



**Emergency Program
Suspect Acute Coronary Syndrome (ACS) Care Map
Standards Document and Charting Guidelines
Revised, June 18, 2008
Approved by the Winnipeg Regional Health Authority**

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Preface

The Suspect Acute Coronary Syndrome (ACS) Care Map and Standards Document were created to standardize the care plan for patients who present to the Emergency Department with chest pain suggestive of a coronary event. They include:

- ST Elevation and Non ST Elevation AMI
- Unstable Angina
- Rule out ACS/Chest Pain NYD

The triage nurse should initiate the ACS Care Map if symptoms are suggestive at the time of patient presentation, but it may be initiated at any time in the Emergency Department stay when evidence of an ACS becomes apparent. The Care Map should be used for the patient's entire stay in the Emergency Department.

The Standards Document defines a variety of topics intimately related to the Suspect ACS Care Map, and is complementary to its use. These include principles of triage and inclusion criteria for the Care Map, the criteria and use of the 12 lead ECG, indications and contraindications to fibrinolytic therapy and the use of ancillary treatments of AMI or unstable angina. The standards document also outlines the standards for physician and nursing assessments as well as, ongoing assessment in the ED. These are based upon the best available evidence, or when evidence is lacking, on expert opinion and published practice guidelines.

Implementation Guidelines

The Suspect ACS Care Map is to be established *by the Triage Nurse/designate* following a focused primary assessment for all patients presenting with suspicious chest pain or symptoms suggestive of ACS. **All patients with symptoms suspicious of ischemic pain or with atypical symptoms, but a high risk profile are to be placed on the Map.** All patients qualifying for the ACS Care Map are to be triaged as a Level 1 (resuscitation if unstable) or a Level 2 (emergent).

Refer to the table on page 4 for guidelines for the identification of ACS patients by the Triage Nurse. If the patient has been designated as a possible ACS patient, start the Suspect ACS Care Map.

Screening ECGs at Triage

Patients presenting to triage complaining of chest pain suspicious of ACS and triaged as a Level 2 according to CTAS guidelines, who cannot immediately be taken to a monitored bed should have a screening ECG without delay.

In order to reduce time to treatment for STEMIs and rule out malignant arrhythmias at time of presentation, a physician must review the ECGs in an expeditious manner. Patients with STEMIs or lethal arrhythmia are to be immediately placed in a monitored bed. It is important for the triage nurse to understand, however, that the physician has not seen the patient and the absence of ST elevation or malignant arrhythmia does not rule out cardiac disease and in no way should diminish the need for rapid placement of the patient in a proper assessment and treatment area.

Guidelines for the Identification of Suspect ACS Patients By the Triage Nurse
<p>Patients with the following signs and symptoms require immediate assessment by the triage nurse for the initiation of the ACS protocol:</p> <p><u>Chief Complaint:</u></p> <ul style="list-style-type: none">- Chest pain or severe epigastric pain, non traumatic in origin with components of myocardial ischemia or AMI:<ul style="list-style-type: none">- Central/substernal compression or crushing chest pain- Pressure, tightness, heaviness, cramping, burning, aching sensation- Unexplained indigestion, belching, epigastric pain- Radiating pain in neck, jaw, shoulders, back, or one or both arms- Associated dyspnea- Associated nausea/vomiting- Associated diaphoresis <p><u>Medical History:</u></p> <p>The triage nurse should take a brief, targeted, initial history with an assessment of current or past history of the following:</p> <ul style="list-style-type: none">- CABG, angioplasty, CAD, angina on effort, or AMI- Nitroglycerin use to relieve chest discomfort and response- Risk factors, including smoking, hyperlipidemia, hypertension, diabetes mellitus, family history and cocaine use <p><u>Atypical Presentations:</u></p> <ul style="list-style-type: none">- Women may present more frequently than men with atypical chest pain and symptoms- Diabetics and dialysis patients may have atypical presentation, or present without pain due to autonomic dysfunction- Elderly patients have atypical symptoms such as generalized weakness, stroke, syncope or a change in mental status.- Recurrent visits with atypical symptoms

Emergency Department Discharge Criteria

The following four criteria are to be met prior to the patient being discharged from the Emergency Department:

1. Cardiac markers not indicative of ACS
2. ECG non-diagnostic for Acute Coronary Syndrome
3. Chest pain is appropriately managed
4. Appropriate consults are answered

If the outcomes are **NOT** met the patient is to be admitted.

If the patient is **discharged home** the following outcomes are to be met:

- Appropriate follow up arrangements is to be made with either:
 - Chest Pain Clinic (HSC, St. B) or Medical Clinic (VGH , GGH)
 - Outpatient Cardiac Rehabilitation –
 - Cardiac Rehabilitation Referral Criteria : CHF – ischemic and non ischemic or Stable Angina
 - Family physician or appropriate specialist
 - Other
 - Follow-up not required (should be documented)

Discharge teaching sheets and/or brochures are provided and teaching provided as appropriate:

Medication Sheets:

- Ant platelets
- Beta Blockers
- Nitroglycerin
- Lipid Lowering Agents
- ACE Inhibitors

Brochures:

- Manitoba Heart and Stroke Foundation Angina Brochure
- Guide to Coronary Angiogram and Angioplasty/Stent Brochure
- Two Cardiac Rehabilitation Brochures:
 - Wellness Institute and the Reh- Fit Centre

Nursing Assessment Standards

Initial Emergency Assessment

The initial nursing assessment is comprised of the detailed chest pain history, systems assessment, vital signs and interventions.

1. History

A brief targeted history is required. A complete chest pain assessment, based on the following yes/no questions:

- Chest pain on arrival?
- Chest pain at rest within last 24 hours?
- Chest pain not responsive to nitroglycerin within the last 24 hours
- Chest pain within the last 7 days
- Chest pain description. A chest pain assessment tool that could be used is the “PQRST” tool:

P: Provocative/Palliative Factors

What makes the pain better? What makes it worse?

Have you ever had this problem before?

Q: Quality and Quality of the Symptom

What does the pain feel like? How would you describe it? (If possible, have your patient describe his/her symptoms as simply and clearly as possible.) Encourage him/her to make comparisons such as, “The pain feels like an elephant sitting on my chest”. How severe or intense is the pain? How often does it occur?

R: Region or Location of the Symptom

Where is the pain located? (Have your patient point to the area, if appropriate). Can you feel the pain in other areas of your body?

S: Severity Scale/Setting

Under what circumstances did the pain first occur? What were you doing at the time? Where were you when it first began? A scale of 1 – 10 with 10 being the most severe pain the patient has ever had and 1 being almost no pain at all. This is a scale the patient used in describing the intensity of his pain. It is also used as a tool in measuring response to treatment. Myocardial pain is usually greater than 30 minutes in duration.

T: Timing

When did the pain first begin? Did it begin suddenly or gradually? What course has it followed? Has it been steady or intermittent? How long does it last? Has the pain remained the same? Is it better or worse over time?

Vital Signs

Obtain blood pressure on both arms with initial set of vital signs. O₂ Saturation, Temperature and Pulse

Physical Assessment

The initial assessment to include the following:

Neurological Assessment	Alert and oriented to person, place and time Behavior appropriate to situation Obeys simple commands Speech clear and distinct Purposeful and symmetrical movement of all extremities Denies difficulty swallowing No headache or dizziness
Cardiovascular Assessment	Regular radial pulse at 60-100 bpm at rest Screen and radial pulse correlates No ectopic noted Skin colour within patient's normal depending on ethnic background Skin warm, dry, no pallor, no cyanosis of nail beds, mucous membranes or mottling Absence of rash, redness or bruising Evidence of adequate hydration Peripheral pulses palpable with no edema (See Table below) No calf tenderness
Respiratory Assessment	Respiration regular at 10 -20 per minute No use of accessory muscles, able to speak in complete sentences No shortness of breath Chest clear with no adventitious sounds (crackles or wheezing) Sputum absent/clear No pain with respiration
Gastrointestinal Assessment	Bowel sounds present in all four quadrants Abdomen soft. No pain /tenderness No complaints of gastric reflux No nausea or vomiting No pain
Genitourinary Assessment	Urine clear and yellow to amber in colour No dysuria or hematuria No distention, pain/tenderness on palpation

Assessment for pitting edema

Depression	Grade
2 mm	+1
4 mm	+2
6 mm	+3
8 mm	+4

Assessment of pulses

Description	Grade
Doppler only	D
Absent	0
Weak	1+
Normal	2+
Bounding	3+

ECG Monitoring

Patients who are evaluated in the ED for the possibility of ACS often require a stay of many hours while awaiting repeat cardiac markers and completion of their assessment. The management of these patients during this time greatly impacts the resources of the ED. Of specific concern is the availability of beds with cardiac monitoring capability, which are often in short supply and heavy demand.

The 2002 ACC/AHA guidelines for the Management of Patients with Unstable Angina and Non-ST-Segment Elevation Myocardial Infarction state: “Patients should undergo continuous ECG monitoring during their ED evaluation and early hospital phase, because sudden, unexpected ventricular fibrillation is the major preventable cause of death in this period.” These guidelines list continuous ECG monitoring as a Class I recommendation. (Level of Evidence: C). Despite this recommendation, there is good evidence that patients admitted to hospital from the ED with suspected ACS who are stratified to a “low risk” category can be safely managed outside of a monitored setting. The problem is that the risk stratification is not made until the cardiac markers have been repeated. More recently, a decision rule has been proposed whereby patients without pain and with a normal or nonspecific ECG could be taken off the monitor. Further validation is required before definite recommendations can be made.

Guidelines for discontinuing the ECG monitor:

Monitoring should continue until patient has been appropriately risk stratified in the ED.

Individual Emergency Departments must consider the evidence and recommendations above in the context of the patients requiring care in the Department at any given time, using available cardiac monitoring for those at highest risk at any given time.

Continuous ECG and ST Monitoring

Place patient on the monitor with ST monitoring capabilities, if available, in Lead III and V3, activate the alarms and record relevant measurements (PR interval, QRS interval, rate, AV Conduction) on the strip and your impression/interpretation of the heart rhythm.

5. Reassessments

Physical system reassessments are completed q4h, at change of shift or patient care transfer to another nurse. Reassessments are comprised of a focal assessment and vital signs:

1. Focal assessment

A focal assessment is required q4h for the duration of the patients' stay. The table below defines the parameter and normal assessment findings.

Parameter	Normal Assessment
Neurological Assessment	Alert and oriented to person, place and time Behavior appropriate to situation Obeys simple commands Speech clear and distinct
Cardiovascular Assessment	Skin colour within patient's normal depending on ethnic background Skin warm, dry, no pallor, no cyanosis of nail beds, mucous membranes or mottling Absence of rash, redness or bruising Peripheral pulses palpable if previous deficit noted on initial assessment or change in patients condition No edema No calf tenderness.
Respiratory	Respiration regular at 10 -20 per minute No use of accessory muscles, able to speak in complete sentences No shortness of breath Chest clear with no adventitious sounds (crackles or wheezing)
Gastrointestinal	Bowel sounds active in all 4 quadrants Abdomen soft No pain on palpation No nausea or vomiting No pain
Genitourinary	States able to empty bladder No hematuria Urine clear and yellow to amber in colour Bladder not distended on palpation No pain

Vital Signs, Pain Assessment and ST Monitoring

Frequency of ongoing vital signs and pain assessment are: q15 minutes for hour, then q1h x 6 hours and q4h until discharged or admitted. Continue q15 minutes and prn with ongoing chest pain and/or unstable vital signs. Vital signs include heart rate screen and radial, blood pressure, respiratory rate, and oxygen saturation.

Notify the Emergency Physician if the following occur:

- Systolic blood pressure <90 mmHg
- Signs of CHF
- Oxygen saturation <92% with oxygen therapy
- Ongoing chest pain unrelieved with Nitroglycerin
- New arrhythmia

Medical Assessment Standards

Attempts to standardize physician assessment and reassessment of patients with suspected acute coronary syndromes are challenging as there are no evidence-based standards to draw upon. The following recommendations attempt to draw upon current practice patterns and published practice guidelines.

Initial Assessment

Time: Assessment should begin within 15 minutes of arrival. Time of initial assessment must be documented.

History: A focused but thorough history should be taken and documented with particular importance placed upon:

- Nature of symptoms, include onset, quality and duration
- Age
- Prior history of coronary artery disease (CAD)
- Risk factors, including hypertension, smoking, DM, family history, hyperlipidemia.
- Consideration of significant non-cardiac disease (e.g. PE, pneumothorax) and, particularly, diseases which could be exacerbated by treatment for ACS (e.g. dissection, pericarditis).

Physical: An appropriate physical examination should be completed and documented with particular importance place upon:

- Vital signs
- An appropriate cardio-pulmonary exam checking for murmurs, bruits, differential pulses and abnormal pulsation.
- Signs of congestive heart failure or cardiogenic shock
- Any other systems as appropriate for specific patient presentations

ECG: Assessment within 10 minutes of arrival. Review EMS ECG if available – act on if applicable. If no EMS ECG, ECG to be done at Triage within 10 minutes of arrival to determine STEMI or Non-STEMI. ECG to be reviewed by physician – no indication for thrombolysis. Interpretation is to be documented by the physician on the patient’s health record. In those patients with ongoing chest pain with a normal or non-diagnostic initial ECG, repeat ECGs are recommended as the initial ECG is not highly sensitive for AMI. In those patients with STEMI, suspected location and estimated size of infarct can be documented.

Who can be safely discharged?

A large proportion of patients presenting with chest pain of possible cardiac origin are ultimately diagnosed with a non-cardiac, non-life threatening diagnoses. This group of patients consumes a substantial proportion of scarce hospital resources. At the same time, a small but significant proportion of chest pain patients who are discharged from the Emergency Department have missed myocardial infarcts or other serious cardiac events. The challenge for practitioners is to decrease the length of stay/admission rate for non cardiac chest pain patients without increasing adverse events. Since diagnostic certainty in the Emergency Department is often impossible, current strategies emphasize the need to risk stratify individuals. Patients who are at low risk will presumably have a very low event rate when discharged from the Emergency Department. Unfortunately, outcome data and studies on chest pain patients discharged from the Emergency are limited. While there is fairly good evidence to help identify groups at high risk who in most circumstances should not be discharged, a large proportion of patients will not fall into either of these groups and will be at intermediate risk. Determining which, if any, of these can be safely discharged (without provocative testing) remains challenging. The following risk stratification and disposition recommendations are based on a review of the literature, as well as our local (Winnipeg) experience with the Chest Pain Follow-up Clinics at HSC and SBGH

Risk of ADVERSE EVENT for Patients with Suspect ACS

High Risk: (any **ONE** of the following criteria)

- ECG: (any **ONE** of the following not known to be old)
 - ST elevation in 2 or more contiguous leads
 - ST depression ≥ 0.5 mm in 2 or more contiguous leads
 - T wave inversion > 1 mm in 2 or more contiguous leads with non-dominant R waves
 - LBBB
- Presence of arrhythmia
- Evidence of CHF
- Hypotension
- Pain similar to previous MI
- Significant worsening of previously stable angina
- Cardiac markers diagnostic for ACS

Intermediate Risk: (**ALL** of the following)

- No high risk characteristics.
- ECG:
 - normal **or**
 - unchanged from previous **or**
 - ST depression < 0.5 mm **or**
 - shallow t-wave flattening/inversion < 1 mm.
- If pain thought likely to be angina then must satisfy **ALL** of the following:
 - less than 20 minutes duration
 - no more than 2 episodes in last 24 hours
 - non-recurrent in the E.D.
- Age < 65

- If known history of CAD, then pain must be different from prior angina with reassuring characteristics (e.g. sharp/stabbing, non-radiating to neck/arm/jaw, reproducible with palpation etc)
- Cardiac markers normal or non-diagnostic of ACS

Low Risk: (**ALL** of the following)

- No high risk characteristics
- Atypical chest pain with reassuring qualities (e.g. sharp/stabbing, non-radiating to neck/arm/jaw, reproducible with palpation etc)
- ECG:
 - normal **or**
 - unchanged from previous **or**
 - ST depression < 0.5 mm **or**
 - T-wave flattening/inversion < 1 mm
- No confounders on EKG (i.e. LVH or LBBB or paced Rhythm)
- No known history of CAD

Disposition:

High Risk: Admit and/or Cardiology consult.

Intermediate Risk: May consider discharge with expedited (within 72 hours) follow-up at a chest pain clinic or equivalent; clinical judgment is required.

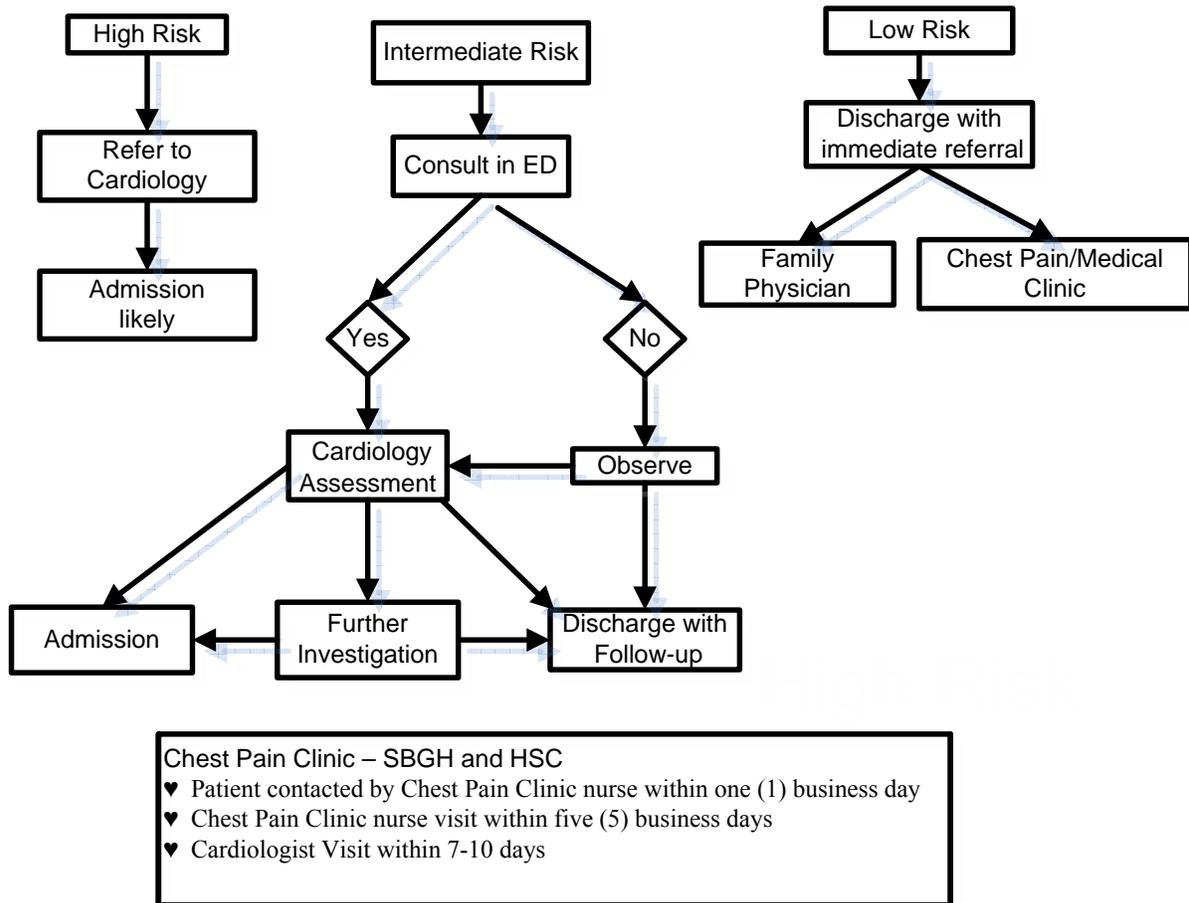
Low Risk/Very Low Risk: Can likely be discharged with suitable arrangements for follow-up.

NB. This is risk a stratification protocol for possible ACS. Other life threatening non-traumatic causes of chest pain must be considered prior to discharge (e.g. pulmonary embolism, aortic dissection etc.)

Chest Pain Clinic

At HSC and SBGH, Chest Pain Clinics have been used for outpatient follow-up of patients deemed to be at low risk of adverse events post discharge. Patients receive a follow-up phone call from the Chest Pain Clinic nurse within 1 business day of their ED visit, who coordinates follow-up investigations and referrals as appropriate. There has been a very low incidence of adverse events using this system. Community Hospitals are encouraged to establish a similar follow-up and referral system using it's their local resources and expertise.

**Disposition for Patient with Suspect ACS
Based on
Risk Stratification**



Medical Reassessment Standards

Change in Status:

Any significant change in patient’s clinical status should prompt physician reassessment, including:

- time of change
- nature of change
- repeat ECG and/or blood work
- possible change of treatment plan

Pre-Discharge:

All patients before leaving the emergency department should have a documented physician reassessment including:

- time of reassessment
- resolution of symptoms, response to treatment
- review of appropriate tests: cardiac markers, repeat ECG’s, chest x-ray, other blood work
- diagnosis
- disposition – including follow-up plan if discharged

Diagnostic Standards

Baseline as follows:

- Initial 12 Lead ECG recommended within 10 minutes of patient's arrival.
 - Review EMS ECG if available
 - **NOTE:** Evidence of STEMI on the EMS ECG in a symptomatic patient should prompt immediate initiation of reperfusion protocols, if indicated. Repeating the ECG in ER is unnecessary in this scenario and may prolong door to needle/balloon time.
 - A 15 lead ECG is required when the initial 12 lead:
 - Is non-diagnostic and the patient is exhibiting signs of cardiac ischemia.
 - Is showing ST depression in V1 and V2 with prominent R waves.
 - Is showing signs of an inferior AMI.
 - Is showing ST depression in V1 and V2+/-prominent R waves
 - Laboratory Standards: CBC, electrolytes, urea, creatinine, glucose, troponin, CO₂, INR/PT/PTT
2. Repeat 12 lead ECG Standard
- Repeat ECG's at physician's discretion. Q 15-30 minutes with ongoing ischemia and a normal 12 lead

Serum Markers

- Of the currently available biochemical markers to rule out MI, serum TnT is the most specific and is highly sensitive (>98%) at > 6 hours after onset of symptoms. The following guidelines should be considered when using TnT in the setting of ACS. See Appendix G – Troponin T 6 hour testing guideline in low likelihood for ACS patients

1. Document the time of onset of chest pain on all patients.
2. No single serum marker used alone has sufficient sensitivity or specificity to reliably identify or exclude AMI within 6 hours after symptom onset.
3. A rising TnT level is required in order to diagnose an AMI.
4. In patients with background elevations of TnT (e.g. patients with CRF), two (2) measurements are required to demonstrate a rising pattern.
5. TnT is considered negative: (when measured \geq 6 hours after onset of chest pain)
→ ≤ 0.01 ug/L

OR

- ≥ 0.01 .ug/L **and** not rising on 2 samples measured at least 2 hours apart **and** in context of alternate etiology for elevated troponin

In patients with low likelihood of ACS:

- TnT must be measured at least six (6) hours after the onset of chest pain for maximum sensitivity
- If TnT measured \geq six (6) hours is negative, AMI may be safely ruled out in patients with a low likelihood of ACS
6. Do not utilize cardiac serum marker tests to exclude unstable angina.

There is no good evidence to suggest that CK and its isoforms, or myoglobin provide any incremental benefit to TnT alone in the detection of AMI. Therefore, the routine measurement of these markers to rule out AMI is being discontinued.

Charting Guidelines

The purpose of the Care Map is to provide a systematic means of gathering patient information, which identifies baseline data, and ongoing assessment information. It is expected that all ED health care professionals will use the Care Map for all patients who present with Suspect Acute Coronary Syndrome. The Care Map has been revised to reflect the chronological order in which care is provided to the patient.

1. Implementation Guidelines

The Care Map is to be established *by the Triage Nurse/designate* following a focused primary assessment for all patients presenting with chest pain or symptoms suggestive of an ACS event.

If the patient has been designated as a possible ACS patient, initiate the ACS Care Map, Nursing Section. The triage nurse will ensure that the triage level is either a 1 or 2 and that a STAT 12 lead ECG is requested. The STAT response time to this STAT ECG is within 10 minutes of the call. The time the ECG Technician is paged is documented on the Care Map

Document allergies and the utilization of sildenafil (Viagra), vardenafil (Levitra) and tadalafil (Cialis) within the last 24 –48 hours on the Care Map.

2. Documentation Guidelines

Basic Care Map Documentation Guidelines:

- Do not leave any section blank.
- Item not appropriate for your patient indicate N/A if “not applicable”. This will indicate that the item has been addressed.
- Signature/Initial Section: Enter initials, signature, and professional status. Initials are used throughout the Care Map
- Time and initials are entered as the interventions are implemented. A signature sheet must be completed as per facility policy.

ACS Care Map – Nursing Section Page ONE

Pre-hospital

Documentation of pre-hospital care by WFPS

Triage

Documentation of history and interventions at Triage

Nurse Initiated Orders and Documentation:

- Standard orders are identified with a solid black box (■). These are initiated on all patients provided there are no allergies and the blood pressure criteria is met. These are pre printed on the Nursing Section of the Care Map and ACS Physician Order Sheets.
- Individualized orders are identified with a blank box (□). These require a physician’s order to activate them. To activate the order the physician will place a “✓” inside the box on the **NSTEMI or STEMI Physician Order Sheet**.

- Ensure that the patient has received ASA or Clopidogrel within the last 24 hours. If the patient does not have an allergy administer ASA 160-mg po. State time on the Care Map. If the patient is allergic to ASA and is **not** a surgical candidate give Clopidogrel 300-mg po. If the patient has taken either ASA or Clopidogrel within the last 24 hours check the box on the Care Map.
- Additional orders are to be written on the Care Map or the facility order form.
- Draw baseline blood work: CBC, electrolytes, urea, creatinine, glucose, troponin, CO₂, INR/PT/PTT
- Draw the blood work when the IV catheter is inserted. In the case where the IV is already established perform a venipuncture.
- Document the establishment of the intravenous on the Intake and Output section of the Care Map. A second Intravenous is required if a fibrinolytic agent is ordered. This section will be utilized to record all intake and output and replaces the facility 24-Hour Fluid Balance Record.

ACS Care Map – Nursing Section Page TWO

Nursing Assessment Section:

- List pertinent past history.
- Date and time the assessment
- Initial Vital Signs
 - Blood pressure on both arms is required, as a large disparity is suggestive of a dissecting aortic aneurysm.
 - Document the oxygen saturation with the corresponding oxygen. If this is a room air saturation level document room air.
- Chest Pain Assessment:
 - Record time of onset of current episode of chest pain
 - Ask the patient the following yes/no questions:
 - Chest pain on arrival?
 - Chest pain at rest within last 24 hours?
 - Chest pain not responsive to Nitroglycerin within the last 24 hours
 - Chest pain within the last 7 days
- Description of the chest pain
Whenever possible, ask open-ended questions. Another assessment tool that could be used is the “PQRST” tool.
- Place patient on the monitor, activate the alarms and record relevant measurements. Subsequent strips are mounted on facility rhythm form.
- Establish Oxygen
Start oxygen therapy and titrate the oxygen to a saturation level > 95%. Record the time the oxygen was started and the L/minute.
- Obtain STAT 12 Lead ECG:
The triage nurse would have called for a STAT 12 lead ECG at the time of triage. Record the time the initial ECG was done. This time should correlate with the time on the ECG machine. Ensure a 15 lead ECG is done if:
 - the initial 12 lead ECG non-diagnostic for ACS *OR*
 - 12 lead ECG has ST elevation in leads II, III, aVF *OR*
 - i. 12 lead ECG with ST depression in V1 and V2 with or without prominent R waves

- The nursing assessment reflects a charting by exception concept in which only abnormal assessments are charted. The relevant body systems (Respiratory, Neurological, Cardiovascular, etc) are assessed according to defined norms. If the assessment is normal checks mark the appropriate systems box. Abnormal assessments require a narrative entry in the space provided.
- List current medications with dosage and frequency (SBGH only – Use Medication Reconciliation Form)

ACS Care Map – Nursing Section Page THREE and FOUR

- Assessments Required for Fibrinolytic Patients only:

Parameter	Frequency
Vital Signs	q15minutes during infusion or a minimum of 1 hour
Neurological Assessment: - Glasgow coma scale - Pupil assessment - Motor assessment	Baseline and q1h x 2 from bolus/start of agent then q4h x 24 hours
12 lead ECG	1 and 8 hours post bolus

Nursing Reassessments

- Document vital signs and oxygen saturation q15 minutes x 1 hour, then q1h x 6 hours then q4h until discharged or admitted. Continue q15 minutes with ongoing chest pain and/or unstable vital signs.
- Document ongoing vital signs and medications on the Care Map. Ensure reassessments of medication are documented.

ACS Care Map – Nursing Section Page FIVE

- Focal assessments are required q4h until discharge. These assessments reflect a charting by exception concept in which only abnormal assessments are charted. The relevant body systems are assessed according to defined norms. If the assessment is normal checkmark the appropriate systems box. Abnormal assessments require a narrative entry in the space provided
- Nursing to, as appropriate, provide discharge teaching. If teaching is not required this would be indicated on the Care Map.

ACS Care Map – Emergency Physician Section Page ONE

Emergency Physician Section includes the physician assessment, consult section, Disposition, Follow and Discharge Follow-up.

- Date and time the assessment
- Time of ECG and diagnostic ECG interpretation
- Time of Troponin and results
- Date and Time the consult
- Diagnosis: state the final diagnosis

Discharge Section

- **Emergency Physician to Assess Discharge Outcomes**
The following clinical criteria are to be met prior to the patient being discharged from the Emergency Department. If the outcomes are not met, the patient is to be admitted.
 1. Normal cardiac serum makers
 2. ECG non-diagnostic for Acute Coronary Syndrome.
 3. Chest pain is managed.
 4. Appropriate consults are answered.

- **Physician Disposition Order**
Check off the disposition/separation order (transfer to, admit to, discharge, deceased). The nurse /unit clerk documents time and initials when the patient left the department.

- **Follow up Correspondence to Another Physician section**
If correspondence is required complete the Health Records section on the Care Map.

- **If the patient is discharged home:**
 1. Emergency Physician to provide appropriate follow up with either:
 - Chest Pain Clinic (SBGH and HSC only)
 - Medicine Clinic (GGH)
 - Family physician
 - Other - Specify

ACS Care Map – Emergency Physician Section Page TWO

- Algorithm for Disposition for Patient with suspect ACS based on Risk Stratification
- Chest Pain Referral Criteria and information
- Creatinine Clearance Conversion Table

ACS Care Map – Physician Orders for Non-ST Elevation (NSTEMI) & Unstable Angina (UA) Page ONE

- All Medication, Intravenous and General Orders

ACS Care Map – Physician Orders for Non-ST Elevation (NSTEMI) & Unstable Angina (UA) Page TWO

- Risk Stratification Table for Chest Pain of Possible Cardiac Origin

ACS Care Map – Physician Orders for ST Elevation (STEMI) Page ONE

- All Medication, Intravenous and General Orders

ACS Care Map – Physician Orders for ST Elevation (STEMI) Page ONE

- Primary Percutaneous Coronary Intervention and Fibrinolytic Therapy Administration Indications
- Tenecteplase Dosing Table
- AMI Stroke Risk Score with Thrombolytics
- Rescue PCI Protocol (Post-lytics)

Evaluation Plan

Following site implementation of the Suspect ACS Care Map the WRHA Emergency Standards Committee will be responsible for ensuring completion of a clinical audit of the Care Map at the seven Emergency Departments. The indicators and database will be developed jointly by the WRHA Emergency Standards Committee and the ACS Care Map Author Team.

References

ST Monitoring References

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Appendix A

WRHA Reperfusion Protocol for ST Elevated Acute MI Patients

Policy

Upon a Cardiologist's/Internist's /Emergency Physician's/Family Physician's' order a reperfusion therapy agent may be given by a Registered Nurse in the Intensive Care Unit or Emergency Department/Urgent Care.

SBGH ONLY

Patients presenting to SBGH between 0700 and 1800 hrs weekdays should be considered candidates for primary PCI. **If there is no response from the Interventionalist within 10 minutes, thrombolytics therapy should be administered if the patient has presented within 3 hours of the onset of symptoms.**

All other patients should receive thrombolytics therapy if there are no contraindications and the patient has presented within 3-6 hrs hours of symptom onset.

Purpose

Drug therapy and treatment strategies continue to evolve rapidly in the field of STEMI. The focus is on early recognition and treatment. The priority is rapid reperfusion. Secondary goals include the relief of ischemic pain and treatment or early life threatening complications.

Reperfusion may include two strategies:

- The use of fibrinolytic therapy OR
- Primary percutaneous coronary intervention (PCI)

As “time is muscle”, the goal of reperfusion therapies is to restore blood flow to the myocardium as soon as possible, in order to minimize necrosis. **Initiating treatment early is a priority and delays must be minimized.**

Patient Selection

1. Candidates for Primary PCI (STEMI) Indications

- Contraindications to lytics, OR
- Cardiogenic Shock, OR
- Pulmonary Edema, OR
- Recurrent VF/VT. OR
- Medical Contact to balloon < 60 minutes, OR
- Diagnosis of STEMI in doubt (LVH with strain, pericarditis)

Notes:

- ◆ There must be no contraindications to anticoagulation
- ◆ Any questions concerning adjunctive therapy (example: Clopidogrel) should be reviewed with the interventional cardiologist.
- ◆ Patient must be able to lie flat with O₂ or intubate prior to transfer.
- ◆ Medical contact to balloon < 60 minutes is currently achievable for SBGH patients only, when Cath Lab on site (weekdays 0700 hrs – 1800 hrs)

2. Candidate for Rescue Percutaneous Coronary Intervention STEMI (Post-Lytics)

- Cardiogenic shock
- Persistent electrical instability (recurrent VF or recurrent/sustained VT)
- Pulmonary edema
- < 50% resolution of ECG changes (even if pain free)
- Suspected reinfarction
 - Recurrent ST elevation or pain after initially successful reperfusion
- Persistent significant ischemic symptoms even if >50% ST resolution.

Absolute Contraindications for Rescue PCI

- Severe GI/Systemic Bleed post-lysis.
- New unexplained neurological findings.

Relative Contraindication for Rescue PCI (Needs to be discussed with Angiographer)

- Severe co-morbidities precluding reasonable survival.
- Previous CABG without operative report.
- >80 years of age

Criteria for the Re-Administration of TNK

- If recurrent or persistent ST elevation occurs and delay to cath lab will be greater than one hour, then TNK can be re-administered if no significant contraindications
- Administer half dose of TNK if within 24 hours of original dose of fibrinolytic therapy.
- Repeat full dose of TNK if greater than 24 hours after original dose of fibrinolysis.

2. Candidates for Fibrinolytic Therapy

Patients presenting with an ST elevation myocardial infarction who meet any of the following criteria are appropriate candidates for the administration of a fibrinolytic agent:

- Chest pain consistent with myocardial ischemia.
- ECG changes consistent with ST elevation Acute Myocardial Infarction (AMI), either:
 - ST segment elevation of a least 0.1 mm in two adjacent leads **OR**
 - New LBBB **OR**
 - ST segment depression with prominent R waves in leads V1 – V3 consistent with posterior infarction.
- Time from onset of chest pain less than 12 hours.

Contraindications to Fibrinolytics

Absolute contraindications:

- Any prior intracranial hemorrhage
- Known structural cerebral vascular lesion (e.g. arteriovenous malformation)

- Known malignant intracranial neoplasm (primary or metastatic)
- Ischemic stroke within 3 months
- Suspected aortic dissection
- Active bleeding or bleeding diathesis (excluding menses)
- Significant closed head or facial trauma within 3 months

Relative Contraindications

- SBP >180 or DBP >110 mmHg (irrespective of whether BP lowers after presentation)
- History of chronic severe, poorly controlled hypertension
- History of prior ischemic stroke greater than 3 months, dementia or known intracranial pathology not covered in contraindications
- Traumatic or prolonged CPR (greater than 10 minutes)
- Major surgery (less than 3 weeks)
- Recent internal bleeding (within 2 – 4 weeks)
- Pregnancy
- Active peptic ulcer
- Current use of anticoagulants: the higher the INR, the higher the risk of bleeding
- Pregnancy
- Non-compressible vascular puncture site

Enoxaparin

- See contraindications for Fibrinolytics
- Allergy or sensitivity to heparin, pork products or enoxaparin
- Known malignant intracranial neoplasm (primary or metastatic)
- History of thrombocytopenia (HIT) on enoxaparin
- Known history of renal failure

Pre-therapy Considerations

Critical Concept: Saving time to reperfusion saves lives.

The priority is rapid administration of the fibrinolytic agent. When STEMI diagnosis is not in question, DO NOT delay the administration of fibrinolytic for prolonged nursing assessments and/or lab/diagnostic tests. Remember 20-30% of all patients with STEMI have contraindications to lytics.

Nursing Assessment/Interventions

- Baseline system assessment with emphasis on the Glasgow coma scale, Skin assessment (pre-existing hematoma and echymosis) and history related to recent falls and contusions
- Vital signs (radial and screen pulse, blood pressure on both arms, respirator rate, oxygen saturation)
- Initiate cardiac monitoring including ST segment analysis (lead 3, V3 or fingerprint lead)
- Chest pain assessment using pain assessment PQRST
- Two peripheral IV's are ideal, especially with the administration of Unfractionated Heparin

Diagnostics

- 12/15 lead ECG
- CBC, PTT, INR
- Troponin, CK
- Na, K, glucose, urea, creatinine, CO₂
- Portable Chest X-ray if clinically indicated

Fibrinolytic Therapy Post Therapy Considerations

1. Nursing Assessment

- GCS – baseline and q 1h x2, then q4h x24 hours
- Vital signs q15 minutes for the first hour, then q30 minutes x2
- ST segment monitoring for 24 hours

2. Laboratory/diagnostic test

- 12 lead ECG: at 1 and 8 hours post bolus
- CK q8h x three from admission
- Troponin q8h x three from admission or until first positive result obtained
- CBC, platelets OD x three days from admission

3. Reperfusion Assessment

- Reperfusion in STEMI limits myocardial damage and reduces mortality by approximately 30%.
- Monitor closely for signs of reperfusion during the first 60 – 90 minutes following administration.
- Monitor ECG rhythm, ST segments, vital signs and chest pain.
- Critical Concept: Saving time to reperfusion saves lives.

1) Chest Pain: The patient's discomfort decreases significantly from its peak (without narcotics)

2) Decreased ST Elevation: A decrease of 50% or greater is an excellent indication of successful reperfusion. Besides continuous monitoring of the ECG with ST segment analysis, a 12 lead ECG should be obtained with any ischemic chest pain and one hour post bolus.

3) Arrhythmias: Reperfusion arrhythmias occur frequently. Treatment depends on the patient's clinical status

If reperfusion has not occurred and there is continuing evidence of myocardial ischemia, prompt transfer to St. Boniface General Hospital for rescue PCI may be appropriate. Rescue PCI is considered if there has not been at least 50% resolution of the ST segment and significant reduction in pain and discomfort within 60- 90 minutes after fibrinolytic administration.

- i. Bleeding Complications
 - **Observing for signs of intracranial hemorrhage is a high priority.** ICH occurs in approximately 1-2% of patients with an increase risk in those patients >75 years of age.

Cooperative cardiovascular project risk model for intracranial hemorrhage with thrombolytics therapy.

Risk Factors

- Age >75
- Black race
- Female sex
- Previous stroke
- Systolic BP >160
- Weight <65 kg for women or < 80 kg for men
- INR >4
- TNK

Risk Factors	ICH
0-1	0.69%
2	1.02%
3	1.63%
4	2.49%
5	4.11%

References:

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Appendix B

Antithrombotic Protocol for Enoxaparin in Acute Coronary Syndrome

Policy

All registered nurses and licensed practical nurses may administer enoxaparin without restriction.

Background

Once a plaque has ruptured in a coronary artery, the outcome depends to a large extent on the degree of thrombus formation in that artery. The goal of antithrombotic therapy is prevent further formation of thrombus and hence occlusion of the artery. This goal must be balanced with the goal of minimizing bleeding complications from such therapy. The low molecular weight heparin enoxaparin has been demonstrated to be superior to unfractionated heparin in the setting of unstable angina (UA) and non-ST elevation myocardial infarction (NSTEMI) in both the ESSENCE and TIMI 11B trials. Based on this information the WRHA Pharmacy and Therapeutics (P & T) committee had approved the use of enoxaparin in this setting in 2001. More recently new clinical trials have demonstrated the benefit of enoxaparin in the setting of ST elevation myocardial infarction (STEMI) with fibrinolytics. Enoxaparin demonstrated reduction in re- ischemia and re-infarction compared to unfractionated heparin in both the ASSENT III and ExTRACT-TIMI 25 trials. However given the increased risk for bleeding with fibrinolytics the protocol for enoxaparin in STEMI is more complex than in UA/NSTEMI. In November 2006 the WRHA P & T committee approved the use of enoxaparin in the setting of STEMI with the proviso that appropriate protocols be implemented to prevent excess bleeding.

Enoxaparin Indication

1. Use in STEMI patients
2. Use in NSTEMI patients
3. Use in high and intermediate risk unstable angina patients
 - High risk defined as: If patient exhibits any of the following: ischemic ST depression > 0.5 mm, marked symmetric T wave inversion in multileads, transient ECG changes during pain, troponin positive
 - Intermediate risk defined as: troponin negative at presentation in ER and ST depression ≤ 0.5 mm OR shallow T wave inversion. In addition, if patient exhibits any of the following: non cardiac vascular disease, diabetes, 3 or more risk factors other than Diabetes
4. The time duration of Enoxaparin is 48 hours to 5 days in the setting of UA/NSTEMI or until revascularization. (whichever comes first) and up to 8 days in STEMI (or until revascularization or discharge, whichever comes first.

Contraindications

- Prior history of heparin-induced thrombocytopenia
- Contraindications to anticoagulation:
 - Active bleeding
 - History of bleeding diathesis
 - Gastrointestinal or genitourinary bleeding, hematemesis, hematochezia or melena within 30 days
 - History of intracranial hemorrhage, intracranial neoplasm, arteriovenous malformation or aneurysm.
 - History of nonhemorrhagic stroke within 30 days or any history of hemorrhagic stroke.
 - Major surgery or severe trauma within 4 weeks
 - Evidence of aortic dissection
 - Severe hypertension (SBP > 180 or DBP > 110) not adequately controlled on antihypertensive treatment.
- **Use unfractionated IV heparin** in the following situations (i.e. do NOT use enoxaparin)
 - If an intervention (e.g. diagnostic cath, PTCA, CABG) is planned within next the 12 hours
 - If patient progresses to refractory ischemia and requires eptifibatide pre-angiography
 - Patients with known or suspected renal dysfunction (absolute cutoff: creatinine Clearance < 30 ml/min; serum creatinine > 200 umol/L)

Use table to determine if creatinine clearance <30 mL/min. Select patient age (round to closest age) and read serum creatinine (SCr) cut off point under appropriate gender. If patient SCr is **greater than** this number **do not give enoxaparin**. This number corresponds with a creatinine clearance=30 ml/min.

Male SCr Cut Off Point	Age	Female SCr Cut Off Point
300	40	255
285	45	242
270	50	230
255	55	216
240	60	204
225	65	191
210	70	178
195	75	165
180	80	153
165	85	140
150	90	127

* Semchuk et al.; based on Cockcroft/Gault method for estimating CrCl . Based on Saskatoon Regional Health enoxaparin protocol.

Pre-Therapy Considerations

- Baseline CBC, Urea, Creatinine

Administration

- In STEMI patients < 75 years old
 - A. Give enoxaparin 30 mg IV bolus, **before** giving TNK
 - B. Give enoxaparin 1 mg/kg subcut q12 h starting ASAP **after** giving TNK (within 15 minutes)
 - C. Maximum dose enoxaparin 100 mg subcut q12h for the first 24 hours. After the first 24 hours the maximum dose is enoxaparin 140-150 mg q12h (exact dosage will depend if using multi-dose vial or pre-filled syringes).
- In STEMI patients \geq 75 years old
 - A. Do **not** give enoxaparin IV bolus
 - B. Give enoxaparin 0.75 mg/kg subcut q12 h starting ASAP **after** giving TNK (within 15 minutes)
 - C. Maximum dose enoxaparin 75-80 mg subcut q12h for the first 24 hours. After the first 24 hours the maximum dose is 110-120 mg q12h (exact dosage will depend if using multi-dose vial or pre-filled syringes).
- In NSTEMI/UA patients regardless of age
 - A. Give enoxaparin 1 mg/kg subcut q12h
 - B. Maximum dose enoxaparin 140-150mg subcut q12h (exact dosage will depend if using multi dose vial or pre-filled syringes).
- Dosage Formats:
 - Use of pre-filled syringes: round dose **up** to nearest 20 mg increment using table below.
 - Use of multi-dose vial available administer dose per table below.

**Enoxaparin dosing table for 1 mg/kg subcut
STEMI <75 years old & NSTEMI/UA**

Weight (kg)	Pre-filled syringe strength	Dose for Multidose vial
40 – 44	40 mg	40 mg
45 – 49	40 mg	45 mg
50 – 54	60 mg	50 mg
55 – 59	60 mg	55 mg
60 – 64	60 mg	60 mg
65 – 69	60 mg	65 mg
70 – 74	80 mg	70 mg
75 – 79	80 mg	75 mg
80 – 84	80 mg	80 mg
85 – 89	80 mg	85 mg
90-94	100 mg	90 mg
95-99	100 mg	95 mg
100-104	100 mg	100 mg
Do not give more than 100 mg q12 h for first 24 hours in STEMI		
105-109	100 mg	105 mg
110-114	120 mg	110 mg
115-119	120 mg	115 mg
120-124	120 mg	120 mg
125-129	120 mg	125 mg
130-134	140 mg	130 mg
135-139	140 mg	135 mg
140-144	140 mg	140 mg
145-149	140 mg	145 mg
>149	Do not use enoxaparin	

**Enoxaparin dosing table for 1 mg/kg subcut
STEMI ≥75 years old**

Weight (kg)	Pre-filled syringe strength	Dose for Multidose vial
40 – 44	30 mg	30 mg
45 – 49	30 mg	30 mg
50 – 54	40 mg	35 mg
55 – 59	40 mg	40 mg
60 – 64	40 mg	45 mg
65 – 69	40 mg	45 mg
70 – 74	60 mg	50 mg
75 – 79	60 mg	55 mg
80 – 84	60 mg	60 mg
85 – 89	60 mg	60 mg
90-94	60 mg	65 mg
95-99	80 mg	70 mg
100-104	80 mg	75 mg
Do not give more than 75-80 mg q 12 h for first 24 hours in STEMI		
105-109	80 mg	75 mg
110-114	80 mg	80 mg
115-119	80 mg	85 mg
120-124	100 mg	90 mg
125-129	100 mg	90 mg
130-134	100 mg	95 mg
135-139	100 mg	100 mg
140-144	100 mg	105 mg
145-149	100 mg	110 mg
>149	Do not use enoxaparin	

- Suggested administration times for enoxaparin based on timing of first dose. (i.e. if first dose at 2100 then enoxaparin should be given at 0900-2100) However in order to facilitate more convenient dosing times the dosing interval may be modified by up to 2 hours (i.e. if first dose at 2100 then subsequent doses could be between 0700-1100).
- Suggested administration times for enoxaparin based on timing of first dose. Refer to table below for recommended dosing schedules.

First Dose	Dosing Schedule
> 0100 H - < 0500 H	1400 and 0200
≥ 0500 H - < 0900 H	1800 and 0600
≥ 0900 H - ≤ 1300 H	2200 and 1000
> 1300 H - ≤ 1700 H	0200 and 1400
> 1700 H - ≤ 2100 H	0600 and 1800
> 2100 H - ≤ 0100 H	1000 and 2200

Based on Sunnybrook & Women’s College Health Sciences Centre, Toronto enoxaparin protocol.

Guidelines for Enoxaparin use with Invasive procedures

- Diagnostic cardiac catheterization
 - ideally a morning procedure - give last enoxaparin dose 12 hours pre-cath
 - remove sheath 6-8 hours post most recent SC enoxaparin injection
 - if clinically required, resume enoxaparin 2-4 hours following sheath removal
- PTCA (Percutaneous Transluminal Coronary Angioplasty) consider switching to unfractionated heparin and consult with interventionalist.
- If anticipated CABG (Coronary Artery Bypass Surgery) switch to unfractionated heparin 24 hours prior to surgery if possible. Recommend a 12 hour delay from the last dose of enoxaparin and the time of the surgery.
- Switching from enoxaparin to unfractionated heparin:
 - Based on last enoxaparin dose administered:
 - < 6 hours after last dose of enoxaparin DO NOT given any unfractionated heparin
 - 6-12 hours after last dose of enoxaparin initiate unfractionated heparin 12 units/kg/hr (maximum 1000units/hr with NO IV bolus). Target aPTT 49-65 seconds.
 - 12 hours after last dose of enoxaparin initiate unfractionated heparin 60 units/kg IV bolus (maximum dose is 4,000 units); 12 units/kg/hr infusion (maximum 1,000 units/hr). Target aPTT 49-65 seconds.

Post Therapy Considerations

1. Laboratory Tests
 - CBC q2 days
 - serum urea ,creatinine q3 days
 - Monitor for bleeding. Note aPTT and INR monitoring is NOT required
2. Management of Bleeding Complications and Reversal of enoxaparin:
When hemorrhage severe enough to warrant reversal of anticoagulation:
 - use a slow IV infusion of protamine sulfate (maximum rate: 50 mg/10 minutes, restricted to registered nurses in Critical Care, Emergency)
 - anti-factor Xa activity is incompletely neutralized (maximum about 60%)
 - avoid overdosage with protamine sulfate
 - 1 mg of protamine (equivalent to 100 units of antiheparin) will help neutralize the anti-factor Xa and anti-factor IIa activity generated by 1 mg (100 IU anti-factor Xa activity) of enoxaparin;
 - the dose of protamine (in mg) is equal to the dose of enoxaparin (in mg)
 - the time elapsed since the last enoxaparin dose is important to determine protamine dose:

Time of Last Enoxaparin Dose	Dose of Protamine
< 8 hours	1 mg/1 mg of enoxaparin
8-12 hours	0.5 mg/1 mg of enoxaparin
> 12 hours	reassess need

 - a second infusion of 0.5 mg protamine per 1 mg enoxaparin may be administered if hemorrhaging continues

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Appendix C

Antithrombotic Protocol for Unfractionated Heparin (UFH) in Acute Coronary Syndromes

Policy

All registered nurses, licensed practical nurses, and psychiatric registered nurses may administer heparin without restriction.

Purpose

Once a plaque has ruptured in a coronary artery, the outcome depends to a large extent on the degree of thrombus formation in the artery. The goal of antithrombotic therapy is to prevent further formation of thrombus and hence occlusion of the artery.

Patient Selection

- Planned Intervention (e.g. diagnostic cath, PTCA, CABG) within the next the 12 hours, after consultation with the interventionalist
- Creatinine Clearance < 30 ml/min (serum creatinine > 220 umol/L) or hemodialysis

Contraindications

- prior history of heparin-induced thrombocytopenia
- contraindications to anticoagulation:
 - Active bleeding
 - History of bleeding diathesis
 - Gastrointestinal or genitourinary bleeding, hematemesis, hematochezia or melena within 30 days
 - History of intracranial hemorrhage, intracranial neoplasm, arteriovenous malformation or aneurysm.
 - History of nonhemorrhagic stroke within 30 days or any history of hemorrhagic stroke.
 - Major surgery or severe trauma within 4 weeks
 - Evidence of aortic dissection
 - Severe hypertension (SBP > 180 or DBP > 110) not adequately controlled on antihypertensive treatment.

Pre-Therapy Considerations

1. Laboratory Tests:
 - Baseline CBC, aPTT, INR

Administration

Initial Heparin Loading Dose: 60 units/kg (maximum dose is 4,000 units). Refer to table below.

Initial Maintenance Infusion: 12 units/kg/hour (maximum 1,000 units/hour). Refer to table below.

Unfractionated Heparin

Body Weight (kg)	Initial Loading Dose* (units)	Initial Infusion** (units/hr)
40	2400	500
50	3000	600
55	3300	650
60	3600	700
65	3900	800
70	4000	850
75	4000	900
80	4000	950
≥ 85	4000	1000

iii. Loading dose based on 60 units/kg

** Infusion based on 12 units/kg/hr, rounded to nearest 50

When not to give IV Heparin bolus:

- If enoxaparin has been administered within the last 12 hours. If switching to heparin the patient will only require the unfractionated heparin infusion.
- If enoxaparin has been administered within the last 6 hours – no heparin is started (bolus or infusion)
- If it is greater than 12 hours since the last dose of enoxaparin and UFH is to be started, a bolus and infusion will be started.

Dosing for Primary PCI

Initial Loading Dose:

70units/kg (maximum dose is 4,000 units). Refer to table below.

Body Weight (kg)	Dose (units)
40	2800
50	3500
60	4200
70	4900
80	5600
90	6300
100	7000
110	7700
120	8400
130	9100
140	9800
>=150	1000

iv. Loading dose based on 60 units/kg

** Infusion based on 12 units/kg/hr, rounded to nearest 50

Intravenous Heparin Dose Adjustments According to aPTT Results

For aPTT results obtained ≥ 6 hours following bolus dose or rate change.
(Mean normal aPTT = 32.1 seconds)

aPTT (seconds)	Heparin Dose Adjustment
<38	↑ infusion by 200 units/hr
38 – 48	↑ infusion by 100 units/hr
49 – 65	Continue current infusion
66 – 82	↓ infusion by 100 units/hr
83 – 105	Hold for 30 minutes, then ↓ infusion by 200 units/hr
>105	Hold for 60 minutes, then ↓ infusion by 300 units/hr

Post Therapy Considerations

vii Laboratory Tests

- aPTT > 6 hours after bolus and/or change in infusion, then daily, once in therapeutic range.
- CBC OD x 3 days, then q2days

v. Management of Bleeding Complications/Reversal of UFH:

When hemorrhage severe enough to warrant reversal of anticoagulation: 1 mg protamine (restricted to Critical Care and Emergency) neutralizes 100 Units of heparin. See WRHA Parenteral Drug Monograph.

References

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Appendix D

WRHA Eptifibatide Protocol for Use in Acute Coronary Syndromes pre Coronary Angiography

Policy

Platelet aggregation inhibitor therapy may be given by a registered nurse in the ICU, ED or designated facility unit following a physician's order. **Approval must be obtained from an interventional cardiologist prior to initiating this treatment. All patients approved for this therapy should undergo coronary Angiography within 24 hours after initiation of infusion.**

Purpose

The glycoprotein inhibitor protocol refers to the administration of Eptifibatide. The result is the inhibition of the final common pathway of platelet aggregation. Glycoprotein IIb/IIIa is a platelet surface membrane receptor that mediates binding of activated platelets to fibrinogen and subsequent thrombus formation.

The goal of glycoprotein inhibitor therapy use is as an adjunct therapy to patients with an ACS not responding to conventional pharmacologic intervention including such agents as nitrates, ASA, B-blockers and heparin (UFH or LMWH) or as prophylaxis in patients undergoing percutaneous coronary intervention (PCI). Glycoprotein inhibition may reduce the incidence of subsequent MI or death in this patient population.

Patient Selection

- Patients with Non ST Elevation MI (NSTEMI) or Unstable Angina with recurring ischemia despite optimal medical therapy who will have a diagnostic cardiac catheterization.
 - **Eptifibatide is initiated at time of approval (i.e. prior to transfer to the cath lab).**
- Unstable Angina patients with one of the following symptoms (i.e. very high risk) in whom a PCI is planned. Examples include:
 - transient or persistent hypotension during anginal pain
 - prolonged ongoing pain
 - heart failure or new mitral regurgitation thought to be ischemic
 - patient is eligible for an urgent PCI
 - **Eptifibatide is initiated prior to cath lab transfer or in the cath lab depending on circumstances**
- **Duration of infusion**
 - **Diagnostic catheterization, with no interference, discontinue eptifibatide at time of decision not of intervention.**
 - **PCI: Continue eptifibatide for an additional 17 hours (discontinue heparin or Enoxaparin at completion of PCI).**

Contraindications

- active bleeding
- history of bleeding diathesis
- gastrointestinal or genitourinary bleeding, hematemesis, hematochezia or melena within 30 days
- history of intracranial hemorrhage, intracranial neoplasm, cranial arteriovenous malformation or aneurysm
- history of non-hemorrhagic stroke within 30 days or any history of hemorrhagic stroke

- major surgery or severe trauma within six weeks
- evidence of aortic dissection
- uncontrolled hypertension (≥ 180 systolic or ≤ 110 diastolic mmHg) not adequately controlled on anti-hypertensive treatment
- known coagulopathy, platelet disorder or pre-existing thrombocytopenia ($<100 \times 10^9/L$)
- acute pericarditis
- administration of warfarin within seven days unless $INR < 1.3$
- previous thrombocytopenia due to glycoprotein IIb/IIIa inhibitor administration
- clinically significant liver disease
- serum creatinine $> 350 \text{ umol/L}$ or hemodialysis patient

Pre-Therapy Considerations

Prior to initiating therapy:

- vii. Draw pre therapy laboratory tests: CBC, creatinine, INR, aPTT
2. Administer ASA 160-mg po.
3. Administer UFH and maintain aPTT between 49 and 65 seconds until interventionist recommends discontinuation.

Administration

IV bolus: 180mcg/kg over 1-2 minutes (maximum 22.6/mg)

Infusion rate: 2mcg/kg/min. (maximum 15mg/hr) OR 1mcg/kg/min (maximum 7.5mg/hr) if serum creatinine 177-350umol/L. Platelet aggregation inhibitors not currently recommended if serum creatinine $>350 \text{ umol/L}$. Infuse via infusion pump using an air vented set?

Concurrent Heparin Administration

- a) If patient currently on enoxaparin
 - Administer Eptifibatide
 - Discontinue enoxaparin if initiated
 - Switch to UFH based on interval from last Enoxaparin dose:
 - 0-6 hours after last dose of enoxaparin no UFH required
 - 6-12 hours after last dose of enoxaparin initiate UFH at 12 units/kg/hr (NO IV BOLUS)
 - >12 hours after last dose of enoxaparin initiate UFH at bolus of 60 units/kg (maximum 4000 units) and 12 units/kg/hr (maximum 1000 units/hour).
- viii. If patient not currently on UFH or enoxaparin administer a loading dose of heparin at 60 units/kg with an infusion of Heparin at 12 units/kg/hr prior to cath lab referral

Post Therapy

- ix. Monitoring
 - assess all potential bleeding sites
 - platelet count 4 hours post bolus and then daily
 - CBC, serum creatinine daily
 - discontinue glycoprotein inhibitor infusion if platelet count decreases by $>50\%$ from baseline, or if platelet count falls below $100 \times 10^9/L$

- maintain aPTT between 49-65 seconds. Note the arterial sheath should not be removed unless aPTT <45 seconds
- x. Management of Bleeding or Thrombocytopenia
- Uncontrolled bleeding: If not controlled with pressure-stop glycoprotein inhibitor and UFH
 - Thrombocytopenia: Stop glycoprotein inhibitor and UFH immediately. Transfuse with platelets if required (4 hrs post discontinuing infusion platelet count recovers > 50%)

References

1. ACC/AHA Guidelines Update for the Management of Patients with Unstable Angina or Non ST Elevation Myocardial Infarction
2. American Journal of Cardiology – March 2000 – A Symposium – The Acute Coronary Syndromes
3. American Journal of Cardiology – A Symposium – Managing Acute Coronary Syndromes – What is the New Standard of Care?

Eptifibatide (Integrilin) bolus dosing table.		
Patient Weight (kg)	Bolus Dose (180 mcg/kg)	Bolus Volume (2mg/mL vial)
37 – 41	6.8 mg	3.4 mL
42 – 46	8 mg	4 mL
47 – 53	9 mg	4.5 mL
54 – 59	10 mg	5 mL
60 – 65	11.2 mg	5.6 mL
66 – 71	12.4 mg	6.2 mL
72 – 78	13.6 mg	6.8 mL
79 – 84	14.6 mg	7.3 mL
85 – 90	15.8 mg	7.9 mL
91 – 96	17 mg	8.5 mL
97 – 103	18 mg	9 mL
104 – 109	19 mg	9.5 mL
110 – 115	20.4 mg	10.2 mL
116 – 121	21.4 mg	10.7 mL
122 or greater	22.6 mg	11.3 mL

Integrilin (Eptifibatide) maintenance dosing table		
Serum Creatinine <177 umol/L		
Patient Weight (kg)	Maintenance Infusion <u>Dose</u> (2 mcg/kg/min)	Maintenance Infusion <u>Volume</u> (0.75 mg/mL vial)
37 – 41	4.5 mg/hr	6 mL/hr
42 – 46	5.25 mg/hr	7 mL/hr
47 – 53	6 mg/hr	8 mL/hr
54 – 59	6.75 mg/hr	9 mL/hr
60 – 65	7.5 mg/hr	10 mL/hr
66 – 71	8.25 mg/hr	11 mL/hr
72 – 78	9 mg/hr	12 mL/hr
79 – 84	9.75 mg/hr	13 mL/hr
85 – 90	10.5 mg/hr	14 mL/hr
91 – 96	11.25 mg/hr	15 mL/hr
97 – 103	12 mg/hr	16 mL/hr
104 – 109	12.75 mg/hr	17 mL/hr
110 – 115	13.5 mg/hr	18 mL/hr
116 – 121	14.25 mg/hr	19 mL/hr
122 or greater	15 mg/hr	20 mL/hr

Integrilin (eptifibatide) maintenance dosing table		
Serum Creatinine 177-350 umol/L		
Patient Weight (kg)	Maintenance Infusion <u>Dose</u> (1 mcg/kg/min)	Maintenance Infusion <u>Volume</u> (0.75 mg/mL vial)
37 – 41	2.25 mg/hr	3 mL/hr
42 – 46	2.625 mg/hr	3.5 mL/hr
47 – 53	3 mg/hr	4 mL/hr
54 – 59	3.375 mg/hr	4.5 mL/hr
60 – 65	3.75 mg/hr	5 mL/hr
66 – 71	4.125 mg/hr	5.5 mL/hr
72 – 78	4.5 mg/hr	6 mL/hr
79 – 84	4.875 mg/hr	6.5 mL/hr
85 – 90	5.25 mg/hr	7 mL/hr
91 – 96	5.625 mg/hr	7.5 mL/hr
97 – 103	6 mg/hr	8 mL/hr
104 – 109	6.375 mg/hr	8.5 mL/hr
110 – 115	6.75 mg/hr	9 mL/hr
116 – 121	7.125 mg/hr	9.5 mL/hr
122 or greater	7.5 mg/hr	10 mL/hr

Appendix E WRHA ACS Drugs

Nitroglycerin

Class I

NTG, sublingual tablet or spray, followed by intravenous administration, for the immediate relief of ischemia and associated symptoms. (Level of Evidence: C)

Recent clinical evidence

No new evidence

Recommendations

There have been no substantial changes to the guidelines in regard to nitroglycerin therapy. Would recommend continuing with current black box orders for nitroglycerin SL for all patients (without contraindication), and a white box order for nitroglycerin intravenous for selected patients.

Morphine

Class I

Morphine sulfate (2 to 4 mg IV with increments of 2 to 8 mg IV repeated at 5- to 15-minute intervals) is the analgesic of choice for management of pain associated with STEMI. (Level of Evidence: C)

Recommendations

There are no recent clinical trials examining the clinical impact of morphine in ACS. This is reflected in the level of evidence for recommendations related to morphine: Only consensus opinion of experts. The retrospective analysis is disturbing in its suggestion that patients given IV morphine have worse outcomes. However given the nature of the study it is unclear as to whether giving morphine actually produces poorer outcomes, or whether it is an ‘innocent bystander’ in patients who for other reasons are destined to have poorer outcomes. Given the recommendations from the guidelines morphine should remain as part of the care map order sheet. It could be a matter of debate as to whether it should remain a black box recommendation for those who do not fully respond to nitroglycerin, or whether it should be changed to a white box to reflect increased ambiguity as to its clinical utility.

Beta-Blockers

Class I

Oral beta-blocker therapy should be administered promptly to those patients without a contraindication, irrespective of concomitant fibrinolytic therapy or performance of primary PCI. (Level of Evidence: A)

Class Iia

It is reasonable to administer IV beta-blockers promptly to STEMI patients without contraindications, especially if a tachyarrhythmia or hypertension is present. (Level of Evidence: B)

Recommendations

There is a large body of mortality and morbidity evidence in the pre-thrombolytic era for the use of beta-blockers in AMI. In the fibrinolytic era there is minimal evidence for a mortality benefit with beta-blockers, however there remains a reduction in reinfarction and ischemia. The latest trial COMMIT early beta-blockers were beneficial in those with a low risk of shock, but neutral to harmful in those with increasing risk of cardiogenic shock. The totality of the evidence suggests a role for beta-blockers on the ACS care map. It is recommended that the care map maintain the current white box order for metoprolol IV in those with SBP >90 and heart rate >50 as adjunctive therapy.

Clopidogrel:

Clopidogrel reduces ischemic events when combined with ASA, Heparin, and anti-anginal medications.

Contraindications/cautions:

Increased bleeding risk in patients, avoid if patient candidate for CABG. No data regarding the use of Clopidogrel in combination with glycoprotein: risk of bleeding unknown.

Recommendations

In hospitalized patients in whom an early non-interventional approach is planned, Clopidogrel should be added to ASA as soon as possible on admission and administered for at least 1 month (level of evidence: A and for up to 9 months (level of evidence B). Use if there is an anticipated delay in obtaining coronary angiography and coronary by-pass is NOT anticipated. Use if non-interventional approach is planned and there are no significant contraindications for bleeding.

Definitions of level of evidence:

A	consistent level 1 studies
B	consistent level 2 or 3 studies or extrapolations from level 1 studies
C	level 4 studies or extrapolations from level 2 or 3 studies
D	level 5 evidence or troublingly inconsistent or inconclusive studies of any level

“Extrapolations” are where data is used in a situation, which has potentially clinically important differences than the original study situation.

Appendix F WRHA ECG Protocols

15 Lead ECG

Note: Modifications May Be Required By Each Facility To Accommodate Needs And Equipment Of That Facility.

Purpose: Diagnosis of a posterior and/or right ventricular infarction.

Indications:

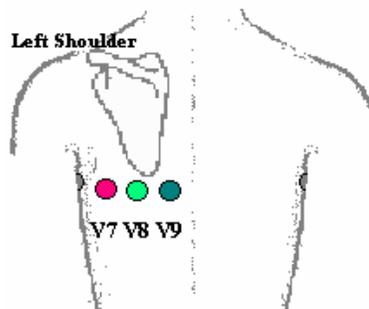
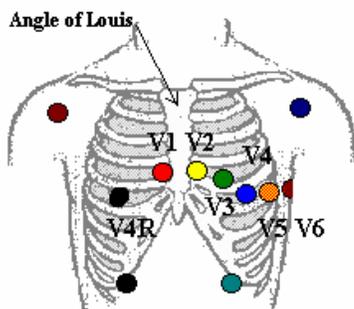
A 15 lead ECG is ordered/required when the initial 12 lead is

- non diagnostic and the patient is exhibiting signs of cardiac ischemia.
- showing ST depression in V₁ and V₂ with or without prominent R waves.
- showing signs of an inferior Acute MI.

Procedure:

When using an ECG machine that does not have software for 15 lead:

1. Obtain a 12-lead electrocardiogram.
2. Remove V₄ precordial lead and place in the V₄R position. (V₄R – 5th intercostal space, right mid-clavicular line).
3. Remove precordial lead V₅ and place in the V₈ position. The patient must turn onto right side or sit up during placement of V₈ and V₉. (V₈ located at the same level and in a horizontal line with V₄- V₆ in the left mid-scapular line).
4. Remove precordial lead V₆ and place in the V₉ position. (V₉ located at the same level and in a horizontal line with V₄- V₆, and 2.5 cm or 1 inch from the left side of the spinal column).
Note: securing the electrodes with tape may be necessary.
5. Change rhythm strip to be obtained to V₄ V₅ V₆ by pressing F2 (Marquette). Record at normal standard 10 mm/mv (Marquette by pressing F4) according to established protocols by facility.
6. Record rhythm. Obtain 2 copies. Press STOP button. Record 12 lead to allow storage into database.
7. Labels these leads as V₄R, V₈ and V₉ on the rhythm strip and on the 12 lead.
8. Attached rhythm strip to standard 12 lead electrocardiogram.
9. Requisition should indicate that V₄R, V₈ and V₉ are included in V₄- V₆ lead group.
10. In machine under reason for test state V₄ – V₆ = V₄R, V₈ – V₉.



Posterior ECG

Note: Modifications May Be Required By Each Facility To Accommodate Needs And Equipment Of That Facility.

Purpose: Diagnosis of a posterior infarction.

Indications:

Posterior leads are done when the initial 12 lead electrocardiogram shows ST depression in V₁ and V₂ with prominent R waves.

Procedure

1. Obtain a 12-lead electrocardiogram.
2. Remove precordial lead V₄ and place in the V₇ position. (posterior axillary line and same level and in a horizontal line with V₄- V₆).
3. Remove precordial lead V₅ and place in the V₈ position. The patient must turn onto right side or sit up during placement of V₈ and V₉. (V₈ located at the same level and in a horizontal line with V₄, V₆ in the left mid-scapular line).
4. Remove precordial lead V₆ and place in the V₉ position (V₉ located at the same level and in a horizontal line with V₄- V₆, and 2.5 cm or 1 inch from the left side of the spinal column).
Note: securing the electrodes with tape may be necessary.
5. Have the patient lie back in the supine position and change the rhythm strip to be obtained to V₄ V₅ V₆ by pressing the F2 button (Marquette). Record at normal standard 10 mm/mv (by pressing F4 – Marquette) according to established protocols.
6. Record rhythm, obtaining two copies. Press STOP. Record 12 lead ECG (to allow storage in database).
7. Label these leads on the tracing as V₇ –V₈-V₉.
8. Include rhythm strip with 12 lead electrocardiogram.
9. Requisition should indicate the posterior leads are included and in which group they are in.
10. In machine under reason for test state V₄- V₆ = V₇– V₉.

Copy of the Emergency Department Suspect ACS Care Map System

The Emergency Department Suspect ACS Care Map System consists of the following components:

Form #	Form Name
	Emergency Department ACS Care Map
	Nursing Section
	Physician Section
	Physician Orders for Non-ST Elevation Myocardial Infarction (NSTEMI) & Unstable Angina (UA)
	Physician Orders for ST Elevation Myocardial Infarction (STEMI)
	Troponin T 6 hour testing guideline in low likelihood for ACS patients
W-00041	Bilingual Teaching Sheet – Nitroglycerine
W-00040	Bilingual Teaching Sheet – Antiplatelets
W-00038	Bilingual Teaching Sheet – ACE Inhibitors
W-00042	Bilingual Teaching Sheet – Cholesterol Lowering Agents
W-00039	Bilingual Teaching Sheet - Beta Blockers
W-00058	Guide to Coronary Angiogram and Angioplasty/Stent Brochure
W-00050	Pre Angiography Order Form for Eptibatide in ACS
W-00049	Outpatient Cardiac Rehabilitation Referral Form -?delete
N/a	Wellness Institute at Seven Oaks General Hospital Cardiac Rehab Brochure
N/a	Reh-Fit Centre Cardiac Rehab Brochure-?delete
N/a	Manitoba Heart and Stroke Foundation Angina Brochure

