Myocardial Ischemia: Management in Critical Care

Site Applicability

SPH Critical Care areas

Practice Level

Specialized:

- Only Registered Nurses who have completed a recognized post-graduate critical care course, or have equivalent education and experience, may manage myocardial ischemia in critical care.
- Additional cardiac monitoring competencies are needed to initiate and interpret continuous ST-segment monitoring.

Need to Know

Chest discomfort, alone or in combination with other symptoms may indicate an imbalance in the supply and demand of oxygen to the myocardium.

The most common cause of myocardial oxygen deficit and the resulting ischemic symptoms is atherosclerosis, which leads to occlusive coronary artery disease. Other causes include low cardiac output (e.g. from hypovolemia, hypotension from other causes such as distributive shock, cardiac arrhythmias), use of cocaine or other stimulants, or vasospasm.

Chest discomfort or other symptoms of ischemia represents an emergency because the longer the period of ischemia, the worse the outcome for the patient. Prompt and accurate assessment and treatment of chest discomfort is necessary to establish a definitive diagnosis (e.g. myocardial infarction), initiate treatment, and reduce myocardial damage.

Precautions / Special Considerations

All chest pain/discomfort should be assumed to be cardiac in origin -acute coronary syndrome (ACS) or myocardial infarction (MI) until determined otherwise. Some patients may not have distinct chest pain, but may have arm, neck, jaw/throat, back or arm/shoulder discomfort, shortness of breath (SOB) or dizziness. Acute coronary syndrome (ACS) can cause both subtle and severe pain. However, some myocardial ischemia is asymptomatic or “silent”, but may be detected as changes in ST segments.

Women and men are equally likely to have coronary heart disease and experience ACS. Women may report more symptoms than men, making diagnosis more difficult, but most research has shown that women who are having ACS are as likely as men to report chest discomfort.

Pulmonary embolus should be suspected with acute onset of pleuritic chest pain accompanied by dyspnea and severe hypoxia in the setting of recent surgery, known malignancy or immobility.

Equipment and Supplies

Cardiac monitor with ST-segment monitoring capability and patient cable

Protocol

Myocardial Ischemia: Nursing Assessment

ASSESSMENT	RATIONALE
1. Assess pain/discomfort: Onset, precipitating factors, quality, radiation/region, severity, time/duration, associated symptoms. Signs and symptoms might include: • Sudden onset of sharp, stabbing, aching or crushing pain/discomfort in chest (can be central, left- or right-sided) • Pain/discomfort radiating to left arm/shoulder, neck, jaw or back • A tight, dull, heavy or band-like pressure or general discomfort • Diaphoresis • Nausea/vomiting, indigestion, belching • SOB • Clenching of fist over the sternum (Levine's sign) • Dizziness or syncope • Feeling of impending doom • Precipitation by exertion, emotional stress, a heavy meal or cold weather Assess further any symptom that patient describes as an unusual discomfort	Communicate all new episodes of chest pain/discomfort or ischemic symptoms to the MRP immediately to facilitate diagnosis, further monitoring and initiation of treatment.
2. Assess vital signs (HR, BP, SaO_2 or SpO_2, T, RR)	Assess for • Irregular cardiac rhythm or changes in HR • Hypo- or hypertension • Shortness of breath, decreased O_2 saturation
3. Assess cardiac rhythm: • Assess cardiac rhythm and ST-segment deviation	

ASSESSMENT	RATIONALE
4. Consider relevant health history: • Personal medical history and family history of heart disease or diabetes • Cardiac risk factors such as smoking, hypertension, diabetes, overweight and/or physical inactivity, high cholesterol • Any other signs or symptoms of heart disease such as general fatigue and lethargy, shortness of breath, edema • Factors precipitating, decreasing or relieving pain	
5. Medication history: • Cardiac medications • Recent use of cocaine or sildenafil (Viagra®), vardenafil (Levitra®) or tadalafil (Cialis®)	**Avoid nitroglycerin** if patient has used sildenafil (Viagra®) vardenafil (Levitra®) **within 24 hours** or tadalafil (Cialis®) **within 48 hours**.

Myocardial ischemia: Nursing interventions

INTERVENTION	RATIONALE
1. Initiate cardiac rhythm and ST monitoring for all patients (see B-00-12-10018 – ST Segment Monitoring: Initiating)	Review rhythm strip for ST deviation (elevation or depression). If monitor showing ST-segment changes greater than 2 mm, perform 12-lead ECG as per Table 1
2. Position in semi-Fowler's position and measure VS Restrict activity to bedrest	If SpO_2 is less than 90%, initiate O_2 via suitable delivery system until 90% achieved. **Oxygen therapy is not indicated for SpO_2 greater than 90%, and may cause harm**. If SpO_2 monitoring is not available, provide oxygen to any patient who exhibits signs of respiratory distress.
3. Determine if patient requires a 12-lead ECG	See "12-lead ECG" (Appendix A)
4. Continue to monitor VS Q3 to 5 min during episode of chest pain/discomfort	1:1 nursing care should be implemented during pain episode If chest pain/discomfort is not resolved and/or patient becomes hemodynamically unstable, call for assistance or Code Blue as necessary

	INTERVENTION	RATIONALE
5.	Administer SL nitroglycerin if systolic BP 90 mmHg or more: • Administer 1 dose (0.4 mg/dose) sublingual spray every 5 minutes as needed, up to 3 doses in 15 minutes ***OR*** 0.3 mg sublingual tablet every 5 min, up to 3 doses per episode • If pain unrelieved with 3 doses, contact MRP and consider (with provider order) morphine or nitroglycerin infusion for ongoing symptoms of ischemia	A physician's order is required for nitroglycerin administration. Nitroglycerin can cause a sudden drop in blood pressure. **Avoid administering nitroglycerin if**: • SBP is below 90 mmHg, or drops more than 30 mmHg below baseline after first spray • heart rate is below 50 bpm • suspected RV infarct, • and/or diagnosis of aortic stenosis, If patient already receiving nitroglycerin infusion titrate according to PDTM Monograph and Provider order.

Intended Outcomes

With safe and effective initiation of treatment, ischemic pain/discomfort is relieved within 10 to 15 minutes, as evidenced by subjective and objective data, and associated complications are prevented or minimized.

- Signs of improvement within 5 minutes of initiating treatment
- Complete resolution of pain within 15 minutes

Unintended Outcomes

- Hypotension (side effect of nitroglycerin)
- Chest pain unresolved for longer than 15 minutes
- Acute myocardial infarction
- Cardiac arrest

Documentation

1. **Interactive View and I&O:**
    - Ischemic Symptoms: Date, time, initial and ongoing assessment of presenting chest pain symptoms, other ischemic symptoms, interventions implemented and responses, and physician communication.
    - During episodes of ischemia record VS, hemodynamic parameters, FiO_2, and pain scale rating (e.g. 1 to 10) Q3 to 5 min.
    - Education/information given to patient and other interventions.
2. **ECG Strip Flowsheet** (Form ID - 2892): Cardiac rhythm strip
3. **Critical Care ST Analysis** (Form ID – 6473): ST-segment analysis
4. **Medication Administration Record (MAR)**: Date, time, and dose(s) of medication(s) given

Patient and Family Education

When appropriate, explain rationale for the treatment being provided and possible side effects. Instruct patient about importance of and method for communicating further episodes of chest pain/discomfort

- Instruct the patient to notify the nurse with ANY onset of chest or other ischemic pain/discomfort, or recurrence of the specific symptoms that led to initial admission. Emphasize that even "minor" discomfort should be reported to nurse.
- Instruct patient and family as to significance of patient's particular symptoms, and the importance of reporting.
- Reassure patient that you will be present with patient during symptoms, and that goal is to **eliminate** symptoms.

Related Documents

1. B-00-13-10017 – Physical Assessment (Critical Care Areas)
2. B-00-13-10011 – Cardiac Monitoring, protocol
3. B-00-12-10018 – ST Segment Monitoring: Initiating
4. B-00-13-10019 – Oxygen Therapy, Acute care
5. PDTM Monographs, Nitroglycerin
6. Emergency Cardiac Care: Decision Support Tool #3

References

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3. Mackay,M. (June 2021). Emergency cardiac care decision support tool #3 (chest discomfort). Available online at: http://heartcentre.ca
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Infarction: Focused Update on Regionalization and Reperfusion. *The Canadian journal of cardiology*, *35*(2), 107–132. https://doi.org/10.1016/j.cjca.2018.11.031

Definitions

Acute Coronary Syndrome (ACS): umbrella term encompassing unstable angina, non-ST-elevation myocardial infarction (MI) and ST-elevation MI. It is caused by a sudden disruption of an atherosclerotic plaque in a coronary artery, which leads to inadequate myocardial perfusion.

Pleuritic Chest Pain: sharp, stabbing pain typically worsens with inspiration and coughing, usually unilateral and quite localized. Ischemic cardiac discomfort does not usually worsen with inspiration and is usually more diffuse than pinpoint. Pleuritic chest pain is a symptom of pleurtits (pleurisy), pulmonary embolism, pneumothorax and other respiratory disorders.

Appendices

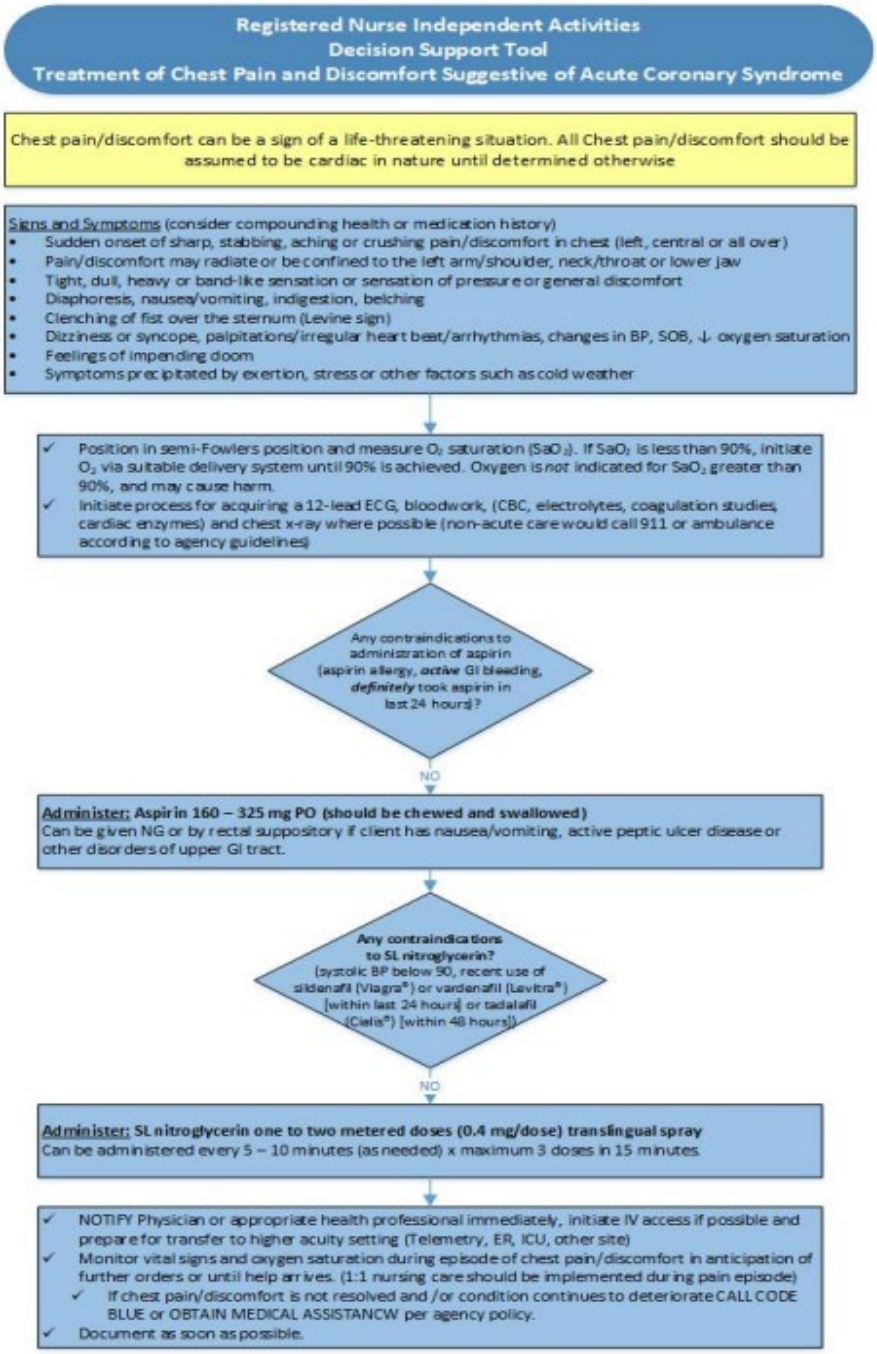
Appendix A: 12-Lead ECG

Appendix B: Registered Nurse Independent Activities Decision Support Tool: Treatment of Chest Pain and Discomfort Suggestive of Acute Coronary Syndrome

Appendix A: 12-Lead ECG

OBTAIN 12-LEAD ECG STAT IF:	NO 12-LEAD ECG REQUIRED IF:
Diagnostic testing or cardiac intervention has not been completed *OR* Pain or symptoms are different or increased in severity, or persist greater than 15 minutes in duration *OR* Monitor showing ST-segment changes greater than 2 mm *OR* Hemodynamic instability	Diagnostic testing or cardiac intervention is complete on this admission and additional criteria in Box A is not applicable *OR* Ventricular paced rhythm

Appendix B: Registered Nurse Independent Activities Decision Support Tool: Treatment of Chest Pain and Discomfort Suggestive of Acute Coronary Syndrome



EMERGENCY CARDIAC CARE DECISION SUPPORT TOOL #3 (CHEST DISCOMFORT)
APPROVED 2011 (REV 2013, 2021)
Author: Martha Mackay, Providence Health Care Heart Centre & Emergency Cardiac Care Working Group

Emergency Cardiac Care – Decision Support Tool #3

Persons Consulted

Director, Cardiac Intensive Care Unit
Nurse Educator, Cardiac Intensive Care Unit
Nurse Educator, High Acuity Unit, MSJ
Nurse Educator, Post Anesthetic Care Unit
Nurse Educator, Intensive Care Unit
Clinical Nurse Specialist, Acute Coronary Syndrome Program

Author

Clinical Nurse Specialist, Cardiology

Revised by

Nurse Educator, Cardiac Intensive Care Unit

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	Heart Centre