

Minnesota Chest Pain/Acute Coronary Syndrome Toolkit

Patient with Chest Pain or Potential Acute Coronary Syndrome (Page 1)

1. STEMI, Non-STEMI Chest Pain?
 - a. If STEMI, follow MN STEMI Guideline (Pages 3-4)
 - b. If Non-STEMI, follow MN Non-STEMI Guideline (Page 8)
 - c. If Chest Pain, follow MN ED Chest Pain Guideline (Page 10)

2. 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 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.

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Minnesota STEMI Guideline (Pages 3-4)

Minnesota Mission: Lifeline Statewide STEMI Transfer Guideline

1. Identify/Confirm STEMI
 - a. Signs & Symptoms suspect for AMI (Acute Myocardial Infarction) Duration > 15 min < 12 hours
 - b. ST Elevation defined by criteria on Page 2 (Number 14 below)
 - c. Pre-Hospital STEMI criteria on Page 2 (Number 15 below)
2. Activate Transport
 - a. Establish availability and ETA of Air or Ground ALS EMS for Interfacility Transfer to Primary PCI Hospital
3. Active your Internal STEMI Alert
 - a. Alert appropriate provider(s) and team members
4. Establish Key Times:
 - a. Symptom onset
 - b. First Medical Contact (FMC)
 - c. ETA to arrival at PCI Hospital
5. Estimate FMC (First Medical Contact) to Potential PCI
 - a. Allow approximately 20 minutes after arrival to PCI Capable hospital
6. If Estimated FMC to PCI \leq 120 minutes OR FMC > 120 minutes and one of the following then Do NOT give Lytic/TNK!
 - a. Fibrinolytic Ineligible
 - b. Resuscitated out-of-hospital cardiac arrest patients whose initial ECG shows STEMI
 - c. Evidence of either Cardiogenic Shock or Acute Severe CHF
7. For all patients in Number 6 above
 - a. Aspirin 325 mg PO chewed
 - b. Heparin IV Bolus 60 Units/kg, max 4,000 Units (No IV Heparin Drip)
 - c. Ticagrelor 180 mg PO (If Ticagrelor not available, then give Clopidogrel 600 mg PO)
8. If Estimated FMC to PCI 120-180 minutes then
 - a. Establish if Fibrinolytic appropriate (See Page 2, Numbers 16 and 17 below, for contraindications)
 - b. Goal: Door to Needle < 30 min
 - c. For all patients transferring not utilizing pharmaco-invasive strategy proceed to Full Dose Fibrinolytic Strategy (Number 9 below)
 - d. For patient transferring to Abbott Northwestern/MHI utilizing pharmaco-invasive strategy, administer HALF-Dose TNK IV and transfer for PCI (Dosing table on Page 2, Number 18 below)
 - e. Aspirin 81 mg x 4 (324 mg) chewed
 - f. Heparin IV Bolus 60 Units/kg, max 4,000 Units (No IV Heparin Drip)

- g. Clopidogrel 600 mg PO
 - h. TNK "Half-Dose" IV
9. If Estimated FMC to PCI > 120 minutes and for all ages transferred with an estimated FMC to PCI > 180 minutes)
- a. Establish if Fibrinolytic appropriate (See page 2 for contraindications, Numbers 16 and 17 below)
 - b. Goal: Door to Needle < 30 minutes
 - c. Consider consultation with PCI receiving center Cardiology prior to administration of fibrinolytic
 - d. Aspirin 325 mg PO chewed
 - e. Heparin IV Bolus 60 Units/kg, max 4,000 Units
 - f. Heparin IV Drip 12 Units/kg/hr, max 1,000 Units/hr
 - g. For Age ≤ 75 years then:
 - i. Clopidogrel 300 mg PO
 - ii. TNK "Full-Dose" IV (See Dosing table page 2, Number 18 below)
 - h. For Age > 75 years then:
 - i. Clopidogrel 75 mg PO
 - ii. TNK "Half-Dose IV (See Dosing table page 2, Number 18 below)
10. For all patients, Activate Code STEMI/STEMI Alert at PCI Hospital (Follow your regional STEMI protocol)
11. Transport Patient as Soon as Possible!
- a. Fax or Transmit ECG and other pertinent records (EMS reports, allergies, past medical history, etc.)
12. Top Patient Care Priorities:
- a. Establish DNR/Resuscitation Status
 - b. Obtain vital signs and assess pain level on scale of 1-10
 - c. Cardiac Monitor and attach hands-free defibrillator pads
 - d. Establish Saline Lock – large bore needle (left arm preferred)
 - e. Oxygen PRN at 2 L/min and titrate to SpO₂ > 90%
 - f. Assess Allergies (Note if reaction to IV Contrast?)
 - g. Section for user to add notes
13. Patient Care When Time Allows:
- a. Establish 2nd large bore IV with Normal Saline @TKO (Left Arm preferred)
 - b. Obtain Appropriate Labs: Troponin, CBC, Potassium, Creatinine, PT/INR, aPTT
 - c. Nitroglycerin 0.4 mg SL every 5 min or Nitropaste PRN for chest pain (hold for SBP < 90)
 - d. 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.

14. STEMI (ST Elevation Myocardial Infarction) Diagnostic Criteria
 - a. 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
 - b. Signs & Symptoms of discomfort suspect for AMI (Acute Myocardial Infarction) or STEMI with a duration of > 15 minutes < 12 hours
 - c. 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.
 - d. ECG demonstrates evidence of ST depression suspect of a Posterior MI. Consult with PCI receiving center.
 - e. If initial ECG is not diagnostic but suspicion is high for STEMI, obtain serial 12 Lead ECG's at 5-10 minute intervals.

15. Pre-Hospital STEMI confirmed by 12 Lead ECG trained ALS EMS, recognize ST segment elevation of ≥ 1 mm in 2 contiguous leads, confirmed interpretation of STEMI transmitted, or ECG monitor interpretive statement infers: "Acute Myocardial Infarction" with patient signs and symptoms suspect of AMI.

16. Absolute Contraindications for Fibrinolysis
 - a. Chest Pain/Symptom Onset > 12 hours
 - b. Suspected aortic dissection
 - c. Any prior intracranial hemorrhage
 - d. Structural cerebral vascular lesion or malignant intracranial neoplasm
 - e. Any active bleeding (excluding menses)
 - f. Ischemic stroke within 3 months
 - g. Significant closed-head or facial trauma within 3 months
 - h. Pregnancy

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

18. 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

19. AHA Mission:Lifeline STEMI Recommendations

- a. FMS (First Medical Contact)-to-First ECG time ≤ 10 minutes unless pre-hospital ECG obtained
- b. All eligible STEMI patients receiving a Reperfusion Therapy (Primary PCI or Fibrinolysis)
- c. Fibrolytic eligible STEMI patients with a Door-to-Needle time ≤ 30 minutes
- d. Primary PCI eligible patients transferred to a PCI receiving center with referring center Door in-Door out (Length of Stay) ≤ 45 minutes
- e. Referring Center ED or Pre-Hospital First Medical Contact-to-PCI time ≤ 120 minutes (including transport time)
- f. All STEMI patients without a contraindication receiving Aspirin prior to referring center ED discharge

20. Section for user to add notes

Minnesota Mission: Lifeline EMS STEMI Transport Guideline (Pages 5-6)

1. Obtain 12 L ECG with Initial Assessment & Vital Sign
 - a. Goal: First Medical contact to ECG \leq 10 min, Scene time: \leq 15 min – to provide early identification and pre-hospital arrival notification for suspected myocardial infarction or STEMI
 - b. Chest pain, pressure, tightness or persistent discomfort above the waist in patients \geq 35 years of age
 - c. “Heartburn” or epigastric pain
 - d. Complaints of “heart racing” (HR $>$ 150 or irregular and $>$ 120) or “heart too slow” (HR $<$ 50 and symptomatic)
 - e. A syncopal episode, severe weakness, or unexplained fatigue
 - f. New onset stroke symptoms ($<$ 24 hours old)
 - g. Difficulty breathing or shortness of breath (with no obvious non-cardiac cause)
 - h. ROSC (return of spontaneous circulation) post cardiac arrest
 - i. Recent Cocaine, stimulant and/or other illicit drug use (patients of any age)
 - j. 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

2. Pre-Hospital STEMI ALERT Activation Criteria:
 - a. Goal: Identify potential ACS patients, Recognize STEMI, Alert Receiving Facility
 - b. Activate STEMI Alert when any one or more of the following criteria are met and patient demonstrates signs and symptoms suspect of (AMI) acute myocardial infarction as described above with a duration of \geq 15 minutes \leq 24 hours
 - i. EMS personnel trained in 12 L ECG interpretation recognize ST segment elevation of \geq 1 mm in 2 contiguous leads
 - ii. Interpretation of ECG transmitted and reviewed by a provider (Physician, NP, PA) confirmed to be diagnostic of STEMI
 - iii. 12 Lead ECG Monitor Algorithm Interpretative statement reads: “Acute Myocardial Infarction”

3. Determine Transport Destination
 - a. If Transport time estimated to be \leq 60 min (Goal FMC to PCI \leq 120 min) then
 - i. Notify medical control of STEMI and consider transport via the most expedient method available to the nearest PCI Capable Receiving Hospital for Primary PCI
 - ii. Active STEMI Alert at Receiving Facility and transmit 12 L ECG as able
 - iii. Consider Air transport

 - b. If Transport time estimated to be \geq 60 min (Goal Door to Thrombolysis administration \leq 30 min) then:
 - i. 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.
 - ii. Initiate thrombolytic contraindication checklist per protocol

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- iii. Activate STEMI Alert at Receiving Facility and transmit 12 L ECG as able for provider confirmation
 - iv. Consider Air Transport
 - c. Diversion Criteria: If patient demonstrates instability and/or has any of the following criteria that may require ED evaluation and treatment by a practitioner proceed to the nearest appropriate hospital.
 - i. Symptoms suggestive of acute stroke or neurological evaluation
 - ii. Respiratory or Circulatory Instability
 - iii. Chest trauma or MVC victims
 - iv. DNR status
 - v. Consider Left Bundle Branch Block

4. BLS & ALS:

- a. Administer Oxygen to maintain SpO₂ 90% -94% titrate as needed started at 2 LPM per nasal cannula
- b. Obtain Systolic/Diastolic blood pressure (BP) in both arms
- c. Administer Chewable Aspirin 81 mg x 4 by mouth
- d. Evaluate if Erectile Dysfunction or Pulmonary hypertension medications taken in past 24 hours including: Sildenafil (Viagra, Revatio), Vardenafil (Levitra, Staxyn), Avanafil (Stendra), or Tadalafil (Cialis, Adcirca). Hold nitrates for 48 hours following the last dose.
- e. 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.
- f. BLS Only: Request ALS intercept per local protocol (if transport time exceeds 15 min)
- g. Establish large bore IV Access (L) upper extremity preferred. Establish a 2nd IV line as time allows.

5. ALS:

- a. If available consider one of the following:
 - i. 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.
 - ii. 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.
- b. 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.
- c. Establish a Nitroglycerine IV Drip if chest discomfort is unrelieved. Initiate @ 56 mcg/min & titrate in increments of 5 mcg/min every 5 minutes for chest discomfort per protocol. Maintain a systolic BP of ≥ 90 mm Hg or greater. Hold nitrates as indicated for criteria above.
- d. Administer Analgesia as needed per protocol.

6. Documentation Reminders:

- a. Provide a printed copy of EMS Run Sheet, and 12 L ECG with Report to the receiving hospital ED staff
- b. Document Date and Time of:
 - i. EMS dispatch
 - ii. First Medical Patient Contact

- iii. Scene Departure
- iv. STEMI alert requested

7. AHA Mission: Lifeline EMS Best Practice Goals

- a. All patients with non-traumatic chest discomfort, ≥ 35 years of age, treated and transported by EMS receive a pre-hospital 12-lead electrocardiogram
- b. 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
- c. All thrombolytic eligible STEMI patients treated and transported to a referring hospital for fibrinolytic therapy receive a door to needle time ≤ 30 minutes

8. AHA Mission: Lifeline EMS Recognition Achievement Measures

- a. Percentage of patients with non-traumatic chest pain, ≥ 35 years of age, treated and transported by EMS who receive a pre-hospital 12-lead electrocardiogram
- b. Percentage of STEMI patients treated and transported directly to a STEMI receiving center, with pre-hospital first medical contact to device time ≤ 90 minutes
- c. 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

EMS STEMI Mission: Lifeline Minnesota Transport Flowchart (Page 7)

1. Suspected Cardiac Event
2. Obtain 12 Lead ECG with Initial Assessment & Vital Signs
 - a. Goal: First Medical Contact to ECG \leq 10 min
3. Provide All Additional Treatments per Chest Pain or Appropriate Protocols
4. Pre-Hospital STEMI ALERT Activation Criteria
 - a. Signs & symptoms suspect of AMI with duration \geq 15 min but \leq 24 hrs, and one or more of the following are met:
 - i. ECG transmitted & reviewed by a provider (Physician, NP, PA) confirmed to be diagnostic of STEMI
 - ii. EMS personnel trained in 12 L ECG interpretation recognize ST elevation of \geq 1 mm in 2 contiguous Leads
 - iii. 12-Lead ECG Monitor Algorithm Interpretative statement (i.e. *** Acute Myocardial Infarction ***)
5. Question: Is STEMI Alert Activation Criteria Met?
 - a. If no, then if suspicion high for ACS & symptoms persist, continue protocol treatments and obtain serial ECG's at 5-10 minute intervals and return to Number 2
 - b. If yes, then go to Number 6
6. Determine Transport Destination
 - a. Consider Air Transport
 - b. Consider ALS Intercept if BLS transport $>$ 15 min
7. Question: Is Transport Time to PCI Capable Hospital \leq 60 min?
 - a. If yes, then Notify Medical Control at nearest appropriate PCI Hospital of STEMI ALERT
 - i. Request Cath Lab Activation
 - ii. Consider transport via the most expedient ALS method available for Primary PCI
 - iii. Question: Instability or Diversion Criteria?
 1. If yes, 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, then Proceed to Nearest Appropriate Hospital
 2. If no, then Call PCI Hospital with Patient Identifiers and Proceed to PCI Hospital
 - b. If no, then 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
 - i. Proceed to Nearest Appropriate Hospital
8. For all transported patients, Documentation Reminders upon Arrival at Hospital

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- a. Provide a printed copy of EMS Run Sheet & 12 Lead ECG with Report to the receiving hospital staff
- b. Document Date and Time of:
 - i. EMS dispatch
 - ii. First Medical Patient Contact
 - iii. 12-Lead ECG
 - iv. Scene departure
 - v. STEMI alert requested
 - vi. Destination Arrival
 - vii. EMS agency number, and run number

Minnesota Non-STEMI Guideline (Page 8)

1. Patient meets any of the following criteria:
 - a. HEART Score of 7-10
 - b. ST depression or dynamic T-wave inversion strongly suspicious for ischemia
 - c. Otherwise identified Non-ST elevation acute coronary syndrome (Non-STEMI)

2. Next Step:
 - a. Admit to CCU or appropriate unit with cardiac telemetry (may require transfer)
 - b. Consider Cardiology consult

3. Medications:
 - a. Start adjunctive treatments (as indicated/if no contraindications):
 - i. Aspirin 324 mg PO (give suppository if unable to take PO)
 - ii. Ticagrelor 180 mg PO or Clopidogrel 600 mg PO (loading doses)
 1. Prasugrel 60 mg could also be considered but note warnings in Number 9 below)
 - iii. Heparin 60 Units/kg (max 4,000 Units) IV bolus
 - iv. Heparin 12 Units/kg/hr (max 1,000 Units) IV infusion
 - b. Other medications as indicated per institutional AMI order set

4. Assess Criteria for Early Invasive Strategy (Cath Lab)
 - a. High-risk features & patient a candidate for invasive angiography (PCI)?
 - b. Persistent or recurrent symptoms?
 - c. New ST-segment depression and positive serum Troponin(s)?
 - d. Depressed LV functional study that suggests multi-vessel CAD?
 - e. Hemodynamic instability or VT?

5. Choose Treatment Strategy
 - a. If Early Invasive Strategy (Cath Lab) then go to Number 6 below
 - b. If Ischemia-Guided Strategy (Medical Therapy) then go to Number 10 below

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

7. If CABG surgery is required then
 - a. Continue Aspirin
 - b. Consult CT surgeon about stopping other therapies and timing (i.e. when to hold antiplatelet)

8. P2Y₁₂ Inhibitor Maintenance Dosing & Considerations
 - a. Ticagrelor 90 mg PO twice daily or
 - b. Clopidogrel 75 mg once daily or
 - c. Prasugrel 10 mg once daily (5 mg if ≤ 60 kg) (Note warnings in Number 9 below)

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

9. Prasugrel Warnings:

- a. Do NOT use if history of stroke or TIA
- b. Avoid in patients ≥ 75 years old or < 60 kg
- c. Do NOT start if patient likely to undergo urgent CABG

10. If Ischemia-Guided Strategy (Medial Therapy) then

- a. Continue adjunctive treatments as indicated
- b. Continue serum Troponins q 3 hours x 3
- c. Continue serial ECG's
 - i. Repeat PRN for recurring/worsening symptoms
- d. Obtain cardiac imaging study
 - i. Consult Cardiology for appropriate test (i.e. Echocardiography, CTA, Radionudide, etc.)
- e. If therapy not effective, or pending results of imaging study, reconsider if Invasive Strategy (Cath Lab) would be appropriate (Number 6 above)

11. Late/Hospital/Posthospital Care

- a. Aspirin 81 mg PO once daily
- b. ACE inhibitor or ARB
- c. Beta-Blocker
- d. High Intensity Statin
- e. P2Y12 Inhibitor per Cardiology
- f. Cardiac Rehab Referral

12. This Guideline is 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 (Page 9)

This page is an image of a flowchart depicting the Minnesota Non-STEMI Guideline described on Page 8.

Minnesota ED Chest Pain Protocol (Page 10)

1. For patients presenting to an emergency department with chest pain or equivalent symptoms of a potential Acute Coronary Syndrome (ACS)
2. Obtain STAT 12-lead ECG and IV blood draw for serum Troponin level
 - a. If ECG or Troponin is positive for ACS, patient is no longer low risk, follow appropriate ACS protocols
 - b. Repeat 12-Lead ECG immediately if symptoms change
 - c. Once the first Troponin is resulted, calculate the HEART Score (See Calculate HEART Score below)
3. If the Heart Score is zero to three, patient is considered Low Risk
 - a. Use the Low Risk Shared Decision-Making Tool (Page 12)
 - b. Inform patient at this point, there is a 1.7% risk of adverse cardiac event in the next 4-6 weeks
 - c. Advise patient to stay for another Troponin and ECG at hour of ED admission
 - d. If second Troponin and ECG are negative:
 - i. Inform the patient that now there is a 0.6% risk of an adverse cardiac event in the next 4 weeks
 - ii. Advise that patient can be ruled out for ACS without a stress test
 - iii. Advise patient to follow up with a provider within 1 week, or per local standard of care
4. If the Heart Score is four to six, patient is considered Moderate Risk (Page 13)
 - a. Use the Moderate Risk Shared Decision-Making Tool
 - b. Inform patient at this point there is a 13% risk of an adverse cardiac event in the next 4-6 weeks
 - c. Advise patient to be admitted for observation
 - d. Obtain serial ECG's and Troponins at hours 3 and 6
 - e. Evaluate need for admission or a provocative cardiac Stress Test within the next 72 hours
 - f. Follow appropriate ACS protocols, depending on findings
5. If the Heart Score is seven to ten, patient is considered High Risk (Page 14)
 - a. Use the High Risk Shared Decision-Making Tool
 - b. Inform patient at this point there is at least a 50% risk of an adverse cardiac event in the next 4-6 weeks
 - c. Advise patient to be admitted to PCI capable hospital and follow appropriate ACS protocols
 - d. Obtain serial ECG's and Troponins at hours 3 and 6
 - e. Post Cardiology for consult
6. Section for user to add notes

Calculate HEART Score

1. Calculate History
 - a. 2 points for High Suspicious (mostly high-risk features)
 - i. High-risk features include:
 1. Middle or left-sided
 2. Heavy chest pain
 3. Diaphoresis
 4. Radiation
 5. Nausea/Vomiting
 6. Exertional
 7. Relief of symptoms by sublingual nitrates
 - b. 1 point for Moderately Suspicious (mixture of high-risk and low-risk features)
 - c. 0 points for Slightly Suspicious (mostly low-risk features)
 - i. Low-risk features include:
 1. Well localized
 2. Sharp pain
 3. Non-exertional
 4. No diaphoresis
 5. No nausea/vomiting
2. Calculate ECG
 - a. 2 points for New Ischemic changes (Ischemic ST segment depression (≥ 1 mm))
 - b. 1 point for Non-specific changes
 - i. Repolarization abnormalities
 - ii. Non-specific T-wave changes
 - iii. Non-specific ST-segment depression or elevation
 - iv. Bundle branch blocks
 - v. Pacemaker rhythms
 - vi. LVH
 - vii. Early repolarization
 - viii. Digoxin effect
 - c. 0 points for completely normal
3. Calculate Age
 - a. 2 points for ≥ 65 years
 - b. 1 point for 45 to 64 years
 - c. 0 points for < 45 years
4. Calculate Risk Factors
 - a. 2 points for any of one of the following:
 - i. Known CAD
 - ii. Prior stroke
 - iii. Peripheral arterial disease
 - b. Or 2 points for 3 or more of the following risk factors:
 - i. Obesity (BMI ≥ 30)

- ii. Current or recent smoke (< 90 days)
 - iii. Currently treated diabetes mellitus
 - iv. Family history of CAD (siblings and/or parents < 55 years old)
 - v. Hypertension
 - vi. Hypercholesterolemia
 - c. 1 point for 1 or 2 of the above risk factors
 - d. 0 points for none of the above risk factors
5. Calculate Troponin
- a. 2 points for ≥ 3 times Normal Limit
 - b. 1 point >1 to < 3 times Normal Limit
 - c. 0 points for \leq Normal Limit
6. Sum points from HEART Score Categories -- History, ECG, Age, Risk Factors, and Troponin -- to get Patient Score
- a. Total of 0 to 3 points is Low Risk
 - b. Total of 4 to 6 points is Moderate Risk
 - c. Total of 7 to 10 points is High Risk

Minnesota ED Chest Pain Protocol Flowchart (Page 11)

This page is an image of a flowchart depicting the Minnesota ED Chest Pain Protocol described on Page 10.

Low Risk Shared Decision Making Tool (Page 12)

1. For Chest Pain patients whom: Initial ECG and Troponin are negative, and HEART Score is Low Risk
 - a. 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 only 1 had a heart attack or a heart complication, while 99 did not, within 30 days of their Emergency Department visit.

What to Expect Next?

1. Your Chest Pain Diagnosis
 - a. 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.
 - b. 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.
 - c. However, even if everything is normal, your chest pain may still be an early warning sign of a possible FUTURE heart attack or heart complication.
2. Further Evaluation
 - a. Further evaluation and testing will help check if your heart is working correctly.
 - b. 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
 - a. 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
 - a. 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.
 - b. 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.
5. 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.
6. Factors used to determine your risk using the HEART Score
 - a. H means History

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- b. E means ECG
- c. A means Age
- d. R means Risk Factors for Heart Disease
- e. T means Troponin

7. Section for user to add notes

Moderate Risk Shared Decision Making Tool (Page 13)

1. For Chest Pain patients whom: Initial ECG and Troponin are negative, and HEART Score is Moderate Risk
 - a. 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 13 had a heart attack or a heart complication, while 87 did not, within 30 days of their Emergency Department visit.

What to Expect Next?

1. Your Chest Pain Diagnosis
 - b. 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.
 - c. 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.
 - d. However, even if everything is normal, your chest pain may still be an early warning sign of a possible FUTURE heart attack or heart complication.
2. Further Evaluation
 - a. Further evaluation and testing will help check if your heart is working correctly.
 - b. 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
 - a. 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
 - a. 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.
 - b. 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.
5. 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 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.

6. Factors used to determine your risk using the HEART Score
 - a. H means History
 - b. E means ECG
 - c. A means Age
 - d. R means Risk Factors for Heart Disease
 - e. T means Troponin

7. Section for user to add notes

High Risk Shared Decision Making Tool (Page 14)

1. For Chest Pain patients whom: Initial ECG and Troponin are negative, and HEART Score is High Risk
 - a. 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 50 had a heart attack or a heart complication, while 50 did not, within 30 days of their Emergency Department visit.

What to Expect Next?

1. Your Chest Pain Diagnosis
 - b. 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.
 - c. 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.
 - d. However, even if everything is normal, your chest pain may still be an early warning sign of a possible FUTURE heart attack or heart complication.
2. Further Evaluation
 - a. Further evaluation and testing will help check if your heart is working correctly.
 - b. 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
 - a. 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
 - a. 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.
 - b. If you decline repeated tests and go home now, your current risk for a heart attack may be even greater than 50 out of 100 patients.
5. 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 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.
6. Factors used to determine your risk using the HEART Score

MINNESOTA CHEST PAIN/ACUTE CORONARY SYNDROME TOOLKIT

- a. H means History
- b. E means ECG
- c. A means Age
- d. R means Risk Factors for Heart Disease
- e. T means Troponin

7. Section for user to add notes

Who Needs a Stat 12-Lead ECG? (Page 15)

1. If Age \geq 18 years and either of the following:
 - a. Cardiac Chest Pain
 - b. Or Clinical Judgment suggests need for ECG
 - i. Clinical judgment requires assessment beyond the chief complaint. This list 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 patients 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.
 - c. Then 12 Lead ECG Needed STAT!
2. If No and Age \geq 30 and Any Chest Pain
 - a. Then 12 Lead ECG Needed STAT!
3. If No and Age \geq 50 and any of the following:
 - a. Shortness of Breath
 - b. Weakness
 - c. Altered Mental Status
 - d. Syncope
 - e. Upper Extremity Pain – Nose to Navel (Arm, Back, Jaw, Neck, etc.)
 - f. Then 12 Lead ECG Needed STAT!
4. If No and Age \geq 80 and either of the following:
 - a. Abdominal Pain
 - b. Nausea/Vomiting
 - c. Then 12 Lead ECG Needed STAT!
5. If No, 12 Lead ECG Not Needed STAT, then continue to monitor and assess patient for any changes that would trigger the need for an ECG!!!
6. This flowchart 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. Petersen, 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.

MINNESOTA CHEST PAIN/ACUTE CORONARY SYNDROME TOOLKIT

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