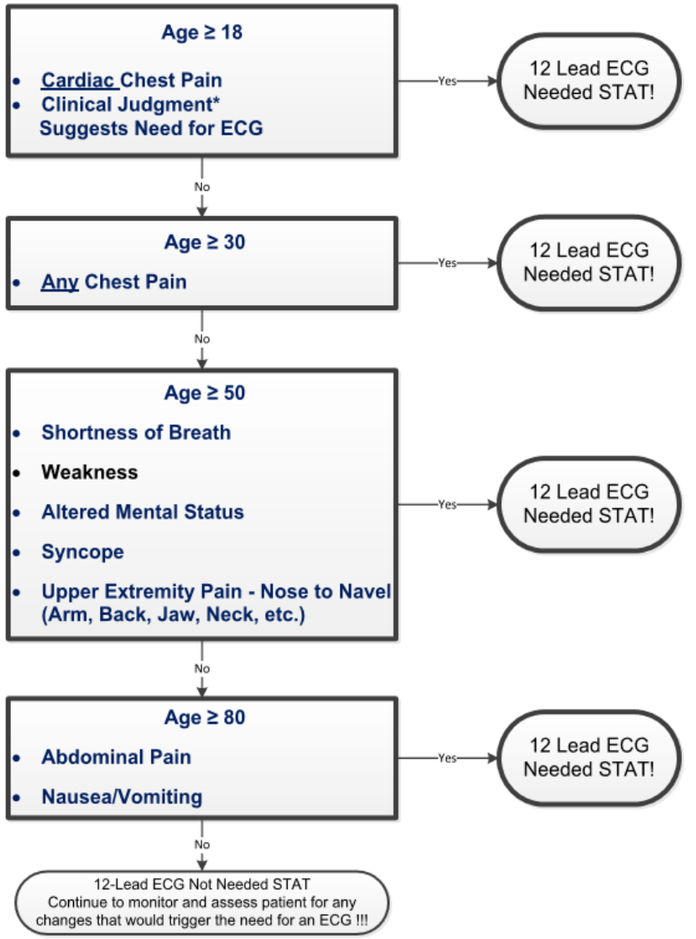
Who Needs A Stat 12-Lead ECG?



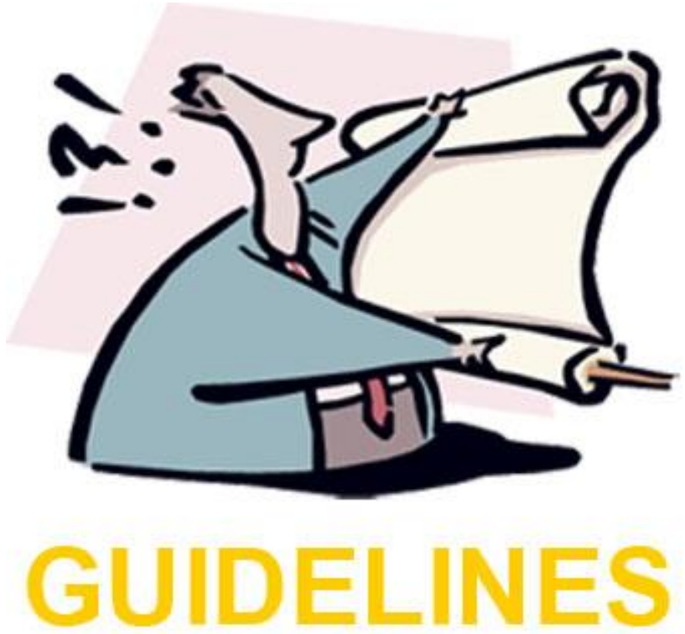
*Clinical Judgment requires assessment beyond the chief complaint. This list of rules is simply a guide. Clinical history, and evaluation of multiple symptoms beyond chest pain, may be present that should trigger concern for potential Acute Coronary Syndrome. Some of these include things like: Pressure, Discomfort, Tightness, Radiating Pain, Pounding, Racing, Beating Fast, Sweating, etc. Be suspicious of patients with cardiac risk factors, like high blood pressure, high cholesterol, diabetes, smoking history, and patient's with a known cardiac history or with recent cardiac surgery or intervention.

If in doubt, always err on the side of caution, and obtain a STAT 12-Lead ECG!

*Based on over 3.5 million ED visits

Adapted from: Development and Validation of a Prioritization Rule for Obtaining an Immediate 12-lead Electrocardiogram in the Emergency Department to Identify ST-elevation Myocardial Infarction Seth W. Glickman, MD, MBA, Frances S. Shofer, PhD, Michael C. Wu, PhD, Matthew J. Scholer, MD, PhD, Adanma Ndubuizu, MD, MPH, Eric D. Peterson, MD, MPH, Christopher B. Granger, MD, Charles B. Cairns, MD, Lawrence T. Glickman, VMD, DrPH, Chapel Hill, Durham, NC. Am Heart J. 2012;163(3):372-382.

What Do The Guidelines Say About Low Risk Chest Pain Patients Presenting to the Emergency Department?



AHA Scientific Statement

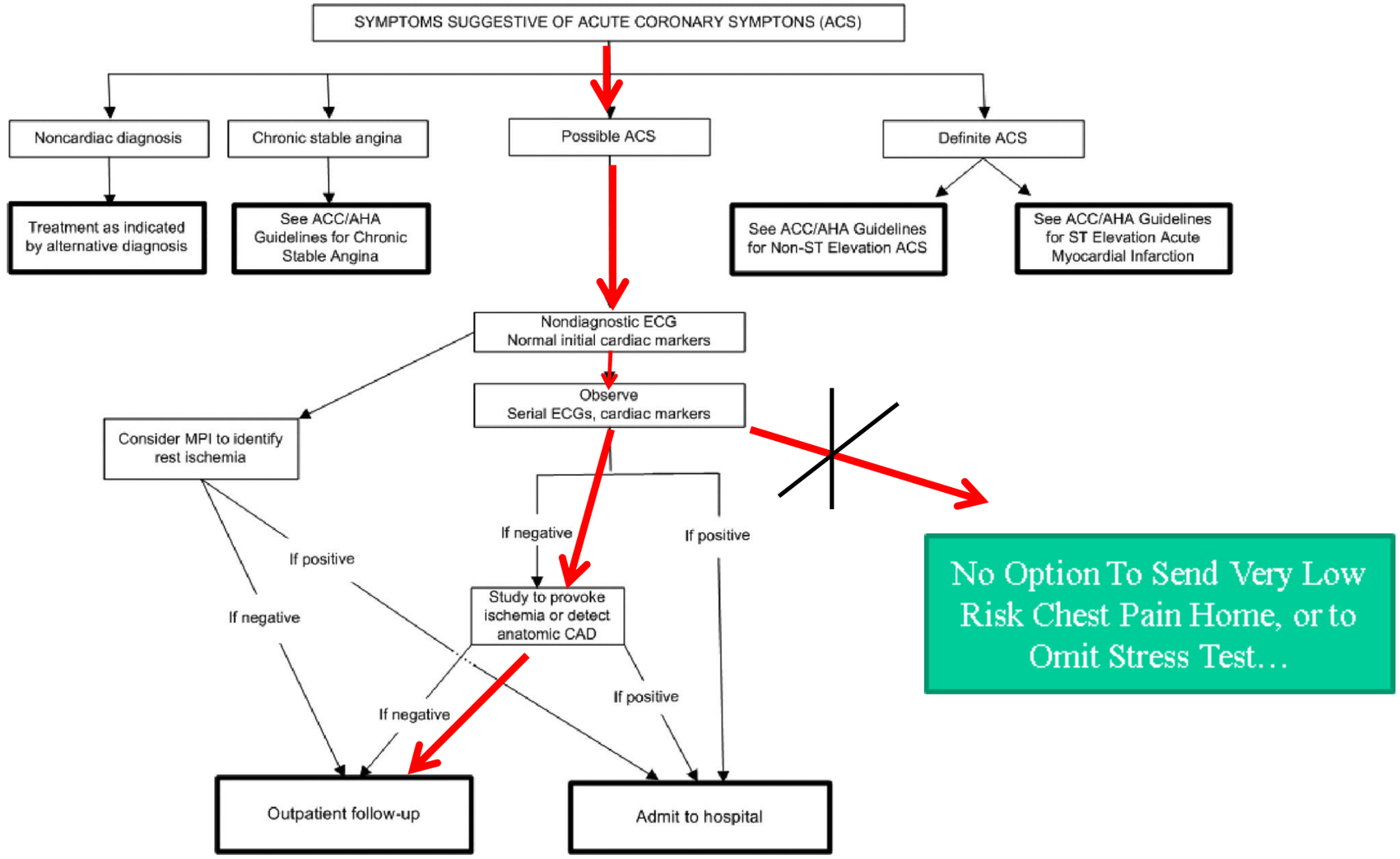
Testing of Low-Risk Patients Presenting to the Emergency Department With Chest Pain

A Scientific Statement From the American Heart Association

Ezra A. Amsterdam, MD, Chair; J. Douglas Kirk, MD, Co-Chair; David A. Bluemke, MD, FAHA; Deborah Diercks, MD; Michael E. Farkouh, MD; J. Lee Garvey, MD; Michael C. Kontos, MD; James McCord, MD; Todd D. Miller, MD, FAHA; Anthony Morise, MD, FAHA; L. Kristin Newby, MD; Frederick L. Ruberg, MD; Kristine Anne Scordo, PhD, RN, ACNP-BC; Paul D. Thompson, MD, FAHA; on behalf of the American Heart Association Exercise, Cardiac Rehabilitation, and Prevention Committee of the Council on Clinical Cardiology, Council on Cardiovascular Nursing, and Interdisciplinary Council on Quality of Care and Outcomes Research

Abstract—The management of low-risk patients presenting to emergency departments is a common and challenging clinical problem entailing 8 million emergency department visits annually. Although a majority of these patients do not have a life-threatening condition, the clinician must distinguish between those who require urgent treatment of a serious problem and those with more benign entities who do not require admission. Inadvertent discharge of patients with acute coronary syndrome from the emergency department is associated with increased mortality and liability, whereas inappropriate admission of patients without serious disease is neither indicated nor cost-effective. Clinical judgment and basic clinical tools (history, physical examination, and electrocardiogram) remain primary in meeting this challenge and affording early identification of low-risk patients with chest pain. Additionally, established and newer diagnostic methods have extended clinicians' diagnostic capacity in this setting. Low-risk patients presenting with chest pain are increasingly managed in chest pain units in which accelerated diagnostic protocols are performed, comprising serial electrocardiograms and cardiac injury markers to exclude acute coronary syndrome. Patients with negative findings usually complete the accelerated diagnostic protocol with a confirmatory test to exclude ischemia. This is typically an exercise treadmill test or a cardiac imaging study if the exercise treadmill test is not applicable. Rest myocardial perfusion imaging has assumed an important role in this setting. Computed tomography coronary angiography has also shown promise in this setting. A negative accelerated diagnostic protocol evaluation allows discharge, whereas patients with positive findings are admitted. This approach has been found to be safe, accurate, and cost-effective in low-risk patients presenting with chest pain. (*Circulation*. 2010;122:1756-1776.)

Evaluation of patients presenting with symptoms suggestive of ACS. ACC indicates American College of Cardiology; AHA, American Heart Association.



Amsterdam E A et al. Circulation 2010;122:1756-1776

Stress Testing Availability

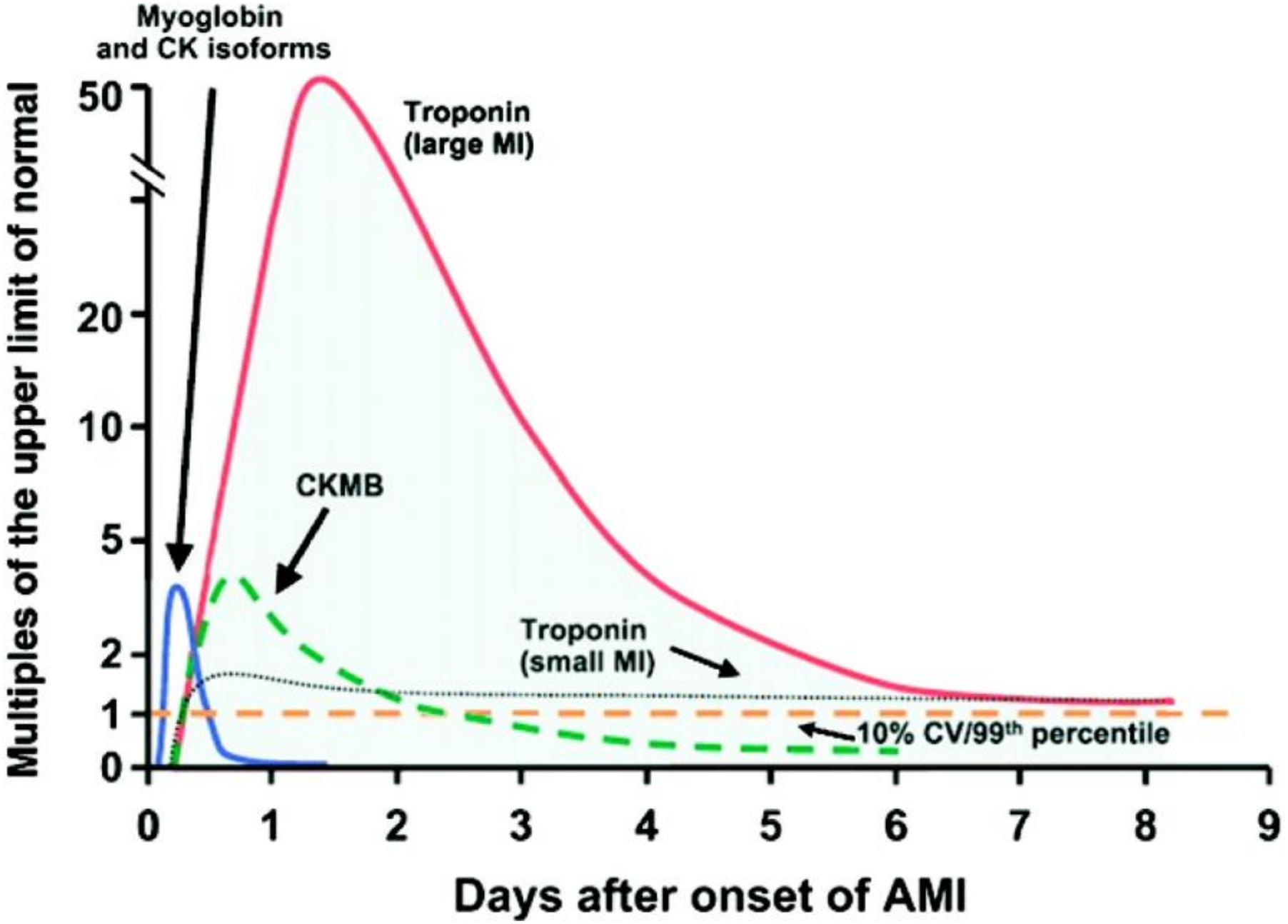
Not Everyone Needs A Stress Test!

- The future may “**back off**” on need for stress testing

- “Although avoiding false negatives is a noble aim, the frequently cited statistic that 2% of patients presenting with chest pain are inappropriately discharged from the emergency department is based on 1993 data collected prior to recent advances in biomarker testing…
- …Thus, the historical circumstances that provide impetus for our current practice may no longer be applicable."

Prasad V, Cheung M, Cifu A, et al. Chest pain in the emergency department: The case against our current practice of routine noninvasive testing. Arch Intern Med 2012; DOI:10.1001/archinternmed.2012.4037. Available at: http://archinte.jamanetwork.com/journal.aspx.

who did not have signs of STEMI on ECG. For emergency department patients with a presenting complaint consistent with ACS, high-sensitivity cardiac troponin T (hs-cTnT) and cardiac troponin I (cTnI) measured at 0 and 2 hours should not be interpreted in isolation (without performing clinical risk stratification) to exclude the diagnosis of ACS. In contrast, high-sensitivity cardiac troponin I (hs-cTnI), cTnI, or cardiac troponin T (cTnT) may be used in conjunction with a number of clinical scoring systems to identify patients at low risk for 30-day major adverse cardiac events (MACE) who may be safely discharged from the emergency department.


Myoglobin
and CK isoforms
Troponin
(large MI)
CKMB
Troponin
(small MI)
10% CV/99th percentile
Multiples of the upper limit of normal
50
20
10
5
2
1
0
0
1
2
3
4
5
6
7
8
9
Days after onset of AMI

Biomarkers in ACS…
Without *a formal risk assessment*

- Two observational studies used troponin (cTnI, cTnT, or hscTnT) measured at 0 and 2 hours to assess whether patients could be safely discharged from the ED
- ACS would have been missed in 2.5% to 7.8% of the patients studied
  - A formal risk assessment instrument was not used in either of these 2 studies

2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, or attached Highlights document; Newman, et al.; (Circulation. 2015;132[suppl 2]:S315–S367. DOI: 10.1161/CIR.0000000000000252.)

Clinical Decision Rules Along With Troponin Measurements

- Six additional observational studies combined troponin testing (using cTnI, cTnT, hs-cTnI, or hs-cTnT) with use of clinical decision rules such as:
  - TIMI
  - Vancouver
  - North American
  - HEART
- The proportion of false-negative results among patients with 30-day MACE ranged from 0% to 1.2%
  - When the age cutoff for low-risk patients was increased from 50 years to 60 years for the North American Chest Pain Rule, the proportion of false-negative results rose from 0% to 1.1%

2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, or attached Highlights document; Newman, et al.; (Circulation. 2015;132[suppl 2]:S315–S367. DOI: 10.1161/CIR.0000000000000252.)

Chest Pain "Rule-Outs" Need **BOTH** a Troponin & a Risk Score

- We recommend against using hs-cTnT and cTnI alone measured at 0 and 2 hours (without performing clinical risk stratification) to identify patients at low risk for ACS
  - (Class III:Harm, LOE B-NR).

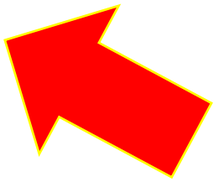
- We recommend that hs-cTnI measurements that are less than the 99th percentile, measured at 0 and 2 hours, may be used together with low-risk stratification (TIMI score of 0 or 1 or low risk per Vancouver rule) to predict a less than 1% chance of 30-day MACE
  - (Class IIa, LOE B-NR).

- We recommend that negative cTnI or cTnT measurements at 0 and between 3 and 6 hours may be used together with very low-risk stratification (TIMI score of 0, low-risk score per Vancouver rule, North American Chest Pain score of 0 and age less than 50 years, or low-risk **HEART score**) to predict a less than 1% chance of 30-day MACE
  - (Class IIa, LOE B-NR).

2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, or attached Highlights document; Newman, et al.; (Circulation. 2015;132[suppl 2]:S315–S367. DOI: 10.1161/CIR.0000000000000252.)

What are some of the scoring methods currently used? (Backus et al. 2011)*

RISK SCORE	YEAR OF PUBLICATION	SCORE RANGE	SCORE PREDICTS	C-STATISTIC OF ORIGINAL STUDY
PURSUIT	2000	1 - 18	Risk of Death or death/MI at 30 days after admission	0.84 (death) and 0.67 (death/MI)
TIMI	2000	0 - 7	Risk of all cause mortality, MI, and severe recurrent ischemia requiring urgent revascularization within 14 days after admission	0.65
GRACE	2003	1 - 372	Risk of hospital death and post-discharge death at 6 months	0.83
FRISC	2004	0 - 7	Treatment effect of early invasive strategies in ACS	0.77 (death) and 0.7 (death/MI)
HEART	2008	0 - 10	Prediction of combined endpoint of MI, PCI, CABG or death within 6 weeks after presentation	0.90



Backus BE, Six AJ, Kelder JC, et al. Chest pain the emergency room. A multicenter validation of the HEART score. Crit Pathw Cadiol 2010;9:164-169.

What is the applicability of each score to clinical practice in the ED?

- **PURSUIT:** Does not include troponin assays as part of score and the majority of the score is dependent on patient age.
- **TIMI:** Simple to use, but has a poor predictive power (i.e. c-statistic 0.65)
- **GRACE:** Very complex to use and a large portion of the score is dependent on the patient age. Also patients not divided into different risk groups
- **FRISC:** Like TIMI, is simple to use but has a poor predictive power (i.e. c-statistic 0.70)

- All of the above scores are well validated, but none of them emphasizes patient history as part of the score
- The HEART Score does incorporate history and clinical judgement

The New Opportunity Today

- Utilization of the HEART Score will allow more low-risk chest pain patients to be discharged, without non-invasive stress testing
  - Reducing costs, and need for hospital resources
  - Better patient experience

Original HEART Score from 2008

(Six, Backus, and J C Kelder, 2008)

The HEART Score for Chest Pain Patients in the ED		
History	• Highly Suspicious • Moderately Suspicious • Slightly or Non-Suspicious	• 2 points • 1 point • 0 points
ECG	• Significant ST-Depression • Nonspecific Repolarization • Normal	• 2 points • 1 point • 0 points
Age	• ≥ 65 years • > 45 - < 65 years • ≤ 45 years	• 2 points • 1 point • 0 points
Risk Factors	• ≥ 3 Risk Factors or History of CAD • 1 or 2 Risk Factors • No Risk Factors	• 2 points • 1 point • 0 points
Troponin	• ≥ 3 x Normal Limit • > 1 - < 3 x Normal Limit • ≤ Normal Limit	• 2 points • 1 point • 0 points
Risk Factors: DM, current or recent (<one month) smoker, HTN, HLP, family history of CAD, & obesity		
Score 0 – 3: 2.5% MACE over next 6 weeks → Discharge Home **Score 4 – 6:** 20.3% MACE over next 6 weeks → Admit for Clinical Observation **Score 7 – 10:** 72.7% MACE over next 6 weeks → Early Invasive Strategies		

Neth Heart J. 2008 Jun;16(6):191-6.

The Heart Score

- Backus, et al, 2008

Risk Level	End Point	Percentage Reached Endpoint
Low	1/39	2.5%
Moderate	12/59	20.3%
High	16/22	72.7%

Neth Heart J. 2008 Jun;16(6):191-6.

Original Article

The Chest Pain Choice Decision Aid
A Randomized Trial

Erik P. Hess, MD; Meghan A. Knoedler, RN; Nilay D. Shah, PhD; Jeffrey A. Kline, MD; Maggie Breslin, MDes; Megan E. Branda, MS; Laurie J. Pencille, RN; Brent R. Asplin, MD, MPH; David M. Nestler, MD; Annie T. Sadosty, MD; Ian G. Stiell, MD; Henry H. Ting, MD, MBA; Victor M. Montori, MD

Background—Cardiac stress testing in patients at low risk for acute coronary syndrome is associated with increased false-positive test results, unnecessary downstream procedures, and increased cost. We judged it unlikely that patient preferences were driving the decision to obtain stress testing.

Methods and Results—The Chest Pain Choice trial was a prospective randomized evaluation involving 204 patients who were randomized to a decision aid or usual care and were followed for 30 days. The decision aid included a 100-person pictograph depicting the pretest probability of acute coronary syndrome and available management options (observation unit admission and stress testing or 24–72 hours outpatient follow-up). The primary outcome was patient knowledge measured by an immediate postvisit survey. Additional outcomes included patient engagement in decision making and the proportion of patients who decided to undergo observation unit admission and cardiac stress testing. Compared with usual care patients (n=103), decision aid patients (n=101) had significantly greater knowledge (3.6 versus 3.0 questions correct; mean difference, 0.67; 95% CI, 0.34–1.0), were more engaged in decision making as indicated by higher OPTION (observing patient involvement) scores (26.6 versus 7.0; mean difference, 19.6; 95% CI, 1.6–21.6), and decided less frequently to be admitted to the observation unit for stress testing (58% versus 77%; absolute difference, 19%; 95% CI, 6%–31%). There were no major adverse cardiac events after discharge in either group.

Conclusions—Use of a decision aid in patients with chest pain increased knowledge and engagement in decision making and decreased the rate of observation unit admission for stress testing.

Clinical Trial Registration—URL: http://www.clinicaltrials.gov. Unique identifier: NCT01077037.

(***Circ Cardiovasc Qual Outcomes*. 2012;5:251-259.**)

What's Next?

Prepared for: _____

1 Your Chest Pain Diagnosis

Our initial evaluation has NOT shown any evidence of a heart attack. This conclusion is based on a blood test (to look for troponins — enzymes that are released when the heart muscle is damaged) and an electrocardiogram (to check that your heart is getting enough oxygen and blood). Over the next five hours, two additional blood tests (troponins) will be taken to definitively rule out a heart attack.

However, even if these tests do confirm our diagnosis, your chest pain may indicate possible warning signs of a FUTURE heart attack.

2 Further Tests

A STRESS TEST EVALUATION may more precisely determine if your heart is functioning correctly by viewing blood flow to your heart while at rest and under stress.

Examining your risk will help you to determine whether you would like to have a stress test now or would like assistance in making a clinic appointment.[1]

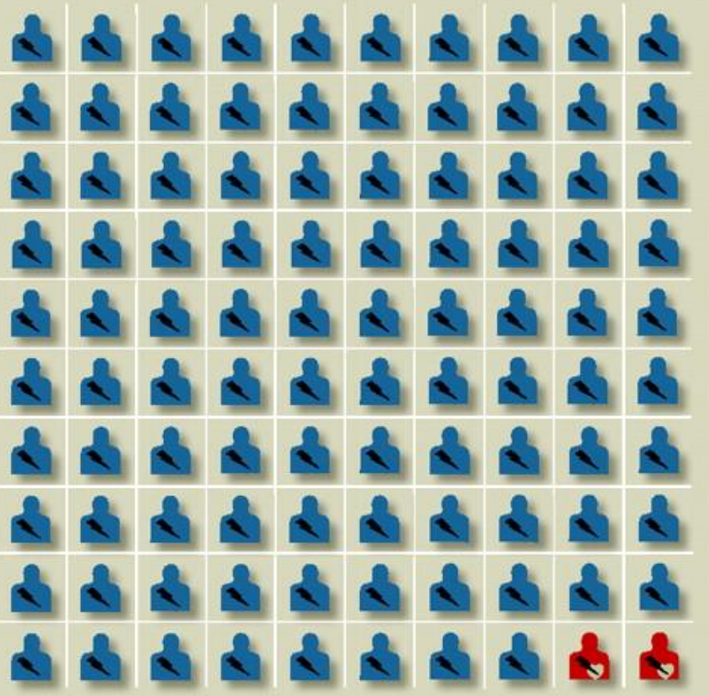
3 Your Personal Risk Evaluation

Your risk of having a heart attack or of having a pre-heart attack diagnosis within the next 45 days can be determined by comparing you to people with similar factors[2] who also came to the Emergency Department with chest pain.

Of every 100 people with factors like yours who came to the emergency department with chest pain...

2 had a heart attack or a pre-heart attack diagnosis within 45 days of their emergency department visit,

98 did not.



4 Would You Like to Have a Stress Test Now or Make an Appointment?

- ❑ **I would like to be admitted to the observation unit to have an urgent cardiac stress test.** I realize that this could add to the cost of my evaluation and lengthen my emergency stay.
- ❑ **I would like to be seen by a Mayo Clinic heart doctor within 24-72 hours** and would like assistance in scheduling this appointment.
- ❑ **I would like to schedule an appointment on my own** to consult with my primary care physician.
- ❑ **I would like my emergency department doctor to make this decision for me.**

[1]Stress test options include nuclear stress testing, ultrasound stress testing, and exercise ECG (electrocardiogram) stress testing. Nuclear stress testing includes exposure to radiation which has been shown to be related to increased cancer risk over a lifetime. Your doctor can help you explore which option may be best for you.

[2]
- Age
- Gender
- Race
- If chest pain is made worse when manual pressure is applied to the chest area
- If there is a history of coronary artery disease
- If the chest pain causes perspiration
- Findings on electrocardiograms (electronic tracings of the heart)
- Initial cardiac troponin T result

American Heart Association.

Erik P. Hess et al. Circ Cardiovasc Qual Outcomes. 2012;5:251-259

The Chest Pain Choice Decision Aid
A Randomized Trial

Table 3.

Management and Thirty-Day Outcomes

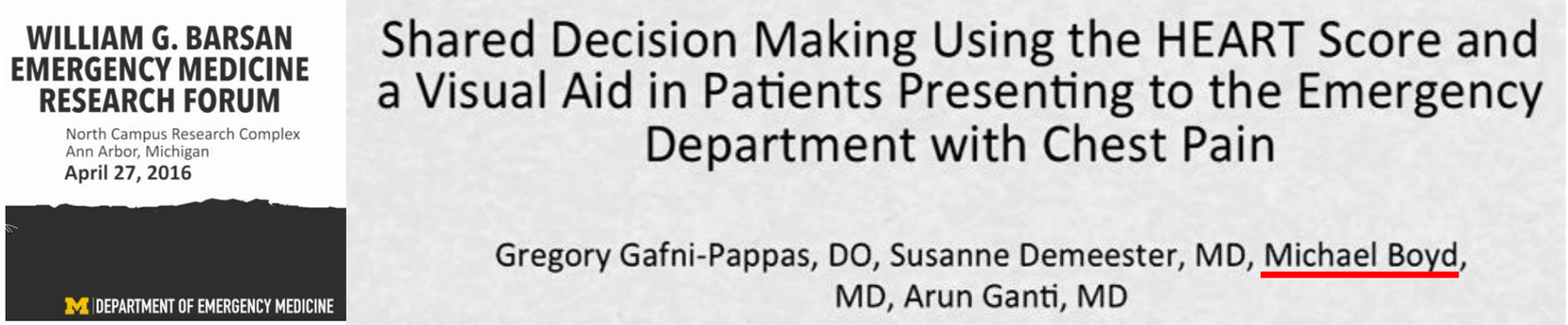
Characteristic	Decision Aid	Usual Care	*P* Value
Management			
Cardiac stress testing performed*	75 (75)	94 (91)	0.0024
Exercise treadmill testing	33 (44)	53 (56)	0.0073
Stress echocardiography	24 (32)	20 (21)	0.4982
Nuclear perfusion testing	16 (21)	21 (22)	0.4687
Coronary angiography performed	7 (7)	9 (9)	0.7958
Coronary revascularization	3 (3)	2 (2)	0.6782
Percutaneous coronary intervention	2 (2)	2 (2)	≈1
Coronary artery bypass grafting	1 (1)	0 (0)	0.4951
Outcomes			
Management decision			<0.0001
Observation unit admission and cardiac stress testing	58 (58)	77 (77)	
Follow-up with a cardiologist	26 (26)	2 (2)	
Follow-up with a primary-care physician	13 (13)	7 (7)	
Let emergency physician decide	3 (3)	14 (14)	
Admitted to the hospital	6 (6)	6 (6)	0.9721
Repeat emergency department visit	3 (3)	0 (0)	0.1195
Rehospitalization	2 (2)	0 (0)	0.2439
Cardiac events			
Acute myocardial infarction	1 (1)	0 (0)	0.4975
Death of cardiac or unknown cause	0	0	
Major adverse cardiac event within 30 d†	0	0	

Data are presented as n (%).

* Within 30 d of the emergency department visit.

† Excluding the index event.

Erik P. Hess et al. Circ Cardiovasc Qual Outcomes. 2012;5:251-259



American College of Emergency Physicians®
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ACEP
QUALITY
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SECTION

- Winners of the 2016 ACEP Quality Improvement & Patient Safety (QIPS) Resident Quality Award

https://www.acep.org/content.aspx?id=107285

https://www.youtube.com/watch?v=-tn_oAMwl2c

ST. JOSEPH MERCY ANN ARBOR
Saint Joseph Mercy Health System

What's Next?

Low Risk
Chest Pain Patients

1 Your Chest Pain Diagnosis

Our testing so far has NOT shown any evidence of a heart attack. This is based on a blood test, an electrocardiogram (ECG), your exam, and your risk factors[1]. It is recommended that a repeat blood test and ECG be performed during your emergency department visit to further rule out a heart attack.

However, even if everything today is normal, your chest pain may be an early warning sign of possible FUTURE heart attack or heart complication.

2 Further Evaluation

Further evaluation and testing will help check if your heart is working correctly. Understanding your risk of having a heart attack or heart complication can help decide how to best proceed with your care in the Emergency Department.

3 Your Personal Risk Evaluation

If your repeat blood test is negative, your risk of having a heart attack or heart complication within the next 30 days can be determined by comparing you to people with similar factors who also came to the Emergency Department with chest pain.

Of every **100** people with factors like yours who came to the Emergency Department with chest pain...

One had a heart attack or a heart complication within 30 days of their Emergency Department visit, **99 did not.**

4 The Next Step

- ☐ We feel it is safe for you to be discharged home and follow-up with your doctor in 3-5 days. If you do not have a doctor, please inform your emergency provider before discharge.
- ☐ Although your risk is low, we recommend you stay for observation and further testing. This will increase your length of stay in the Emergency Department and/or Hospital.

[1] Factors used to determine your risk:
- History
- ECG
- Age
- Risk Factor for heart disease

I was explained and understand my Personal Risk Evaluation as well as the importance of follow up. If my symptoms worsen or I am unable to get follow up within 1 week, I will return to the ED.

Patient/Caregiver Signature	Date	Time
Provider Signature	Date	Time

32.7% Reduction in Observation Unit Admissions (U of Michigan)

Fisher's Exact Test P<0.001

Results

	2014	Pilot Phase
# Patients p/w Chest Pain	4791	132
Admitted Inpatient	148 (3.1%)	0
Direct to Cath	153 (3.2%)	0
EOC (Observation)	2716 (56.6%)	34 (25.7%)
Discharge	1927 (40.2%)	98 (74.24%)

DEPARTMENT OF EMERGENCY MEDICINE

https://www.acep.org/content.aspx?id=107285

The University of **Maryland** Medical System built on the HEART score*

- Patients with chest pain that is considered low-risk for acute coronary syndrome (ACS) are a disposition challenge for emergency physicians
  - Many factors affect the decision to admit or discharge, such as the availability of hospital beds or ED observation units, the willingness of in-house physicians to admit, the level of risk-acceptance by the emergency physician, and published practice standards from the American Heart Association [1]

- A **medically-sensible and defensible** approach to care has been needed for quite some time

*Oct. 2015. http://epmonthly.com/article/beyond-heart-building-a-better-chest-pain-protocol/

1.Amsterdam EA, Kirk JD, Bluemke DA, et al. Testing of low-risk patients presenting to the emergency department with chest pain. A scientific statement from the American Heart Association. Circulation 2010;122:1756-1776

The guideline was incorporated into clinical practice in the **University of Maryland** Emergency Medicine System in February 2015

- Feedback from the medical directors at each hospital has been that there has been a reduction in chest pain hospitalizations without known major adverse cardiac events

- One of the busiest EDs reported a **22% reduction in patients placed in observation status**
  - Informal surveys of patient satisfaction with this protocol are positive

- Physicians and risk managers have been extremely happy with the potential legal protection that the protocol affords
  - We feel this combination of tools not only reduces the number of hospitalizations, but also helps emergency physicians determine which patients are most appropriate to discharge and provides excellent medical decision-making that can be documented within the medical record

Oct. 2015. http://epmonthly.com/article/beyond-heart-building-a-better-chest-pain-protocol/

THE UNIVERSITY OF MARYLAND
LOW PROBABILITY ACS PROTOCOL

- Obtain an ECG at the time of arrival, and repeated along with each troponin, or if symptoms change
  - If evolving changes are noted on the repeat ECGs, the patient is judged higher risk and admitted

- Determine a HEART score for patients presenting with chest pain after the first troponin value has resulted

- If the patient has a HEART Score of 0-3 and a negative initial troponin, have a discussion with the patient utilizing the Shared Medical Decision-Making document
  - Inform the patient that based on validated studies, there is a less than 2% chance of an adverse cardiac event within the next 4-6 weeks

http://epmonthly.com/article/beyond-heart-building-a-better-chest-pain-protocol/

What's Next?

UNIVERSITY of MARYLAND MEDICAL SYSTEM

1 Your Chest Pain Diagnosis

Our testing so far has NOT shown any evidence of a heart attack. This is based on a blood test, an electrocardiogram (ECG), your exam, and your risk factors.[1] It is recommended that a repeat blood test and ECG be performed during your emergency department visit to further rule out a heart attack.

However, even if everything today is normal, your chest pain may be an early warning sign of a possible FUTURE heart attack or heart complication.

2 Further Evaluation

Further evaluation and testing will help check if your heart is working correctly. Understanding your risk of having a heart attack or heart complication can help decide how to best proceed with your care in the Emergency Department.

[1] Factors used to determine your risk:
- History
- ECG
- Age
- Risk Factors for heart disease
- Troponin

3 Your Personal Risk Evaluation

If your repeat blood test is negative, your risk of having a heart attack or heart complication within the next 30 days can be determined by comparing you to people with similar factors[1] who also came to the Emergency Department with chest pain.

Of every

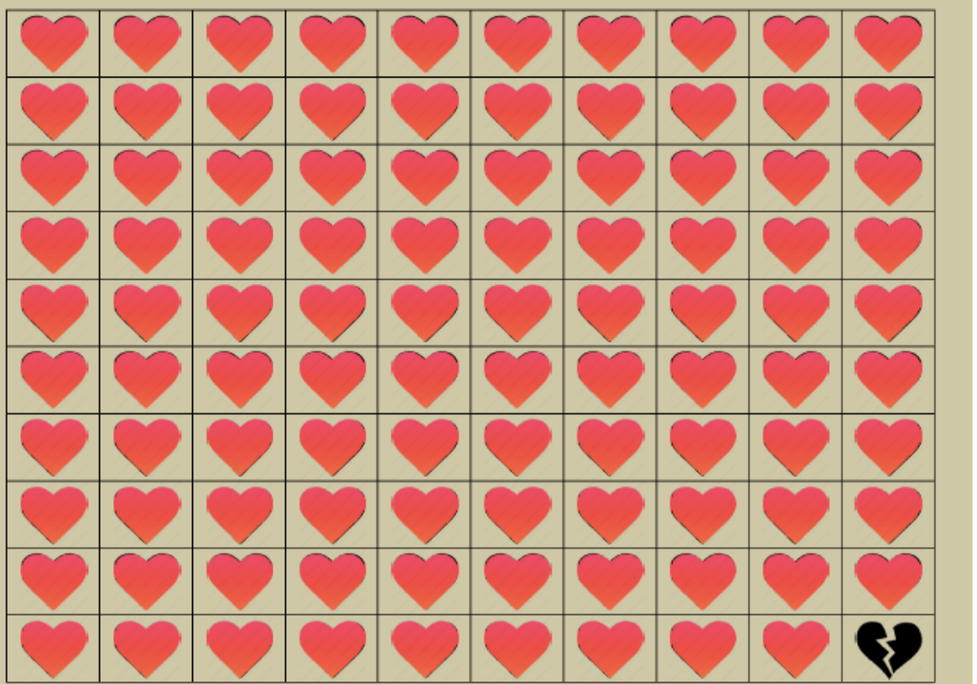
100

people with factors like yours who came to the Emergency Department with chest pain…

1

had a heart attack or a heart complication within 30 days of their Emergency Department visit,

99
did not.



4 Would You Like to Have Further Testing Now or Would You Like to Make an Appointment?

☐ I would like a repeat blood test and if negative, be discharged for follow-up with a primary care physician or cardiologist

☐ I would like to be placed in observation for further testing. I understand this will increase my length of stay in the emergency department and/or hospital.

☐ I will decline a repeat blood test and will follow up with a primary care doctor or cardiologist. I understand that my risk for a heart attack or heart complication increases to about 2 out of every 100 patients by doing so.

I was explained and understand my Personal Risk Evaluation as well as the importance of follow up. If my symptoms worsen or I am unable to get follow up within 1 week, I will return to the ED.

Patient/Caregiver Signature _____ Date _____ Time _____

Provider Signature _____ Date _____ Time _____

http://epmonthly.com/article/beyond-heart-building-a-better-chest-pain-protocol/

The patient chooses amongst the three options listed in the Shared Medical Decision-Making document

- The patient can be offered, and may elect to remain for, a second troponin test and ECG obtained at hour three of the ED stay
  - If that troponin is negative as well, the patient can be informed that the risk of adverse cardiac event has been lowered to < 1% at 4 weeks
  - If the second troponin is increased by at least 20% and positive, the patient should be hospitalized for further evaluation
- The patient may elect to be admitted to the hospital or observation unit (based on hospital availability) for observation of occurrence of a cardiac event, or for provocative testing
  - The patient should be given honest information about the resulting length of stay
- The patient may elect to be discharged immediately after having the single troponin value and knowledge of the < 2% risk as described above

http://epmonthly.com/article/beyond-heart-building-a-better-chest-pain-protocol/

Minnesota Low Risk Chest Pain Workgroup Challenge:

Standardize a New, HEART Score Based, ED Low Probability ACS Protocol & Shared Decision Tool Across the State?

HEART Score for Chest Pain Patients		Points
History	Highly Suspicious	2
	Moderately Suspicious	1
	Slightly or Non-Suspicious	0
ECG	Significant ST-Deviation	2
	Nonspecific Repolarization	1
	Normal	0
Age	≥ 65 years	2
	46 to 64 years	1
	≤ 45 years	0
Risk Factors	≥ 3 Risk Factors or History of CAD	2
	1 or 2 Risk Factors	1
	No Risk Factors	0
Troponin	≥ 3x Normal Limit	2
	>1 to <3x Normal Limit	1
	≤ Normal Limit	0
HEART Score = Total Points (0-10):		_____ pts

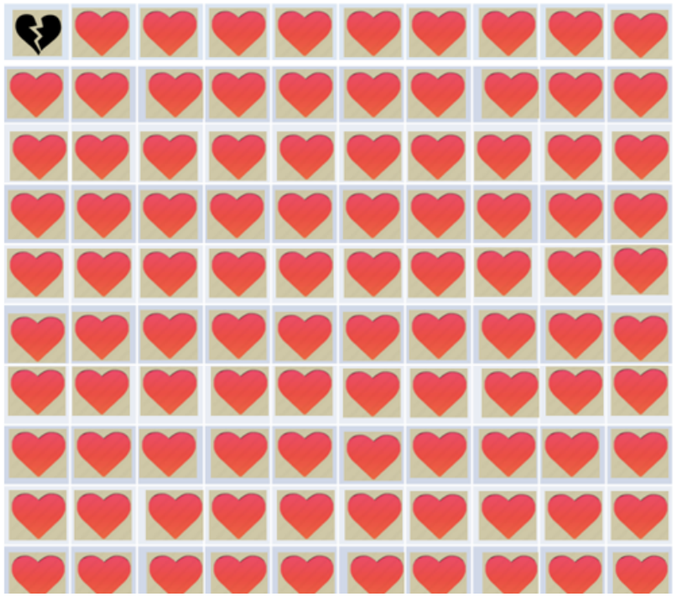
Backus, et al.Neth Heart J. 2008 Jun;16(6):191-6

For Chest Pain patients whom:
Initial ECG and Troponin are negative, and
HEART Score* is **Low Risk**

Of every **100** people with factors* like yours who came to the Emergency Department with chest pain, and had 2 negative ECG and Troponin tests…
…within 30 days of their Emergency Department visit:

Only 1 had a heart attack or a heart complication.

While 99 did not.



The New Opportunity Today

- Utilization of the HEART Score will allow more low-risk chest pain patients to be discharged, without non-invasive stress testing
  - Reducing costs, and need for hospital resources
  - Better patient experience

Validation of HEART Score

…the University of Maryland Medical System decided to develop a system-wide evidence-based guideline that would safely allow ED discharge and outpatient follow-up for patients with low risk ACS

- The external, prospective validation by Backus, et al. demonstrated that of 2388 patients with chest pain, only 1.7% of patients with a score of 0-3 had a major adverse cardiac event within 6 weeks
  - Conclusion: HEART score performed better than TIMI and GRACE scores

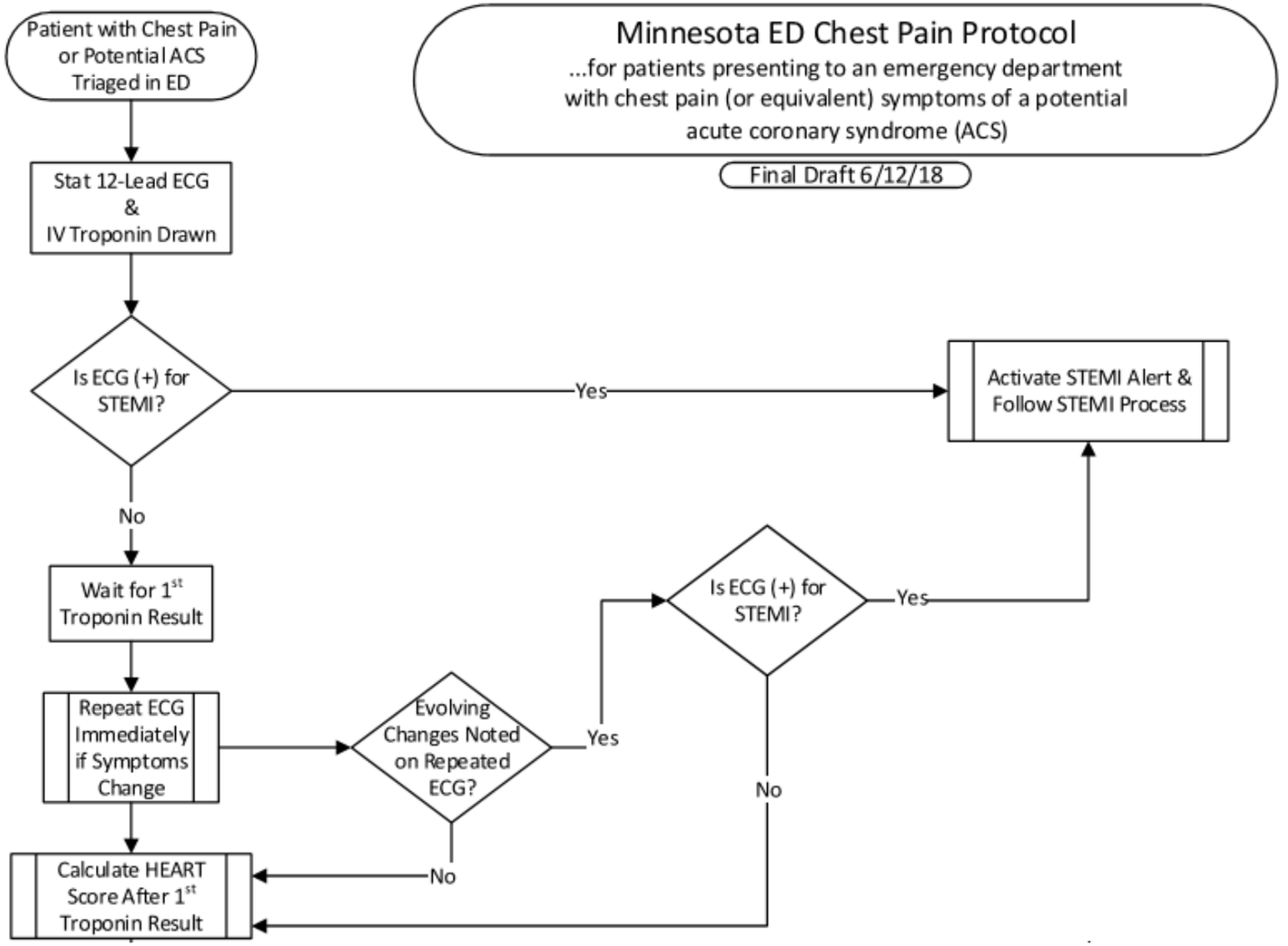
- This proportion was further reduced to <0.6% at 30 days when a second troponin was added at hour 3 in the studies of Mahler, et al.

Oct. 2015. http://epmonthly.com/article/beyond-heart-building-a-better-chest-pain-protocol/

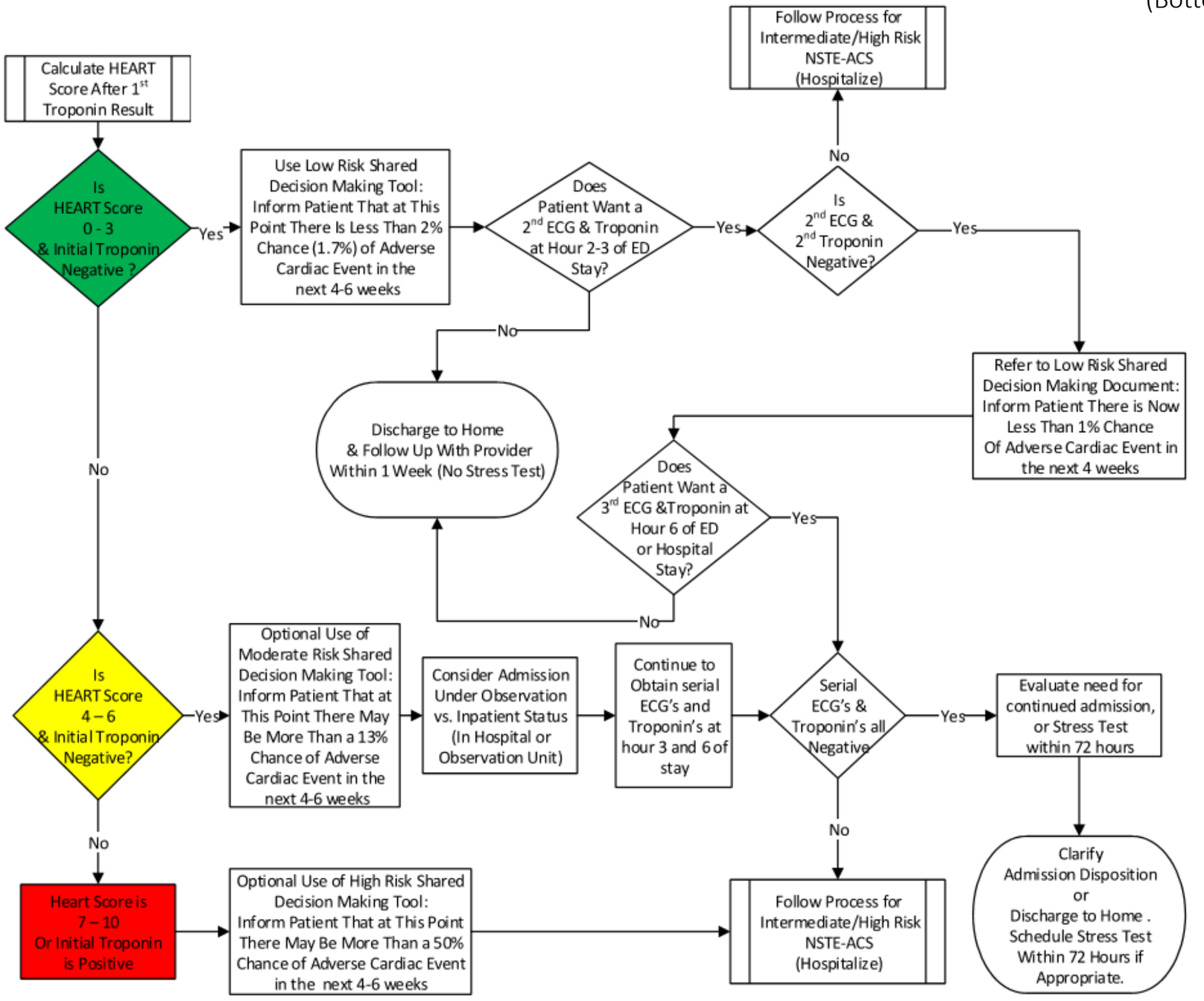
Backus BE, Six AJ, Kelder JC, et al. Chest pain the emergency room. A multicenter validation of the HEART score. Crit Pathw Cadiol 2010;9:164-169.
Backus BE, Six AJ, Kelder JC, et al. A prospective validation of the HEART score for chest pain patients at the emergency department. Int J Cardiol 2013;168:2153-2158.

Mahler SA, Miller CD, Hollander JE, et al. Identifying patients for early discharge: Performance of decision rules among patients with acute chest pain. Int J Cardiol 2013;168:795-802.
Mahler SA, Riley RF, Hiestand BC, et al. The HEART pathway randomized trial. Identifying emergency department patients with acute chest pain for early discharge. Circ Cardiovasc Qual Outcomes 2015;8:195-203.

(Top Half)


Minnesota ED Chest Pain Protocol
...for patients presenting to an emergency department with chest pain (or equivalent) symptoms of a potential acute coronary syndrome (ACS)
Final Draft 6/12/18
Patient with Chest Pain or Potential ACS Triaged in ED
Stat 12-Lead ECG & IV Troponin Drawn
Is ECG (+) for STEMI?
Yes
Activate STEMI Alert & Follow STEMI Process
No
Wait for 1st Troponin Result
Repeat ECG Immediately if Symptoms Change
Evolving Changes Noted on Repeated ECG?
Yes
Is ECG (+) for STEMI?
Yes
No
No
Calculate HEART Score After 1st Troponin Result

(Bottom Half)


Calculate HEART Score After 1st Troponin Result
Is HEART Score 0 - 3 & Initial Troponin Negative ?
Yes
Use Low Risk Shared Decision Making Tool: Inform Patient That at This Point There Is Less Than 2% Chance (1.7%) of Adverse Cardiac Event in the next 4-6 weeks
Does Patient Want a 2nd ECG & Troponin at Hour 2-3 of ED Stay?
Yes
Is 2nd ECG & 2nd Troponin Negative?
Yes
No
Follow Process for Intermediate/High Risk NSTE-ACS (Hospitalize)
No
Refer to Low Risk Shared Decision Making Document: Inform Patient There is Now Less Than 1% Chance Of Adverse Cardiac Event in the next 4 weeks
Discharge to Home & Follow Up With Provider Within 1 Week (No Stress Test)
Does Patient Want a 3rd ECG &Troponin at Hour 6 of ED or Hospital Stay?
Yes
No
No
Is HEART Score 4 – 6 & Initial Troponin Negative?
Yes
Optional Use of Moderate Risk Shared Decision Making Tool: Inform Patient That at This Point There May Be More Than a 13% Chance of Adverse Cardiac Event in the next 4-6 weeks
Consider Admission Under Observation vs. Inpatient Status (In Hospital or Observation Unit)
Continue to Obtain serial ECG's and Troponin's at hour 3 and 6 of stay
Serial ECG's & Troponin's all Negative
Yes
Evaluate need for continued admission, or Stress Test within 72 hours
No
Heart Score is 7 – 10 Or Initial Troponin is Positive
Optional Use of High Risk Shared Decision Making Tool: Inform Patient That at This Point There May Be More Than a 50% Chance of Adverse Cardiac Event in the next 4-6 weeks
Follow Process for Intermediate/High Risk NSTE-ACS (Hospitalize)
Clarify Admission Disposition or Discharge to Home . Schedule Stress Test Within 72 Hours if Appropriate.

What To Expect Next?

1 Your Chest Pain Diagnosis
Initial testing has NOT shown any evidence of a heart attack. This is based on a blood test, an electrocardiogram (ECG), your exam, and your risk factors.*
It is recommended that a repeat blood test (Troponin), and electrocardiogram (ECG) both be performed approximately 2 to 3 hours after initial tests to further rule out a heart attack.
However, even if everything today is normal, your chest pain may still be an early warning sign of a possible FUTURE heart attack or heart complication.

2 Further Evaluation
Further evaluation and testing will help check if your heart is working correctly.
Understanding your risk of having a heart attack or heart complication can help decide how to best proceed with your care in the Emergency Department.

3 Your Personal Risk Evaluation
If a second Troponin blood test and ECG are both negative, your risk of having a heart attack or heart complication within the next 30 days can be determined by comparing you to people with similar factors* who also came to an Emergency Department with chest pain.

4 The Next Step
Another ECG and Troponin blood test should be repeated 2 to 3 hours after your initial blood test, and if they are also negative, your Emergency Department Provider and you may both decide that you could be discharged to home, and recommend you follow up with a primary care provider or cardiologist.

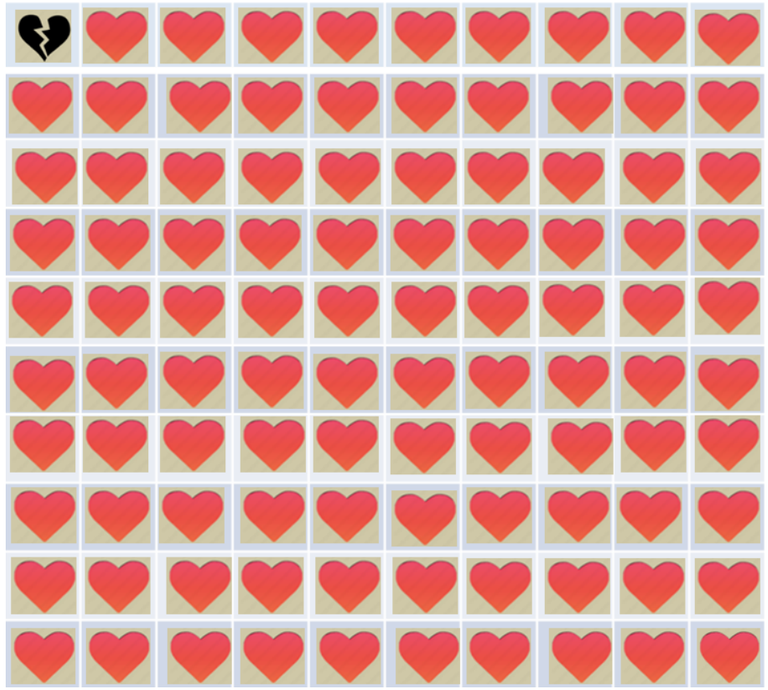
If you refuse, and go home before a second set of tests, your risk for a heart attack may be doubled, up to 2 out of every 100 patients.

For Chest Pain patients whom:
Initial ECG and Troponin are negative, and
HEART Score* is **Low Risk**

Of every **100** people with factors* like yours who came to the Emergency Department with chest pain, and had 2 negative ECG and Troponin tests…
…within 30 days of their Emergency Department visit:

Only **1** had a heart attack or a heart complication.

While **99 did not**.



*Factors used to determine your risk:

History
ECG
Age
Risk Factors for Heart Disease
Troponin

Notes:

This shared decision tool was intended to help you understand your Personal Risk Evaluation.
Even though you might be going home, you need to understand the importance of following up with your primary provider, or a cardiologist within 1 week.

If your chest pain or heart related symptoms return or worsen, you should call 911 or return to the Emergency Department immediately.

What To Expect Next?

1 Your Chest Pain Diagnosis
Initial testing has NOT shown any evidence of a heart attack. This is based on a blood test, an electrocardiogram (ECG), your exam, and your risk factors.*
It is recommended that a repeat blood test (Troponin), and electrocardiogram (ECG) both be performed approximately 2 to 3 hours after initial tests to further rule out a heart attack, and possibly again 3 hours later. However, even if everything today is normal, your chest pain may still be an early warning sign of a possible FUTURE heart attack or heart complication.

2 Further Evaluation
Further evaluation and testing will help check if your heart is working correctly.
Understanding your risk of having a heart attack or heart complication can help decide how to best proceed with your care in the Emergency Department.

3 Your Personal Risk Evaluation
If your second Troponin blood test and ECG are both negative, your risk of having a heart attack or heart complication within the next 30 days can be determined by comparing you to people with similar factors* who also came to an Emergency Department with chest pain.

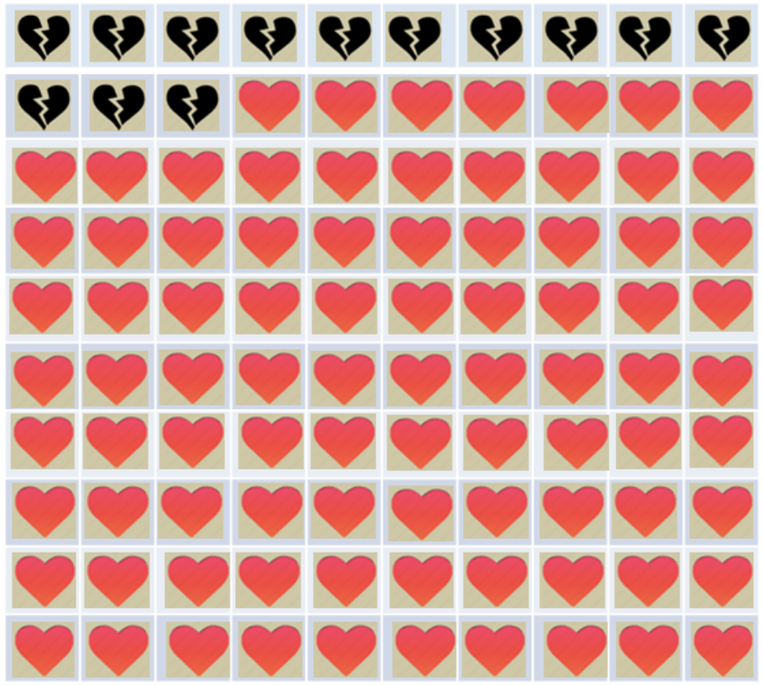
4 The Next Step
You have a moderate (intermediate) risk of a heart attack or complication in the near future.
Your Emergency Department Provider may want you to agree to stay for observation and further testing.
If you decline repeated tests and go home now, your current risk for a heart attack may be even greater than 13 out of 100 patients.

For Chest Pain patients whom:
Initial ECG and Troponin are negative, and
HEART Score* is **Moderate Risk**

Of every **100** people with factors* like yours who came to the Emergency Department with chest pain, and had 2 negative ECG and Troponin tests
…within 30 days of their Emergency Department visit:

13 had a heart attack or a heart complication.

While **87 did not**.



*Factors used to determine your risk:

History
ECG
Age
Risk Factors for Heart Disease
Troponin

Notes:

This shared decision tool was intended to help you understand your Personal Risk Evaluation.
Further observation and testing may be necessary during this visit to the Emergency Department.
If you do end up going home, you may still need further testing as an out-patient.
You need to understand the importance of following up with your primary provider, or a cardiologist, hopefully within 1 week, or whatever is recommended by your Emergency Department Provider.

If you do end up going home, and your chest pain or heart related symptoms return or worsen, you should call 911 or return to the Emergency Department immediately.

What To Expect Next?

1 Your Chest Pain Diagnosis
Our testing so far has NOT shown any evidence of a heart attack. This is based on a blood test, an electrocardiogram (ECG), your exam, and your risk factors.*
It is recommended that a repeat blood test (Troponin), and electrocardiogram (ECG) both be performed approximately 2 to 3 hours after initial tests to further rule out a heart attack, and likely again 3 hours later.
However, even if everything today is normal, your chest pain may still be an early warning sign of a possible FUTURE heart attack or heart complication.

2 Further Evaluation
Further evaluation and testing will help check if your heart is working correctly.
Understanding your risk of having a heart attack or heart complication can help decide how to best proceed with your care in the Emergency Department.

3 Your Personal Risk Evaluation
If your second Troponin blood test and ECG are both negative, your risk of having a heart attack or heart complication within the next 30 days can be determined by comparing you to people with similar factors* who also came to an Emergency Department with chest pain.

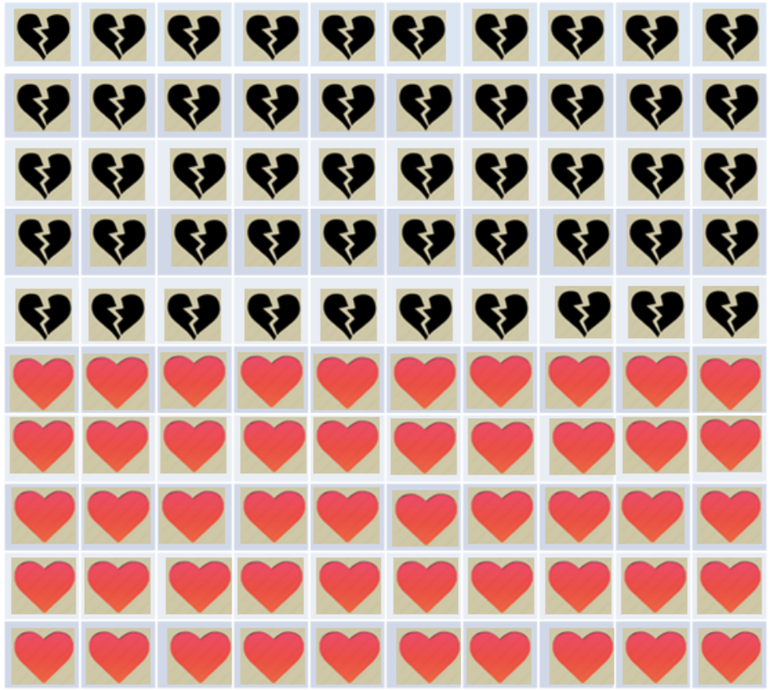
4 The Next Step
You have a high risk of a heart attack or complication in the near future.
Your Emergency Department Provider will likely recommend you stay for observation and further testing.
If you decline repeated tests and go home now, your current risk for a heart attack may be even greater than 50 out of every 100 patients.

For Chest Pain patients whom:
Initial ECG and Troponin are negative, and
HEART Score* is **High Risk**

Of every **100** people with factors* like yours who came to the Emergency Department with chest pain, and had 2 negative ECG and Troponin tests
…within 30 days of their Emergency Department visit:

💔 **50** had a heart attack or a heart complication.

❤️ While **50** did not.



*Factors used to determine your risk:

History
ECG
Age
Risk Factors for Heart Disease
Troponin

Notes:

This shared decision tool was intended to help you understand your Personal Risk Evaluation.
Further observation and testing may be necessary during this visit to the Emergency Department.
If you do end up going home, you may still need further testing as an out-patient.
You need to understand the importance of following up with your primary provider, or a cardiologist, hopefully within 1 week, or whatever is recommended by your Emergency Department Provider.

If you do end up going home, and your chest pain or heart related symptoms return or worsen, you should call 911 or return to the Emergency Department immediately.

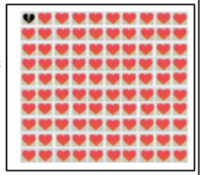
Minnesota ED Chest Pain Protocol

… for Patients Presenting to an Emergency Department
with Chest Pain or Equivalent Symptoms of a Potential Acute Coronary Syndrome (ACS)

aka. "Guideline"

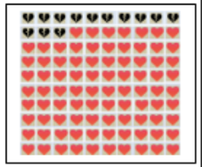
Obtain STAT 12-Lead ECG and IV blood draw for Serum Troponin level
- If ECG or Troponin is positive for ACS, patient is no longer low risk, follow appropriate ACS protocols
- Repeat 12-Lead ECG immediately if symptoms change

Once the first Troponin is resulted, calculate the HEART Score*



If the Heart Score is 0-3, patient is considered Low Risk:
- Use the Low Risk Shared Decision-Making Tool**
- Inform patient at this point, there is a 1.7% risk of an adverse cardiac event in the next 4-6 weeks
- Advise patient to stay for another Troponin and ECG at hour 2 of ED admission

If second Troponin and ECG are negative:
- Inform the patient that now there is a 0.6% risk of an adverse cardiac event in the next 4 weeks
- Advise that patient can be ruled out for ACS without a stress test
- Advise patient to follow up with a provider within 1 week, or per local standard of care



If the Heart Score is 4-6, patient is considered Moderate Risk:
- Use the Moderate Risk Shared Decision-Making Tool**
- Inform patient at this point there is a 13% risk of an adverse cardiac event in the next 4-6 weeks
- Advise patient to be admitted for observation
- Obtain serial ECG's and Troponins at hours 3 and 6
- Evaluate need for admission or a provocative cardiac Stress Test within the next 72 hours
- Follow appropriate ACS protocols, depending on findings

If the Heart Score is 7-10, patient is considered High Risk:
- Use the High Risk Shared Decision-Making Tool**
- Inform patient at this point there is at least a 50% risk of an adverse cardiac event in the next 4-6 weeks
- Advise patient to be admitted to PCI capable hospital and follow appropriate ACS protocols
- Obtain serial ECG's and Troponins at hours 3 and 6
- Post Cardiology for consult

History:

2 Points	**Highly Suspicious (mostly high-risk features)** High-risk features: Middle or left-sided Heavy chest pain Diaphoresis Radiation Nausea/vomiting Exertional Relief of symptoms by sublingual nitrates
1 Point	**Moderately Suspicious (mixture of high-risk and low-risk features)**
0 Points	**Slightly Suspicious (mostly low-risk features)** Low-risk features: Well localized Sharp pain Non-exertional No diaphoresis No nausea/vomiting

ECG:

2 Points	**New ischemic changes** Ischemic ST segment depression (≥1 mm)
1 Point	**Non-specific changes** Repolarization abnormalities Non-specific T-wave changes Non-specific ST-segment depression or elevation Bundle branch blocks Pacemaker rhythms LVH Early repolarization Digoxin effect
0 Points	**Completely normal**

Age:

2 Points	≥ 65 yrs
1 Point	45-64 yrs
0 Points	< 45 yrs

Risk Factors:

	-Obesity (BMI ≥ 30) -Current or recent smoker (≤ 90 days) -Currently treated diabetes mellitus -Family history of CAD (siblings and/or parents < 65 yo) -Hypertension -Hypercholesterolemia
2 Points	**3 or more risk factors above OR any one of the following:** Known CAD Prior stroke Peripheral arterial disease
1 Point	**1 or 2 risk factors**
0 Points	**No risk factors**

Troponin:

2 Points	≥ 3x Normal Limit
1 Point	>1 to <3x Normal Limit
0 Points	≤ Normal Limit

HEART Category	Patient Score
History	
ECG	
Age	
Risk Factors	
Troponin	
Total score:	

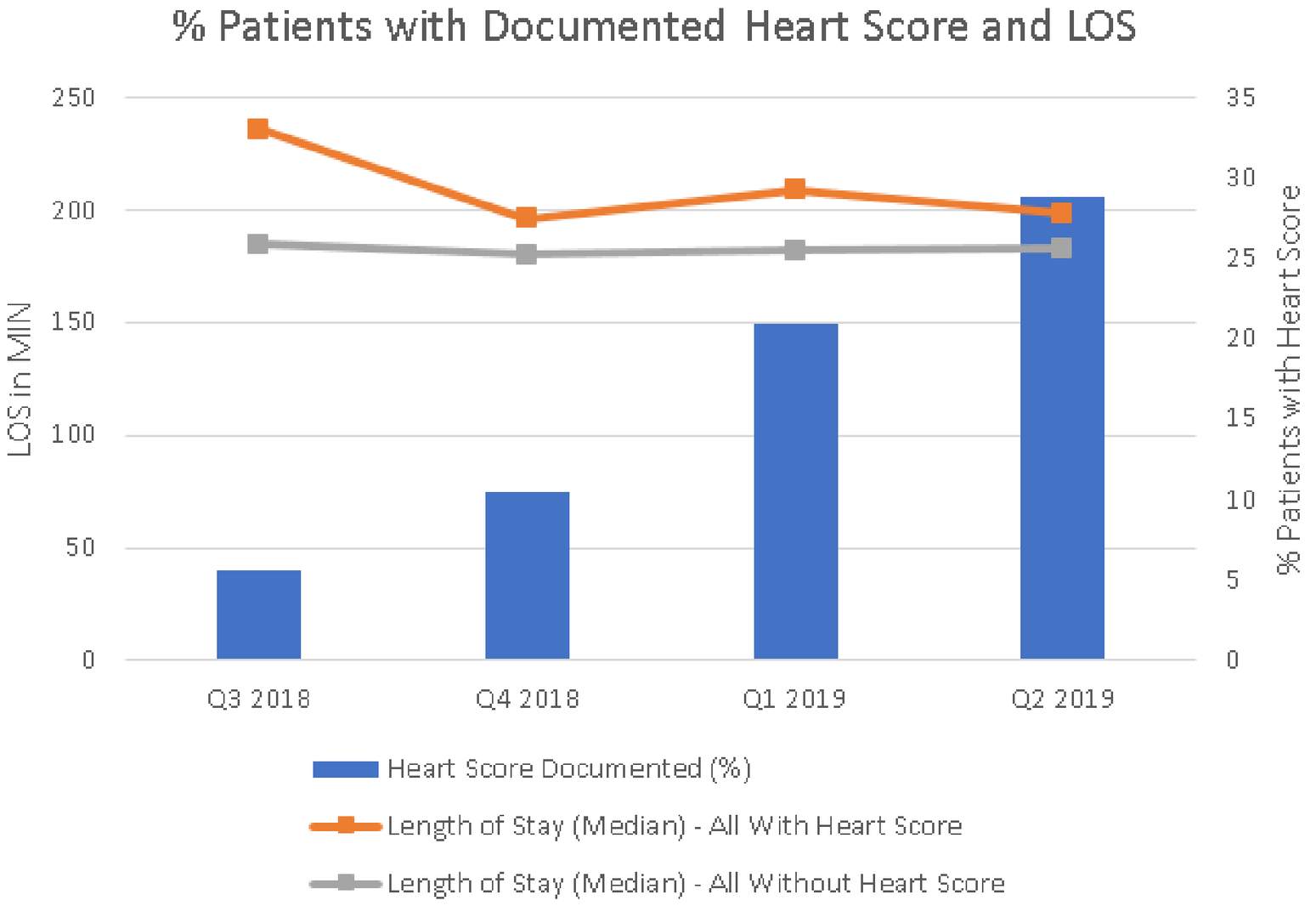
Total 0 - 3	Low risk
Total 4 - 6	Moderate risk
Total 7-10	High risk

Notes:

*If EPIC available, can use Dot-Phrase: ".heartscore"
**If EPIC available, can link to Chest Pain Shared Decision-Making Tools

Final Draft - June 12th, 2018

Essentia Health / St. Mary's Medical Center – Duluth, MN



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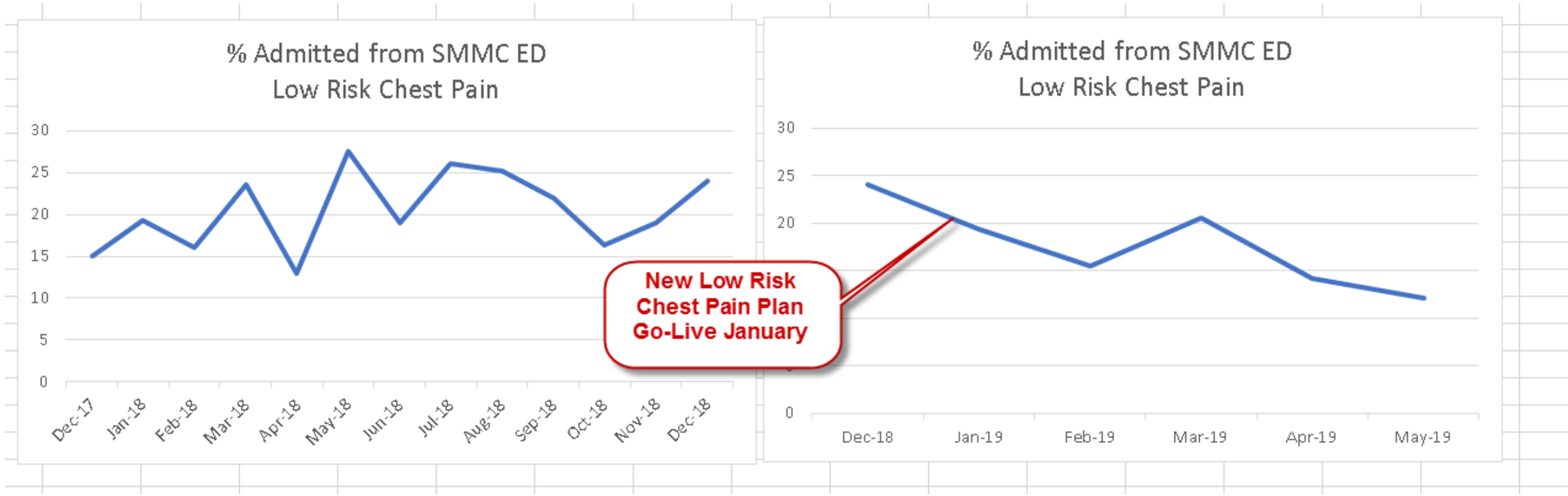
Admissions Before Implementing Guideline & After:



6-Month Trend of Improvement!

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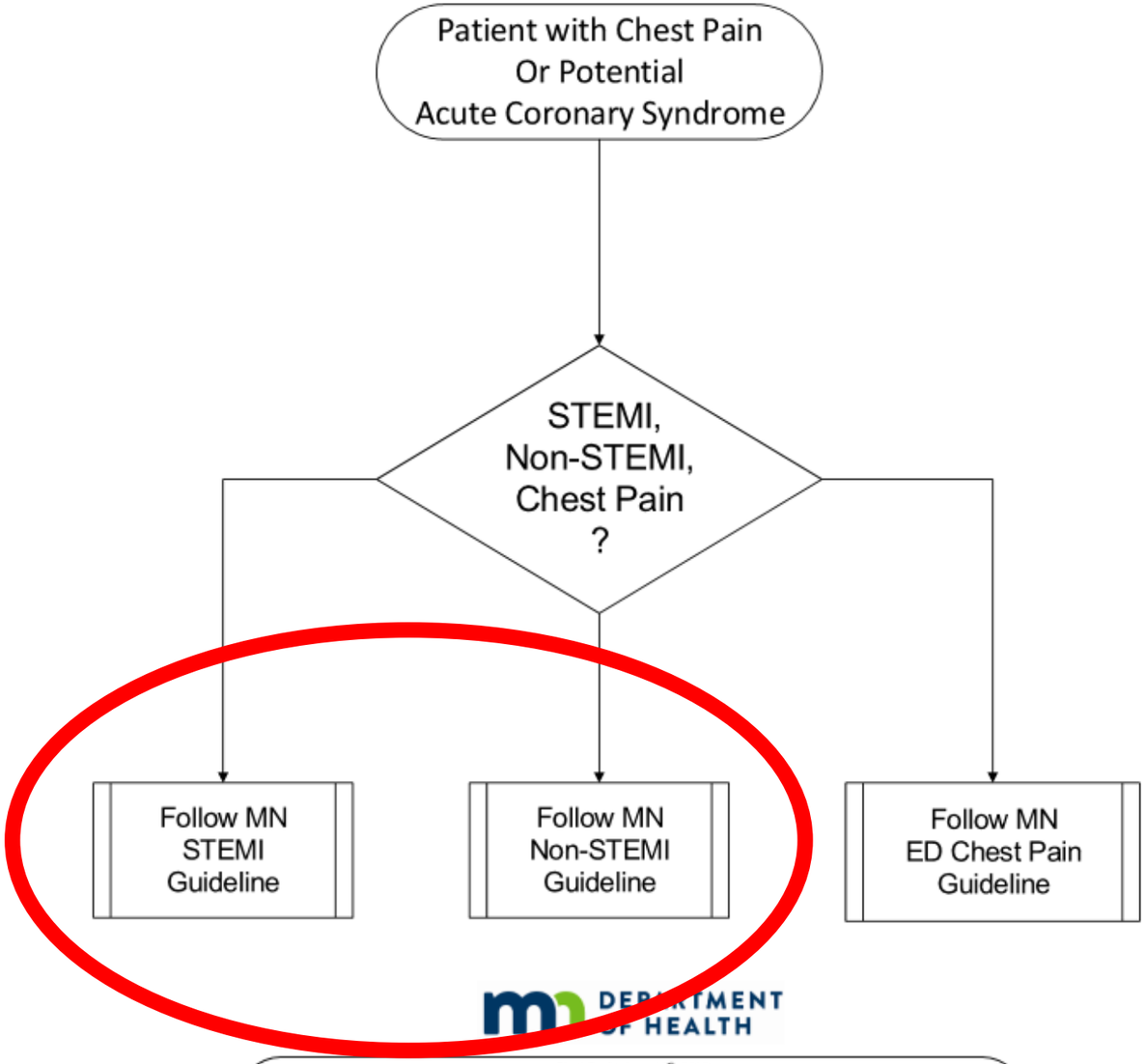
Essentia Health

This is Just a Guide!

- Physician adherence realistically will not be 100%
- Physician discretion and decision making trumps anything on these tools
- The HEART Score is not perfect, but is arguably the most current validated and medically defensible tool available

Minnesota Chest Pain / Acute Coronary Syndrome "Tool-Kit"



DEPARTMENT OF HEALTH

Final Draft: June 12th, 2018

This ACS/Chest Pain "Tool-Kit" was created with coordination from the Minnesota Department of Health, in conjunction with the American Heart Association Minnesota Mission:Lifeline™ Workgroup. This information is intended only as a guideline. Please use your best judgement or newly published literature in the treatment of patients. The Minnesota Department of Health is not responsible for inaccuracies contained herein. No responsibility is assumed for damages or liabilities arising from accuracy, content error, or omission.

Minnesota Non-STEMI Guideline

Final Draft 6.12.18

Patient meets any of the following criteria

- HEART Score of 7-10
- ST depression or dynamic T-wave inversion strongly suspicious for ischemia
- Otherwise identified Non-ST elevation acute coronary syndrome (Non-STEMI)

Next step

- Admit to CCU or appropriate unit with cardiac telemetry (may require transfer)
  - Consider Cardiology consult

Medications

- Start adjunctive treatments (as indicated/if no contraindications):
  - Aspirin 324 mg PO (give suppository if unable to take PO)
  - Ticagrelor 180 mg PO or Clopidogrel 600 mg PO (loading doses)
    - (Prasugrel 60 mg PO could also be considered, but note warnings*)
  - Heparin 60 Units/kg (max 4,000 Units) IV bolus
  - Heparin 12 Units/kg/hr (max 1,000 Units/hr) IV infusion
- Other medications as indicated per institutional AMI order set

Assess Criteria for Early Invasive Strategy (Cath Lab)

- High-risk features & patient a candidate for invasive angiography (PCI)?
- Persistent or recurrent symptoms?
- New ST-segment depression and positive serum Troponin(s)?
- Depressed LV functional study that suggests multi-vessel CAD?
- Hemodynamic instability or VT?

Choose Treatment Strategy

Early Invasive Strategy (Cath Lab)

- Prepare for Cath Lab
  - Transfer if necessary by ground ambulance
    (Air transfers should be reserved for STEMI)
- Insert 2 large bore peripheral saline lock IV's in left arm
- Continue adjunctive treatments as above
- Consult Cardiology for additional treatments
  - (i.e. Beta-Blocker, Nitro, Morphine, O2, etc.)

If CABG surgery is required

- Continue Aspirin
- Consult CT surgeon about stopping other therapies and timing (i.e. when to hold antiplatelet)

Ischemia-Guided Strategy (Medical Therapy)

- Continue adjunctive treatments as indicated
- Continue serum Troponins q 3 hours x 3
- Continue serial ECG's
  - Repeat PRN for recurring/worsening symptoms
- Obtain cardiac imaging study
  - Consult Cardiology for appropriate test
  - (i.e. Echocardiography, CTA, Radionuclide, etc.)

If therapy not effective, or pending results of imaging study, reconsider if Invasive Strategy (Cath Lab) would be appropriate.

P2Y12 Inhibitor Maintenance Dosing & Considerations

- Ticagrelor 90 mg PO twice daily or
- Clopidogrel 75 mg once daily or
- Prasugrel* 10 mg PO once daily (5 mg if ≤ 60 kg)

- Continue up to 12 months if medically treated
- Continue at least 12 months if treated with drug eluting stent, or per Cardiologist discretion
- If switching to a different P2Y12 inhibitor, consider a full loading dose at the time the next dose would be due

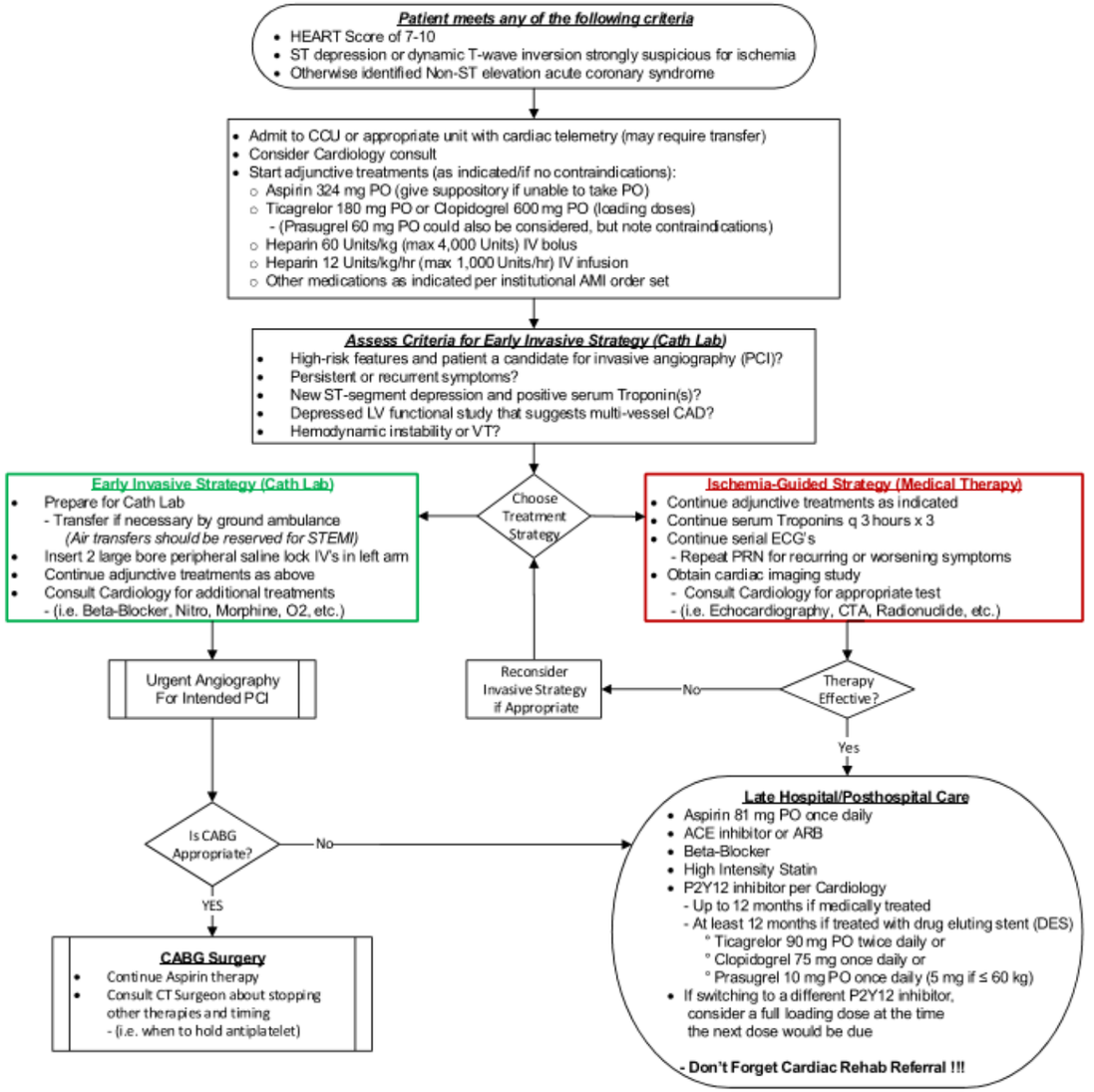
Prasugrel Warnings:
Do NOT use if history of stroke or TIA
Avoid in patients ≥ 75 yo or < 60 kg
Do NOT start if patient likely to undergo urgent CABG

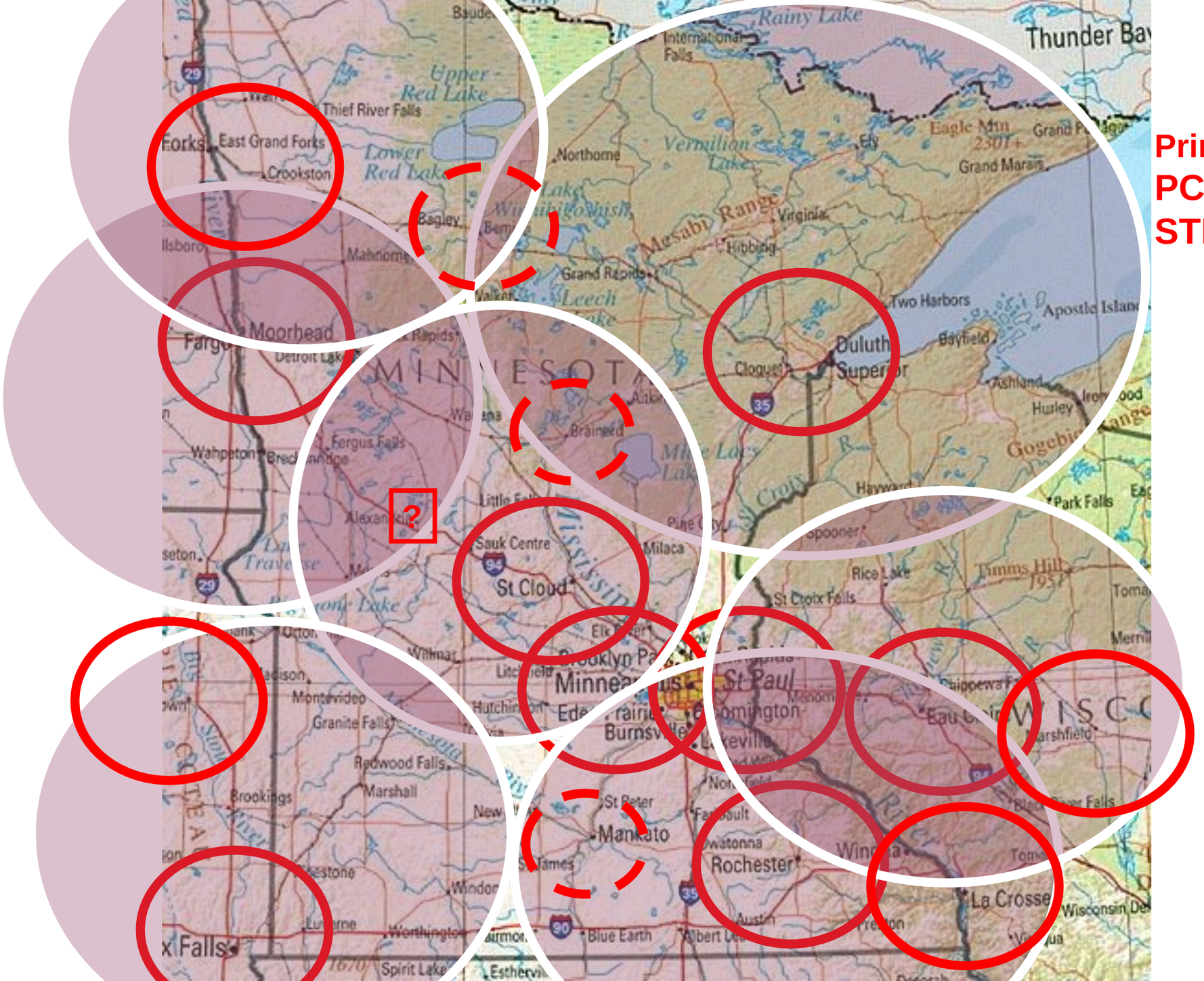
Late Hospital/Posthospital Care

- Aspirin 81 mg PO once daily
- ACE inhibitor or ARB
- Beta-Blocker
- High Intensity Statin
- P2Y12 inhibitor per Cardiology
- Cardiac Rehab Referral

This Guideline is a part of the ACS/Chest Pain "Tool-Kit" created with coordination from the Minnesota Department of Health, in conjunction with the American Heart Association Minnesota Mission:Lifeline™ Workgroup. This information is intended only as a guideline. Please use your best judgement or newly published literature in the treatment of patients. The Minnesota Department of Health is not responsible for inaccuracies contained herein. No responsibility is assumed for damages or liabilities arising from accuracy, content error, or omission.

Minnesota Non-STEMI Guideline - Flowchart




Primary
PCI for
STEMI
?
Moorhead
Fargo
Fergus Falls
Wahpeton
Detroit Lakes
Thief River Falls
East Grand Forks
Crookston
Bagley
Northome
Grand Rapids
Virginia
Hibbing
Ely
Eveleth
Grand Marais
Two Harbors
Duluth
Superior
Cloquet
Bayfield
Ashland
Hurley
Apostle Islands
Park Falls
Rice Lake
St Croix Falls
Spooner
Hayward
Brainerd
Sauk Centre
St Cloud
Milaca
Willmar
Litchfield
Hutchinson
Minneapolis
St Paul
Burnsville
Eden Prairie
Bloomington
Eau Claire
Marshfield
Wisconsin Dells
La Crosse
Rochester
Austin
Albert Lea
Mankato
St Peter
New Ulm
Blue Earth
Fairmont
Worthington
Windom
Luverne
Pipestone
Brookings
Marshall
Redwood Falls
Granite Falls
Montevideo
Madison
Watertown
Spirit Lake
Estherville
Waseca
Owatonna
Faribault
Northfield
Lake Mille Lacs
Lake Vermilion
Rainy Lake
International Falls
Thunder Bay
Mesabi Range
Iron Range
Timms Hill

Minnesota STEMI GUIDELINE

Minnesota Mission: Lifeline Statewide STEMI Interfacility Transfer Guideline

American Heart Association. | MISSION: LIFELINE

IDENTIFY / CONFIRM STEMI

- Signs & Symptoms suspect for AMI (Acute Myocardial Infarction) – Duration > 15 minutes < 12 hours
- ST Elevation as defined by diagnostic criteria on pg. 2
- Pre-Hospital STEMI confirmed by 12 L ECG trained ALS EMS recognize ST segment elevation of ≥ 1 mm in 2 contiguous leads, Confirmed Interpretation of STEMI transmitted, or ECG Monitor interpretative statement infers: "Acute Myocardial Infarction" with pt. signs & symptoms suspect of AMI

ACTIVATE TRANSPORT

Establish availability and ETA of Air or Ground ALS EMS for Interfacility Transfer to PCI Hospital

ACTIVATE YOUR INTERNAL STEMI ALERT

Alert appropriate provider(s) and team members

ESTABLISH KEY TIMES:

Symptom Onset: _____
First Medical Contact: _____
ETA to PCI Hospital: _____

Estimate FMC (first medical contact) to Potential PCI: _____

(Allow approx. 20 min after arrival to PCI capable hospital

Estimated FMC to PCI ≤ 120 minutes

Or FMC > 120 minutes, and one of the following:

- Fibrinolytic Ineligible
- Resuscitated out-of-hospital cardiac arrest patients whose initial ECG shows STEMI
- Evidence of either Cardiogenic Shock or Acute Severe CHF

***Do NOT give Lytic/TNK!*

All:

- Aspirin 81 mg x4 chewed (*Dose to achieve 324 mg)
- Heparin IV Bolus 60 Units/kg, max 4,000 Units (No IV Heparin Drip)
- Ticagrelor 180 mg PO *(If Ticagrelor not available, then give Clopidogrel 600 mg PO)*

Estimated FMC to PCI 120-180 minutes

- Establish if Fibrinolytic appropriate *(See page 2 for contraindications)*
- Goal: Door to Needle < 30 minutes

1. **For all ages transferring not utilizing** Pharmaco-invasive strategy proceed to Full Dose Fibrinolytic Strategy
2. **For patients** transferring to Abbott NW/MHI utilizing Pharmaco-invasive strategy, administer HALF-Dose TNK IV and transfer for PCI *(Dosing table pg. 2)*

All:

- Aspirin 81 mg x4 chewed (*Dose to achieve 324 mg)
- Heparin IV Bolus 60 Units/kg, max 4,000 Units (No IV Heparin Drip)
- Clopidogrel 600 mg PO
- TNK **"HALF–Dose"** IV

Estimated FMC to PCI >120 minutes

- Establish if Fibrinolytic appropriate *(See page 2 for contraindications)*
- Goal: Door to Needle < 30 minutes

**For all ages transferred with an estimated FMC to PCI > 180 minutes

All:

- Aspirin 81 mg x 4 chewed (*Dose to achieve 324 mg)
- Heparin IV Bolus 60 Units/kg, max 4,000 Units
- Heparin IV Drip 12 Units/kg/hr, max 1,000 Units/hr

For AGE ≤ 75 years old:

- Clopidogrel 300 mg PO
- TNK **"FULL-Dose"** IV*

For AGE > 75 years old

- Clopidogrel 75 mg PO
- TNK **"HALF–Dose"** IV

ACTIVATE CODE STEMI / STEMI ALERT AT PCI HOSPITAL

(See Page 2 for phone #, or follow your regional STEMI protocol)

TRANSPORT PATIENT AS SOON AS POSSIBLE!

Fax or Transmit ECG and other pertinent records (EMS reports, allergies, past medical history, etc.)

Top Patient Care Priorities:

- Establish DNR / Resuscitation Status
- Obtain vital signs and assess pain level on scale of 1-10
- Cardiac Monitor & attach hands-free defibrillator pads
- Establish Saline Lock - large bore needle (left arm preferred)
- Oxygen PRN at 2 L/min and titrate to SpO2 > 90%
- Assess Allergies (Note if reaction to IV Contrast?)

Notes:

Patient Care When Time Allows:

- Establish 2nd large bore IV with Normal Saline @TKO (Left arm preferred)
- Obtain Appropriate Labs: Troponin, CBC, Potassium, Creatinine, PT/ INR, aPTT
- Nitroglycerin 0.4 mg SL every 5 min or Nitropaste PRN for chest pain (hold for SBP < 90)
- Evaluate if erectile dysfunction or pulmonary hypertension medications taken in the past 48 hours including: Sildenafil (Viagra, Revatio), Vardenafil (Levitra, Staxyn), Avanafil (Stendra), or Tadalafil (Cialis, Adcirca), and if so, hold nitrates for 48 hours

Minnesota STEMI GUIDELINE

Mission: Lifeline Statewide STEMI Interfacility Transfer Guideline

STEMI (ST Elevation Myocardial Infarction) Diagnostic Criteria:

- ST elevation at the J point in at least 2 contiguous leads of ≥ 2 mm (0.2 mV) in men or ≥ 1.5 mm (0.15 mV) in women in leads V2–V3 and/or of ≥ 1 mm (0.1mV) 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 consultation with PCI receiving center is recommended
- ECG demonstrates evidence of ST depression suspect of a Posterior MI…consult with PCI receiving center
- If initial ECG is not diagnostic but suspicion is high for STEMI, obtain serial 12 Lead ECG's at 5-10 minute intervals

ABSOLUTE CONTRAINDICATIONS FOR FIBRINOLYSIS

- Chest Pain / Symptom Onset > 12 hours
- Suspected aortic dissection
- Any prior intracranial hemorrhage
- Structural cerebral vascular lesion or malignant intracranial neoplasm
- Any active bleeding (excluding menses)
- Ischemic stroke within 3 months
- Significant closed-head or facial trauma within 3 months
- Pregnancy

RELATIVE CONTRAINDICATIONS FOR FIBRINOLYSIS

- Chest Pain / Symptom Onset > 6 hours
- Current use of oral anticoagulants (Warfarin, Dabigatran, Rivaroxaban, Apixaban, etc.)
- Uncontrolled hypertension on presentation (SBP > 180 or DBP > 90 mmHg)
- History of ischemic stroke more than 3 months, dementia, or known intracranial pathology not covered in contraindications
- Traumatic or prolonged CPR (over 10 minutes)
- Major surgery within last 3 weeks
- Recent internal bleeding (within last 2-4 weeks)

Tenecteplase (TNKase) Dosing Chart

Patient Weight	** FULL-DOSE **	** HALF-DOSE **
59 kg or less	30 mg = 6 mL	15 mg = 3 mL
60 - 69 kg	35 mg = 7 mL	18 mg = 3.5 mL
70 - 79 kg	40 mg = 8 mL	20 mg = 4 mL
80 - 89 kg	45 mg = 9 mL	23 mg = 4.5 mL
90 kg or more	50 mg = 10 mL	25 mg = 5 mL

Notes:

Destination CITY	Primary PCI Receiving Hospital	STEMI Activation Phone #:	Fax # for Records:
Bemidji MN	Sanford Health	218-333-2222	218.333.6398
Coon Rapids MN	Mercy Hospital	1-866-922-0246	763-236-6930
Duluth MN	St. Luke's Health	800-306-2939	218-249-5180
Duluth MN	Essentia St. Mary's	877-786-4944	218-786-4248
Edina MN	Fairview Southdale	952-924-8000	952-924-5545
Fargo ND	Essentia Health	701-364-8401	701-364-8405
Fargo ND	Sanford Health	701-234-6304 or 1-877-647-1225	701-234-7203
Eau Claire WI	Mayo Clinic Health	715-838-3333	715-838-3507
Eau Claire WI	Sacred Heart Hospital	877-717-4565	715-717-4972
Grand Forks ND	Altru Health System	701-780-5206 or 1-855-425-8781	701-780-1097
La Crosse WI	Gundersen	1-800-527-1200	608-775-4802
Mankato MN	Mayo Clinic Health	Hospital 507-385-5777 EMS 507-385-2610	507-385-6318
Minneapolis MN	Abbott NW / MHI	612-863-3911	888-764-8218
Minneapolis MN	Hennepin County	800-424-4262 or 612-873-4262	844-904-4200 or 612-904-4200
Minneapolis MN	U of MN. - Fairview	612-273-2500	612-273-2645
Robinsdale MN	North Memorial	763-581-9700	763-581-9771
Rochester MN	Mayo St. Mary's	507-255-2910	507-266-6180
St. Cloud MN	CentraCare Health	877-783-6472	320-255-5845
St. Louis Park MN	Methodist	952-993-0330	952-993-6580
St. Paul MN	Regions	651-254-3307	651-254-6973
St. Paul MN	St. Joseph's Health East	651-232-3348	651-232-3539
St. Paul MN	United Hospital	6512418755	6512415398
Sioux Falls SD	Avera Heart Hospital	605-977-7000	605-977-7108
Sioux Falls SD	Avera McKennan	605-322-2000	605-322-2030
Sioux Falls SD	Sanford Health	605-333-4455 or 800-601-5084	605-333-1578
Watertown SD	Prairie Lakes Health	605-882-7810	605-882-7979
(Other)			
(Other)			

AHA Mission: Lifeline STEMI Recommendations:

- **FMC (First Medical Contact)-to-First ECG** time ≤ 10 minutes unless pre-hospital ECG obtained
- All eligible STEMI patients receiving a **Reperfusion Therapy** (Primary PCI or fibrinolysis)
- Fibrinolytic eligible STEMI patients with **Door-to-Needle** time ≤ 30 minutes
- Primary PCI eligible patients transferred to a PCI receiving center with referring center **Door in- Door out** *(Length of Stay)* ≤ 45 min
- Referring Center ED or Pre-Hospital **First Medical Contact-to-PCI time** ≤ 120 minutes *(including transport time)*
- All STEMI patients without a contraindication receiving **Aspirin** prior to referring center ED discharge

Minnesota Mission: Lifeline EMS STEMI Transport Guideline

Obtain 12 L ECG with Initial Assessment & Vital Signs

Goal: First Medical contact to ECG ≤ 10 min, Scene time: ≤ 15 minutes
-to provide early identification and pre-hospital 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 (patients of any age)

If initial ECG is not diagnostic but suspicion remains high for ACS (acute coronary syndrome) and symptoms persist, obtain serial ECG's at 5-10 minute intervals

Pre- Hospital STEMI ALERT Activation Criteria:

Goal: Identify potential ACS patents, Recognize STEMI, Alert Receiving Facility

Activate STEMI Alert when any **one** or more of the following criteria are met and patient demonstrates signs & symptoms suspect of (AMI) acute myocardial infarction as described above with a duration of ≥15 minutes ≤24 hours

1. EMS personnel trained in 12 L ECG interpretation recognize ST segment elevation of ≥ 1 mm in 2 contiguous leads
2. Interpretation of ECG transmitted and reviewed by a provider (Physician, NP, PA) confirmed to be diagnostic of STEMI
3. 12 Lead ECG Monitor Algorithm Interpretative statement reads: "Acute Myocardial Infarction"

Determine Transport Destination

- **Transport time estimated to be ≤ 60 minutes**
  Goal FMC to PCI ≤ 120 minutes
- Notify medical control of STEMI and consider transport via the most expedient method available to the nearest PCI Capable Receiving Hospital for Primary PCI.
- Activate STEMI Alert at receiving facility and transmit 12 L ECG as able
- Consider Air Transport

- **Transport time estimated to be ≥ 60 minutes**
  Goal Door to Thrombolysis administration ≤ 30 min
- Notify medical control and consider transport to the closest appropriate non-PCI capable referring hospital for possible thrombolytic therapy and subsequent urgent transfer to a PCI Capable Receiving Facility for reperfusion.
- Initiate thrombolytic contraindication checklist per protocol
- Activate STEMI Alert at receiving facility and transmit 12 L ECG as able for provider confirmation
- Consider Air Transport

Diversion Criteria

If patient demonstrates instability and/or has any one of the following criteria that may require ED evaluation and treatment by a practitioner proceed to **nearest appropriate hospital:**

- Symptoms suggestive of acute stroke or neurological evaluation
- Respiratory or Circulatory Instability
- Chest trauma or MVC victims
- DNR Status
- Consider Left Bundle Branch Block

(version revised 4/2015)

BLS & ALS

- Administer Oxygen to maintain SpO2 92% - 94% titrate as needed starting at 2 LPM per nasal cannula
- Obtain Systolic/Diastolic blood pressure (BP) in both arms
- Administer Chewable Aspirin 81 mg x 4 by mouth
- 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
- 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 ≤ 90.
- BLS only: Request ALS Intercept per local protocol (if transport time exceeds 15 min)
- Establish large bore IV Access (L) *upper extremity preferred*. Establish a 2nd IV line as time allows.

ALS

- If available consider:
  - Ticagrelor (Brilinta) 180 mg by mouth if transferring for PPCI with confirmation by PCI Receiving Facility and local medical control per protocol *** Do Not Administer Both Clopidogrel and Ticagrelor
    OR
  - *If Ticagrelor not available, then give Clopidogrel 600 mg* by mouth if transferring for PPCI with confirmation by PCI Receiving Facility and local medical control per protocol
- Heparin IV Bolus 60 Units/kg, max 4,000 Units (No IV Heparin Drip) if transferring for PPCI after confirmation by PCI Receiving Facility and local medical control per protocol
- Establish a Nitroglycerine IV Drip if chest discomfort is unrelieved. Initiate @ 5 mcg/min & titrate in increments of 5mcg/min every 5 minutes for chest discomfort per protocol. Maintain a systolic BP of ≥90 mm/Hg or greater. Hold nitrates as indicated for crtieria above.
- Administer Analgesia as needed per protocol

Documentation Reminders:

- ✓ Provide a printed copy of EMS Run Sheet, and 12 L ECG with Report to the receiving hospital ED staff
- ✓ Document Date and Time of:
  - EMS dispatch, First Medical Patient Contact, Scene departure, STEMI alert requested
- ✓ Document EMS agency number, and EMS run number

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 thrombolytic 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 Recognition Achievement Measures:

1. Percentage of patients with non-traumatic chest pain ≥ 35 years, treated and transported by EMS who receive a pre-hospital 12-lead electrocardiogram
2. Percentage of STEMI patients treated and transported directly to a STEMI receiving center, with pre-hospital first medical contact to device time ≤ 90 minutes
3. Percentage of lytic eligible STEMI patients treated and transported to a STEMI referring hospital for thrombolytic therapy with a door to administration time ≤ 30 minutes

(version reviewed 4-2015)

EMS STEMI

Mission:Lifeline Minnesota Transport Flowchart

(Final Draft: July-2015)

Suspected Cardiac Event

Obtain 12 Lead ECG
with Initial Assessment & Vital Signs
(Goal: First Medical Contact to ECG ≤ 10 min)

Provide All Additional Treatments per Chest Pain or Appropriate Protocols

Pre-Hospital STEMI ALERT Activation Criteria:
Signs & symptoms suspect of AMI with duration ≥ 15 min but ≤ 24 hrs, and one or more are met):
1. ECG transmitted & reviewed by a provider (Physician, NP, PA) confirmed to be diagnostic of STEMI
2. EMS personell trained in 12 L ECG interpretation recognize ST elevation of ≥ 1 mm in 2 contiguous Leads
3. 12-Lead ECG Monitor Algorithm Interpretative statement: (ie. *** Acute Myocardial Infarction ***)

Is STEMI Alert Activation Criteria Met?

Yes

No

If suspicion high for ACS & symptoms persist, continue protocol treatments and obtain serial ECG's at 5-10 minute intervals

Determine Transport Destination
-Consider Air Transport
-Consider ALS Intercept if BLS transport > 15 min

Transport Time to PCI Capable Hospital ≤ 60 min?

Yes

-Notify medical control at nearest appropriate PCI Hospital of **STEMI ALERT**
-Request **Cath Lab Activation**
-Consider transport via the most expedient ALS method available for **Primary PCI**

Instability or Diversion Criteria?

Yes

No

Diversion Criteria:
Patient demonstrates instability and/or has any one of the following criteria that may require ED evaluation and treatment by a practitioner:
- Symptoms suggestive of acute stroke or neurological evaluation
- Respiratory or Circulatory Instability
- Chest trauma or MVC victims
- DNR Status
- Consider Left Bundle Branch Block

Call PCI Hospital with Patient Identifiers

Proceed to PCI Hospital

No

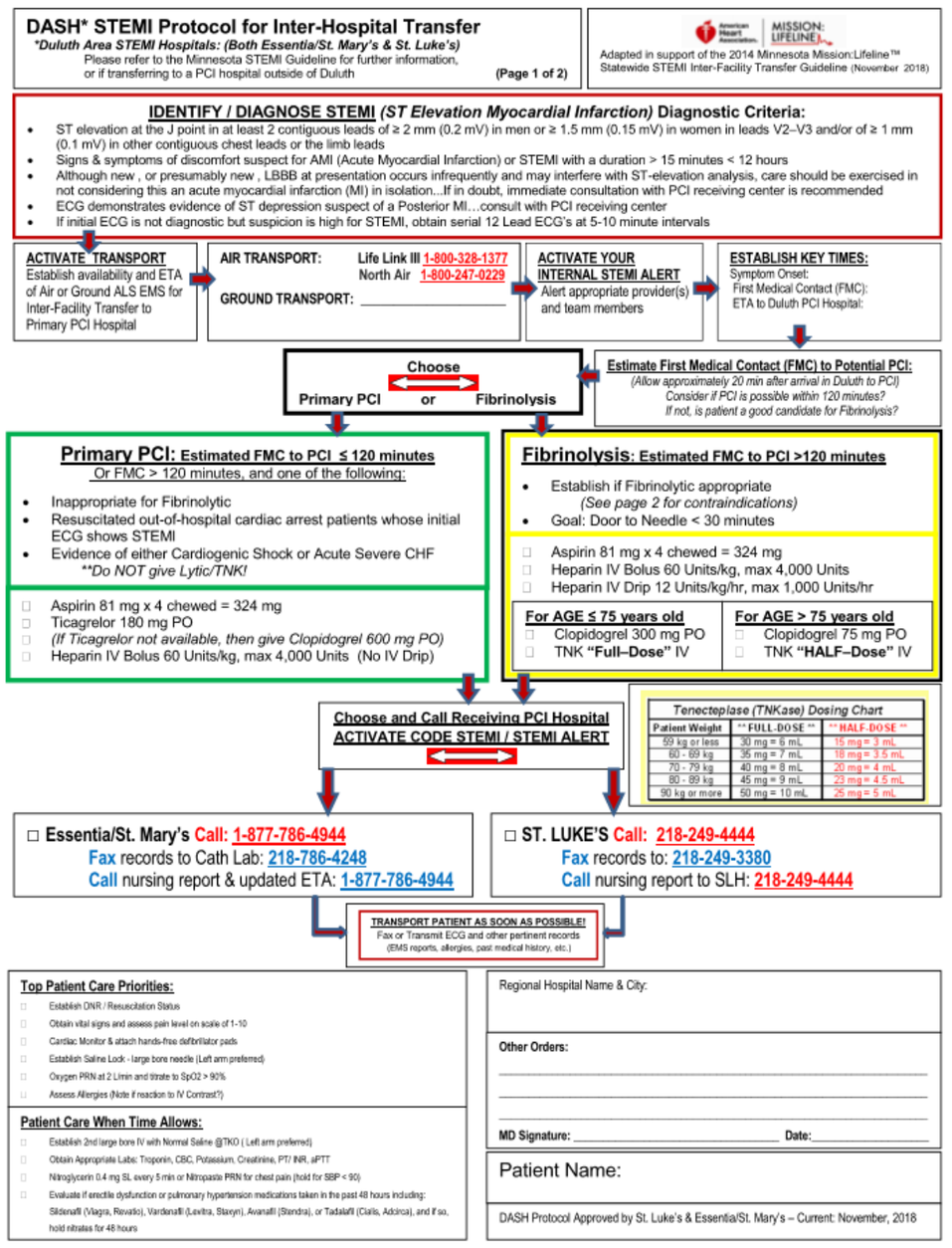
Notify medical control of **STEMI ALERT** and consider transport to the closest appropriate non-PCI capable referring hospital…
…For possible Fibrinolytic therapy and/or subsequent urgent transfer to a PCI Capable Receiving Facility for reperfusion

Proceed to Nearest Appropriate Hospital!

Documentation Reminders Upon Arrival at Hospital:
Provide a printed copy of EMS Run Sheet, & 12 L ECG with Report to the receiving hospital staff.

Document Date and Time of:
-EMS dispatch
-First Medical Patient Contact
-12-Lead ECG
-Scene departure
-STEMI alert requested
-Destination Arrival.
-EMS agency number, and run number.

How the Minnesota STEMI Guideline has been adapted to the regional protocol for the Duluth area…



DASH* STEMI Protocol for Inter-Hospital Transfer
**Duluth Area STEMI Hospitals: (Both Essentia/St. Mary's & St. Luke's)*
Please refer to the Minnesota STEMI Guideline for further information, or if transferring to a PCI hospital outside of Duluth **(Page 1 of 2)**

Adapted in support of the 2014 Minnesota Mission:Lifeline™ Statewide STEMI Inter-Facility Transfer Guideline (November 2018)

IDENTIFY / DIAGNOSE STEMI *(ST Elevation Myocardial Infarction)* Diagnostic Criteria:

- ST elevation at the J point in at least 2 contiguous leads of ≥ 2 mm (0.2 mV) in men or ≥ 1.5 mm (0.15 mV) in women in leads V2–V3 and/or of ≥ 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 consultation with PCI receiving center is recommended
- ECG demonstrates evidence of ST depression suspect of a Posterior MI…consult with PCI receiving center
- If initial ECG is not diagnostic but suspicion is high for STEMI, obtain serial 12 Lead ECG's at 5-10 minute intervals

ACTIVATE TRANSPORT
Establish availability and ETA of Air or Ground ALS EMS for Inter-Facility Transfer to Primary PCI Hospital

AIR TRANSPORT: Life Link III 1-800-328-1377 North Air 1-800-247-0229
GROUND TRANSPORT: _____

ACTIVATE YOUR INTERNAL STEMI ALERT
Alert appropriate provider(s) and team members

ESTABLISH KEY TIMES:
Symptom Onset:
First Medical Contact (FMC):
ETA to Duluth PCI Hospital:

Choose Primary PCI or Fibrinolysis

Estimate First Medical Contact (FMC) to Potential PCI:
(Allow approximately 20 min after arrival in Duluth to PCI)
Consider if PCI is possible within 120 minutes?
If not, is patient a good candidate for Fibrinolysis?

Primary PCI: Estimated FMC to PCI ≤ 120 minutes
Or FMC > 120 minutes, and one of the following:

- Inappropriate for Fibrinolytic
- Resuscitated out-of-hospital cardiac arrest patients whose initial ECG shows STEMI
- Evidence of either Cardiogenic Shock or Acute Severe CHF
  ***Do NOT give Lytic/TNK!*

☐ Aspirin 81 mg x 4 chewed = 324 mg
☐ Ticagrelor 180 mg PO
☐ *(If Ticagrelor not available, then give Clopidogrel 600 mg PO)*
☐ Heparin IV Bolus 60 Units/kg, max 4,000 Units (No IV Drip)

Fibrinolysis: Estimated FMC to PCI >120 minutes

- Establish if Fibrinolytic appropriate
  (See page 2 for contraindications)
- Goal: Door to Needle < 30 minutes

☐ Aspirin 81 mg x 4 chewed = 324 mg
☐ Heparin IV Bolus 60 Units/kg, max 4,000 Units
☐ Heparin IV Drip 12 Units/kg/hr, max 1,000 Units/hr

For AGE ≤ 75 years old	For AGE > 75 years old
☐ Clopidogrel 300 mg PO	☐ Clopidogrel 75 mg PO
☐ TNK **"Full–Dose"** IV	☐ TNK **"HALF–Dose"** IV

Tenecteplase (TNKase) Dosing Chart

Patient Weight	** FULL-DOSE **	** HALF-DOSE **
59 kg or less	30 mg = 6 mL	15 mg = 3 mL
60 - 69 kg	35 mg = 7 mL	18 mg = 3.5 mL
70 - 79 kg	40 mg = 8 mL	20 mg = 4 mL
80 - 89 kg	45 mg = 9 mL	23 mg = 4.5 mL
90 kg or more	50 mg = 10 mL	25 mg = 5 mL

Choose and Call Receiving PCI Hospital
ACTIVATE CODE STEMI / STEMI ALERT

☐ **Essentia/St. Mary's Call: 1-877-786-4944**
Fax records to Cath Lab: 218-786-4248
Call nursing report & updated ETA: 1-877-786-4944

☐ **ST. LUKE'S Call: 218-249-4444**
Fax records to: 218-249-3380
Call nursing report to SLH: 218-249-4444

TRANSPORT PATIENT AS SOON AS POSSIBLE!
Fax or Transmit ECG and other pertinent records (EMS reports, allergies, past medical history, etc.)

Top Patient Care Priorities:

- ☐ Establish DNR / Resuscitation Status
- ☐ Obtain vital signs and assess pain level on scale of 1-10
- ☐ Cardiac Monitor & attach hands-free defibrillator pads
- ☐ Establish Saline Lock - large bore needle (Left arm preferred)
- ☐ Oxygen PRN at 2 L/min and titrate to SpO2 > 90%
- ☐ Assess Allergies (Note if reaction to IV Contrast?)

Patient Care When Time Allows:

- ☐ Establish 2nd large bore IV with Normal Saline @TKO (Left arm preferred)
- ☐ Obtain Appropriate Labs: Troponin, CBC, Potassium, Creatinine, PT/ INR, aPTT
- ☐ Nitroglycerin 0.4 mg SL every 5 min or Nitropaste PRN for chest pain (hold for SBP < 90)
- ☐ Evaluate if erectile dysfunction or pulmonary hypertension medications taken in the past 48 hours including: Sildenafil (Viagra, Revatio), Vardenafil (Levitra, Staxyn), Avanafil (Stendra), or Tadalafil (Cialis, Adcirca), and if so, hold nitrates for 48 hours

Regional Hospital Name & City:

Other Orders:

MD Signature: _____ **Date:** _____

Patient Name:

DASH Protocol Approved by St. Luke's & Essentia/St. Mary's – Current: November, 2018

DASH* STEMI Protocol for Inter-Hospital Transfer
**Duluth Area STEMI Hospitals: (Both St. Mary's/Essentia & St. Luke's)*
Please refer to the Minnesota STEMI Guideline for further information, or if transferring to a PCI hospital outside of Duluth **(Page 2 of 2)**

Adapted in support of the 2014 Minnesota Mission:Lifeline™ Statewide STEMI Inter-Facility Transfer Guideline (Nov. 2018)

ABSOLUTE CONTRAINDICATIONS FOR FIBRINOLYSIS (TNK) IN STEMI

- Chest Pain / Symptom Onset > 12 hours
- Suspected aortic dissection
- Any prior intracranial hemorrhage
- Structural cerebral vascular lesion or malignant intracranial neoplasm
- Any active bleeding (excluding menses)
- Ischemic stroke within 3 months
- Significant closed-head or facial trauma within 3 months
- Pregnancy

RELATIVE CONTRAINDICATIONS FOR FIBRINOLYSIS: (TNK) IN STEMI

- Chest Pain / Symptom Onset > 6 hours
- Current use of oral anticoagulants (Warfarin, Dabigatran, Rivaroxaban, Apixaban, Edoxaban, etc.)
- Uncontrolled hypertension on presentation (SBP > 180 or DBP > 90 mmHg)
- History of ischemic stroke more than 3 months, dementia, or known intracranial pathology not covered in contraindications
- Traumatic or prolonged CPR (over 10 minutes)
- Major surgery within last 3 weeks
- Recent internal bleeding (within last 2-4 weeks)

Tenecteplase (TNKase) Dosing Chart

Patient Weight	** FULL-DOSE **	** HALF-DOSE **
59 kg or less	30 mg = 6 mL	15 mg = 3 mL
60 - 69 kg	35 mg = 7 mL	18 mg = 3.5 mL
70 - 79 kg	40 mg = 8 mL	20 mg = 4 mL
80 - 89 kg	45 mg = 9 mL	23 mg = 4.5 mL
90 kg or more	50 mg = 10 mL	25 mg = 5 mL

CONTRAINDICATION FOR METOPROLOL
Do not give if any of the following: Signs of heart failure or shock, heart rate less than 60 bpm or more than 110 bpm, systolic blood pressure less than 120 mmHg, second or third degree heart block, asthma, or reactive airway disease.

Weight: kg Height: in. Age: yrs

Medication	Dose	Time(s)	Administered By: (Initials)
Aspirin (81 mg x 4) (Chew) Oral	324 mg		
Ticagrelor (Brilinta) Oral *(For PPCI only)*	180 mg		
Clopidogrel (Plavix) Oral	mg		
Heparin IV Bolus 60 U/kg (max 4000 Units)	Units		
Heparin IV Infusion 12 U/kg/hr (max 1000 U/hr)	Units/hr		
Tenecteplase (**TNK**ase) IV Full Dose for AGE ≤ 75 yo Half Dose for AGE > 75 yo	mg (= mL)		
* Do not give Brilinta with Lytic (TNK) * Do not give Brilinta and Plavix together			
Nitroglycerin Sublingual	0.4 mg		
Nitroglycerin IV	mcg/min		
Morphine Sulfate IV	mg		
Diazepam (Valium) Oral or IV	mg		
Ondansetron (Zofran) Oral or IV	4 mg		
Metoprolol 25 mg or 50 mg Oral	mg		
Metoprolol 2.5 mg or 5 mg IV	mg		

Notes:

AHA Mission: Lifeline STEMI Recommendations:

- **FMC (First Medical Contact)-to-First ECG** time ≤ 10 minutes unless pre-hospital ECG obtained
- All eligible STEMI patients receiving a **Reperfusion Therapy** (Primary PCI or fibrinolysis)
- Fibrinolytic eligible STEMI patients with **Door-to-Needle** time ≤ 30 minutes
- Primary PCI eligible patients transferred to a PCI receiving center with referring center **Door in- Door out** *(Length of Stay)* ≤ 45 min
- Referring Center ED or Pre-Hospital **First Medical Contact-to-PCI time** ≤ 120 minutes *(including transport time)*
- All STEMI patients without a contraindication receiving **Aspirin** prior to referring center ED discharge

Please Document Times:

1. _____ Chest Pain Onset
2. _____ Pre-Hospital (+) ECG time (if available)
3. _____ Regional Hospital Arrival
4. _____ Regional Hospital 1st ECG Time
   _____ (+) ECG Time (if 1st is negative)
5. _____ Time Transport Called
6. _____ STEMI Protocol Activation (PCI Hospital 1st Called)
7. _____ Time Transport Arrives
8. _____ Regional Hospital Departure

RN to:
1.) Apply cardiac monitor
2.) Start (2) peripheral IV's (TKO/saline lock)
3.) Verify routine labs & medications were ordered

RN Initials:

Other documentation, labs, allergies, or information:

Copy All paperwork and send with patient (ECG, Labs, Orders, etc.)

RN Name(s): RN Initials:
Date: _____

NURSE DOCUMENTATION
Regional Hospital Name & City:

Patient Name:

DASH Protocol Approved by St. Luke's & Essentia/St. Mary's – Current: November, 2018

STEMI Patient Scenario…

5 am Snow-Storm Call For Chest Pain

…59 yo Male with extensive cardiac history

- 59 yo Male with extensive cardiac history, ICD, on Warfarin, continues to smoke
  - Had Chest Pain and called 911
  - VFD (Justin Root & Will Olson) responded

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According to Will…

- The roads were pretty bad!

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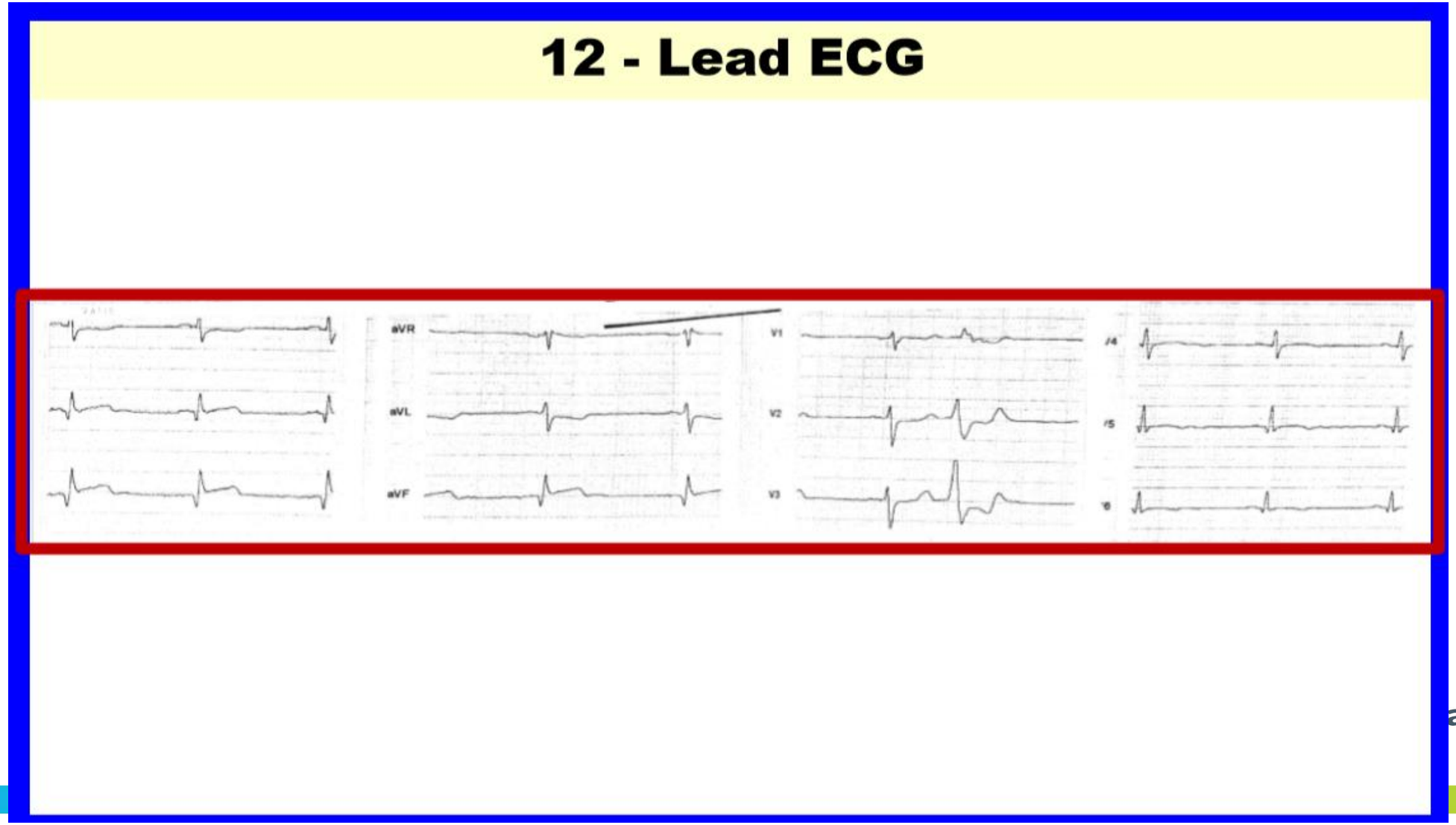
12-Lead Obtained Within 5 minutes (Great!)



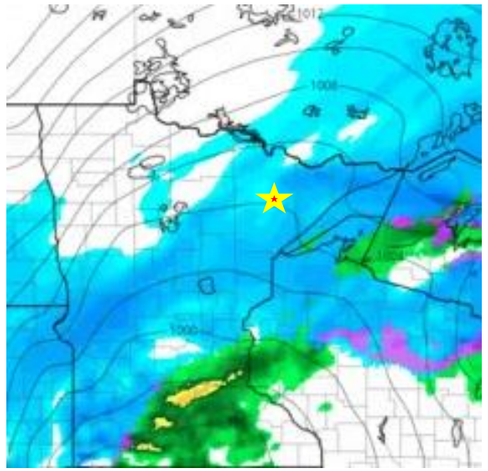
This is Why EMS Should Know How to Read a 12-Lead ECG…

- Unable to send ECG due to connectivity issue with monitor

OK, It’s a STEMI…What’s Next?

- Dispatched asked to check availability of air medical

- Life Link iii & North Memorial both unable to fly
  – due to weather conditions



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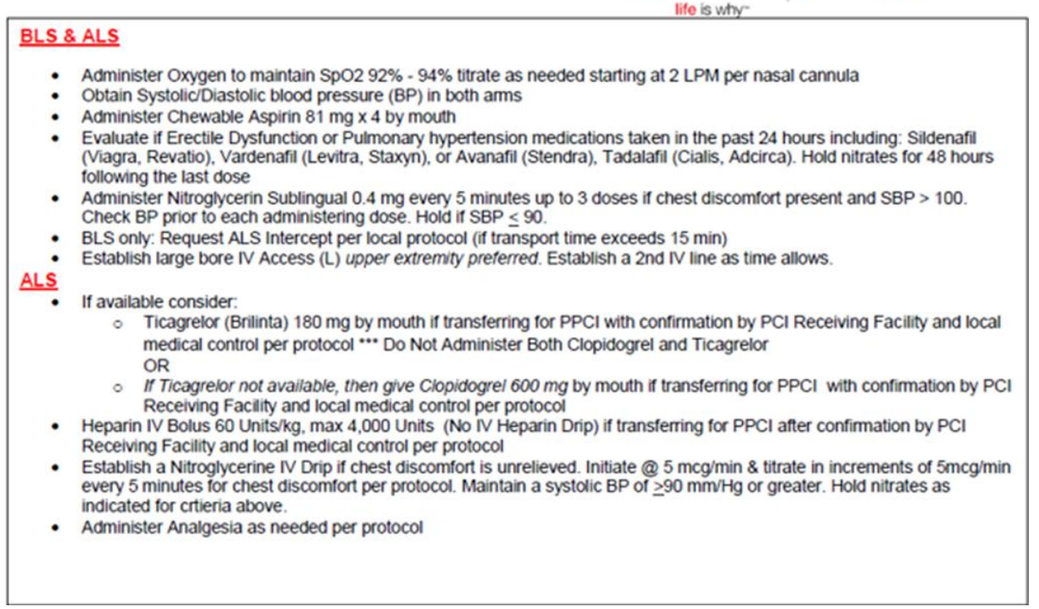

BLS & ALS

- Administer Oxygen to maintain SpO2 92% - 94% titrate as needed starting at 2 LPM per nasal cannula
- Obtain Systolic/Diastolic blood pressure (BP) in both arms
- Administer Chewable Aspirin 81 mg x 4 by mouth
- 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
- 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 ≤ 90.
- BLS only: Request ALS Intercept per local protocol (if transport time exceeds 15 min)
- Establish large bore IV Access (L) *upper extremity preferred*. Establish a 2nd IV line as time allows.

ALS

- If available consider:
  - Ticagrelor (Brilinta) 180 mg by mouth if transferring for PPCI with confirmation by PCI Receiving Facility and local medical control per protocol *** Do Not Administer Both Clopidogrel and Ticagrelor
    OR
  - *If Ticagrelor not available, then give Clopidogrel 600 mg* by mouth if transferring for PPCI with confirmation by PCI Receiving Facility and local medical control per protocol
- Heparin IV Bolus 60 Units/kg, max 4,000 Units (No IV Heparin Drip) if transferring for PPCI after confirmation by PCI Receiving Facility and local medical control per protocol
- Establish a Nitroglycerine IV Drip if chest discomfort is unrelieved. Initiate @ 5 mcg/min & titrate in increments of 5mcg/min every 5 minutes for chest discomfort per protocol. Maintain a systolic BP of ≥90 mm/Hg or greater. Hold nitrates as indicated for crtieria above.
- Administer Analgesia as needed per protocol

- Pt given:
  - 324 mg ASA PO
  - 0.4 mg Nitro tab SL
  - 180 mg Ticagrelor PO
- Venous access obtained in pts Left AC using an 18 g cath
  - 4000 Unit bolus of Heparin IV

- Pt helped downstairs to waiting cot where he was buckled then moved to and secured in ambulance.
- Once in ambulance transport started and cath lab activated at Essentia Health / St. Mary's

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En-Route to St. Mary's with a STEMI…

- Patient stated his pain remained a 7/10
- Pt started on Nitro drip at 10 mcg/min
- Pt said he had no relief after approximately 5 min
- Nitro drip increased to 15 mcg/min
- Pain went to 5/10
- Repeat 12 lead obtained…had minor decrease in ST elevation

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5 am Call For Chest Pain

…59 yo Male with extensive cardiac history

- In the Cath Lab, Dr. Worden first stented the Left Circumflex, and then the Obtuse Marginal

- First Medical Contact Time to PCI was only 93 minutes!

  – Discharged home the next day

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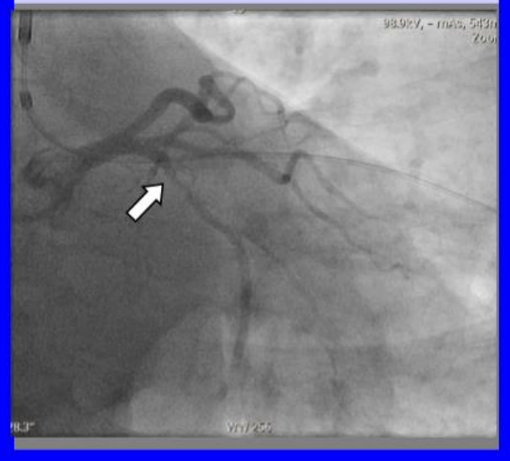
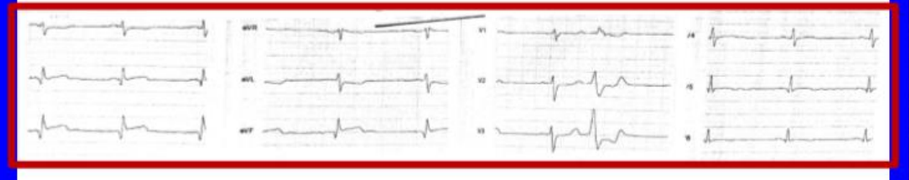
CATH LAB FINDINGS:

Stent Left Circumflex &
2nd Obtuse Marginal

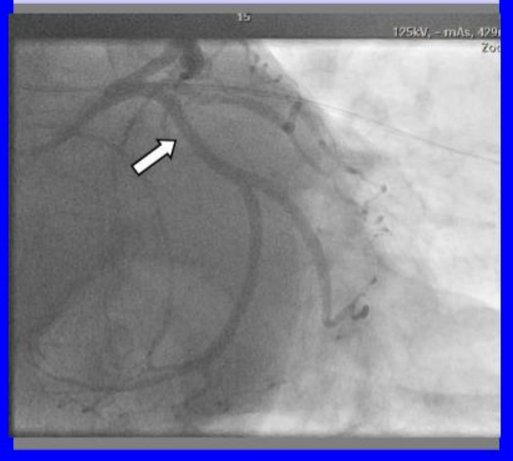
Pre - PCI



12 - Lead ECG

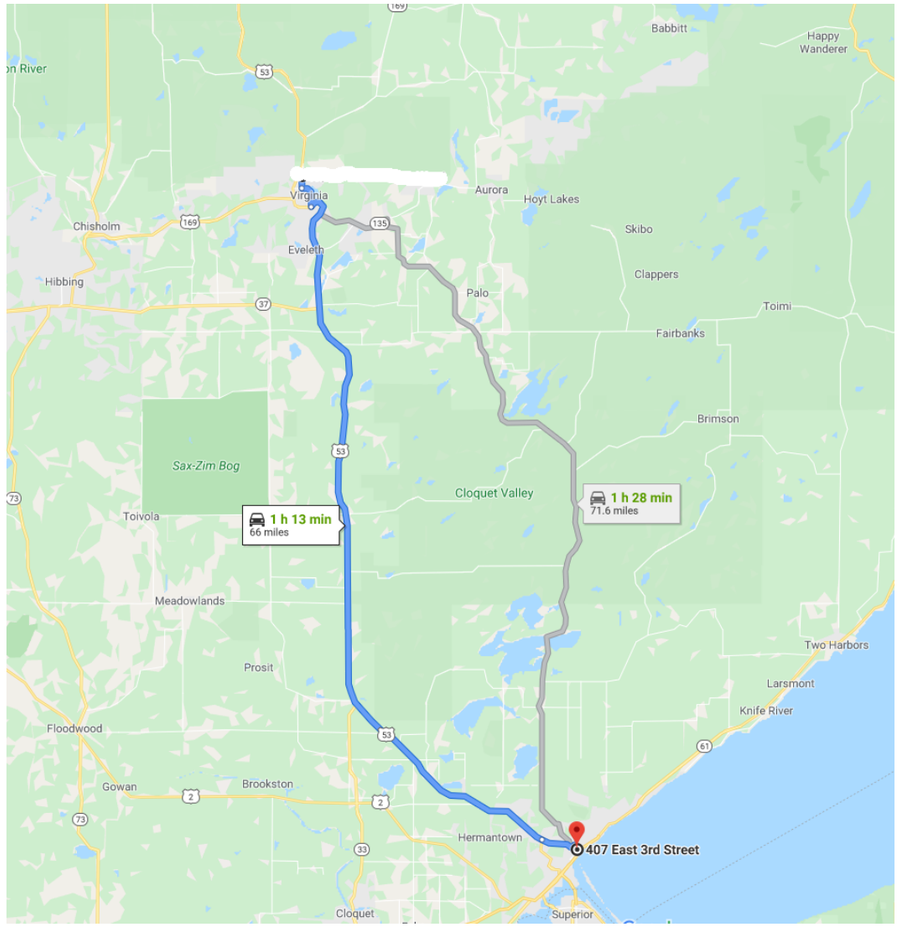


Post - PCI



You did say the roads were, "Pretty Bad"?

- 66 miles in 53 minutes…
  - Average 74.72 miles per hour



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Nice Job Will & Justin!

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Let's Look At The Times…

(66 miles)

Symptom Onset to 911 Call (min)	911 Call to EMS Dispatch (min)	EMS Dispatch to EMS En Route (min)	EMS En Route to Med Contact (min)	EMS 1st Contact to 12-Lead ECG (Goal 10 min)	First EMS (+) ECG to Call for STEMI Activation	EMS Call for Activation to Depart Scene	EMS Scene Time	EMS Depart Scene to Regional Hospital	EMS Depart Scene to Arrival at SMMC
34	1	0	4	5	14	-2	17	NA	53

SMMC Door to Device time (Step 3 EMS)	Cath Lab Start Time to Device	EMS first medical contact to device (Goal ≤ 90 min)	EMS (+) ECG to Device Time	911 Call to Device time	Symptom Onset to Device time	(+) ECG to Decision Time
23	7	93	88	98	132	14

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Local STEMI Research

Less Lytics, Less Critics: Impact of Reducing Fibrinolytic Use on Outcomes in a Large Rural ST-Elevation Myocardial Infarction Program

David Supinski[1], Richard Mullvain[2], Ron Regal[2], Catherine Benziger[2]
[1]University of Minnesota Medical School, Duluth, MN;
[2]Essentia Health Heart and Vascular Center, Duluth, MN

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BACKGROUND

The ST-elevation myocardial infarction (STEMI) guidelines recommend a mixed treatment strategy - primary percutaneous coronary intervention (PPCI) within 90-120 minutes or fibrinolytic therapy if patients are eligible and unable to receive PPCI within 120 minutes from first medical contact (FMC). We aimed to evaluate reperfusion strategy and outcomes after implementation of a comprehensive, large inter-facility transfer STEMI program.

METHODS

- Prospective observational cohort study
- All STEMI patients between 5/03/2009-6/24/2019.
- Data analysis using standard STEMI metrics and cox regression method Kaplan-Meier survival curves for survival analysis, logistic regression for mortality and readmission
- Results were adjusted for age and sex.

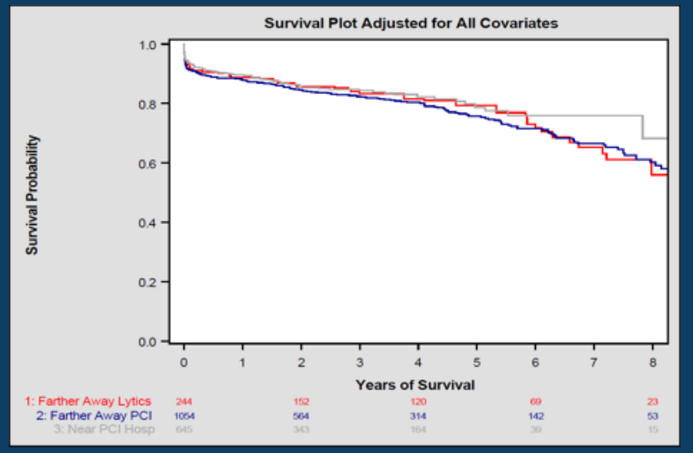
RESULTS

- 2011 (28.4% female, mean age 62.3 years.) STEMI activations.
- 1765 treated by the PPCI pathway, 246 times for the fibrinolytic pathway.
- Annual fibrinolytic use from 2009 to 2018 decreased from 23.92% to 6.13%.
- Rural patients receiving fibrinolytics had a hazard ratio of 1.06 (95% CI: 0.77-1.47) compared to Rural patient receiving PCI treatment, 1-year survival rates were 0.87, (95% CI 0.84-0.90) and 0.88 (95% CI 0.87-0.90) respectively.
- The 30-day readmission for rural patients in the PPCI protocol was 8.7% compared to 11.2% in the fibrinolytic pathway.

CONCLUSION

Noninferior outcomes were demonstrated in patients with extended time to PCI. Readmission rates were significantly lower among PPCI patients compared to those treated with fibrinolytics. There was also no significant change in overall outcomes as treatment strategy shifted towards increased PCI use.

Noninferior survival and **decreased readmission rates** supports our protocol to deliver PPCI to more patients in a large rural health system despite extended times to treatment.



ACC.21

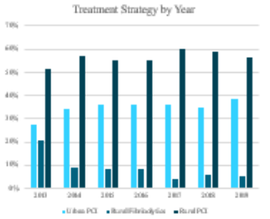
DISCUSSION

This study supports the translation of current STEMI care guidelines from a ceiling of 90-minutes time to PPCI to 120-minutes, allowing for more patients to reach a PCI capable hospital and receive the superior PPCI treatment. This is especially applicable in large rural systems such as the Essentia Health System in northern Minnesota and North Dakota

FIGURE 1

Nonsignificant differences were found in the 1 and 5 year survival rates between urban patients receiving PCI, rural patients with extended times and distances to PCI and rural patients who underwent treatment with fibrinolytics.

FIGURE 2



The percentage of patients treated with thrombolysis as a reperfusion strategy decreased dramatically, form 23.92% in 2009 to 6.13% in 2018, after the initiation of the STEMI transfer protocol.

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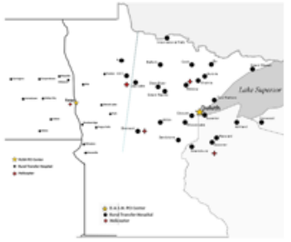

Essentia Health's STEMI systems of care. The two PCI-capable hospitals are located in Duluth, MN and Fargo, ND. Each covers a large rural area, with protocols encouraging urgent transport for PPCI treatment of STEMI.

FIGURE 4

30 Day Readmission

	All cause Readmission	Cardiac Readmission
Rural Fibrinolytics	11.24%	8.53%
Rural PCI	8.68%	7.25%

Hospital all-cause and cardiac related readmission rates after discharge from a STEMI.

DISCLOSURE INFORMATION

Authors have no disclosures to report.

ACKNOWLEDGEMENTS

To the team at Essentia Health St. Mary's Cardiovascular Department, Essentia Institute of Rural Health, Duluth Medical School and others who contributed to this project.

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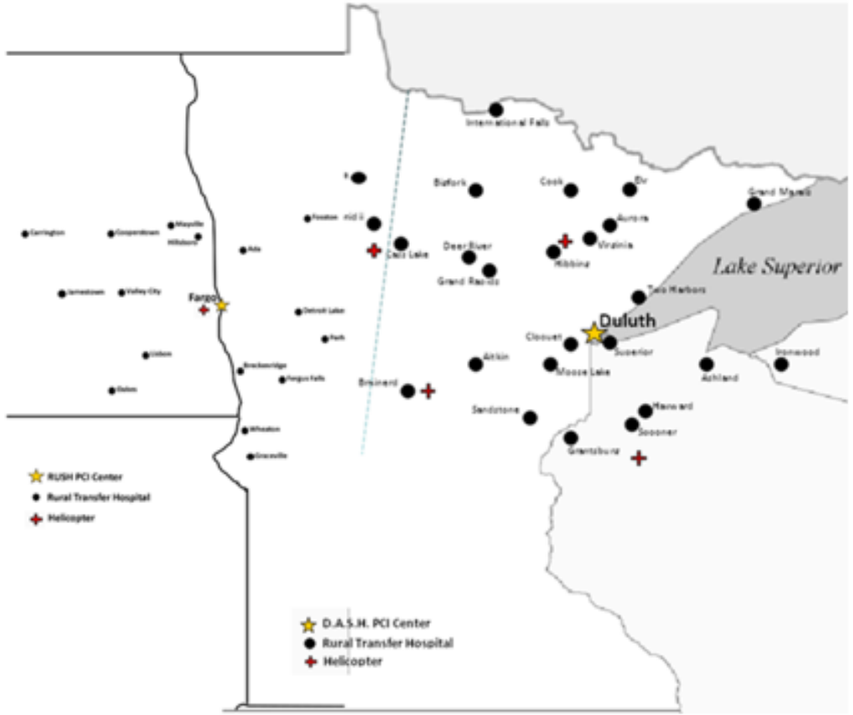

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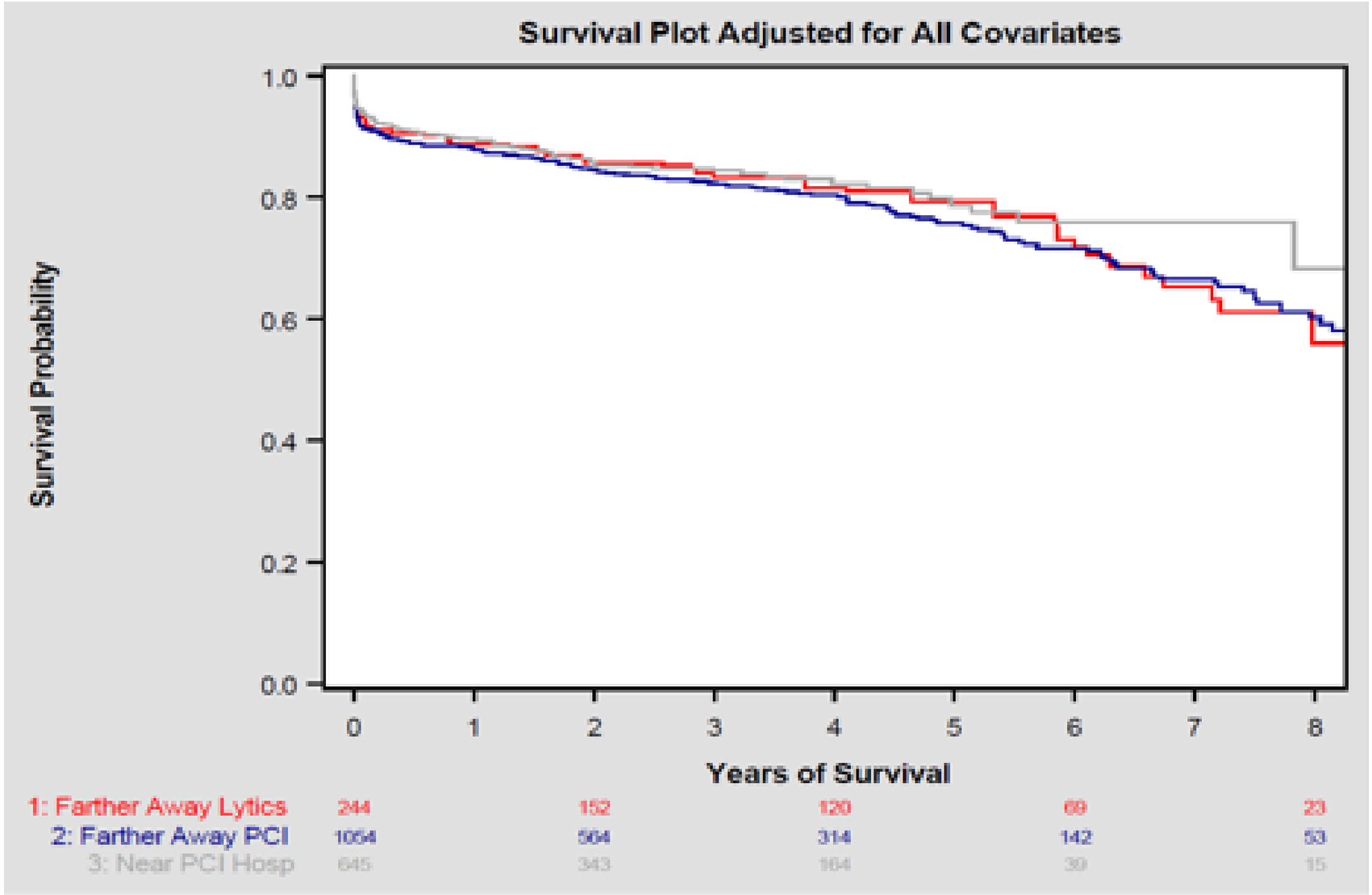

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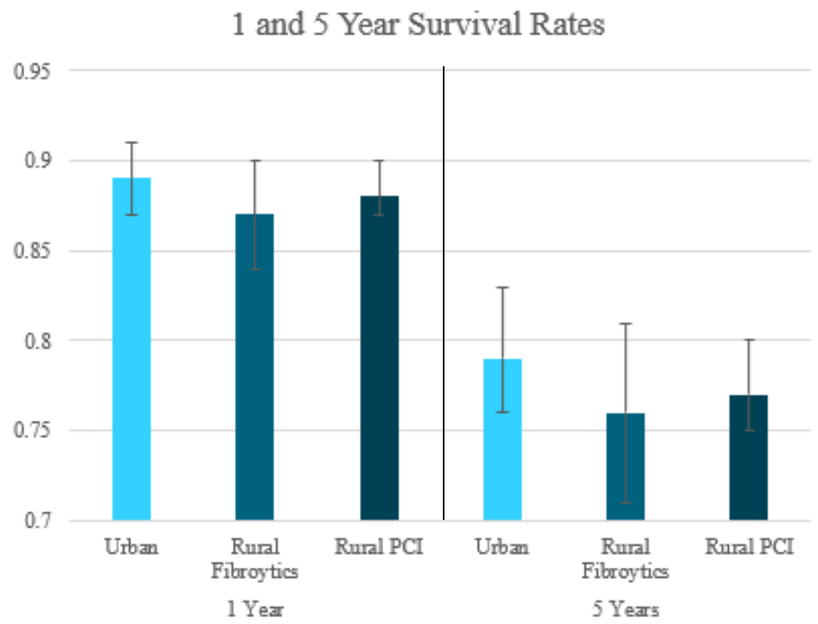

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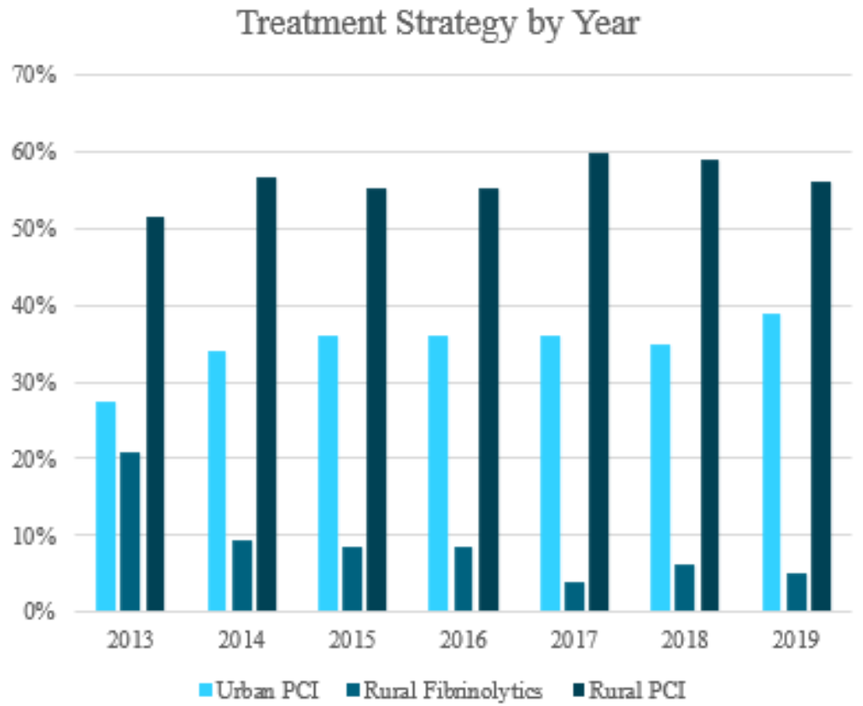

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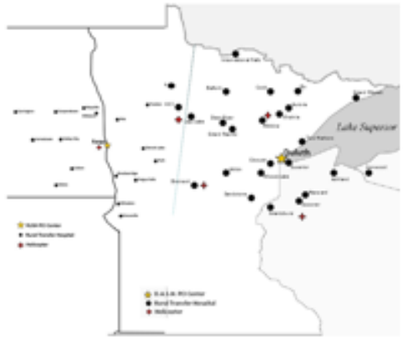

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Thank You!

- Questions?

- Contact info:
  - Richard.Mullvain@EssentiaHealth.org

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