ST-Segment Monitoring

Self-Learning Package

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**Validation Exercise (site/program specific)** ............................................................... See Educator

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PURPOSE

The purpose of this package is to provide the nurse working in cardiac monitored areas education to care for patients requiring ST-segment monitoring.

OBJECTIVES

After completing this package, the learner will be able to:

1. Explain the importance of ST-segment monitoring for different patient populations.
2. Identify appropriate ECG lead placement based on patient population.
3. Identify the appropriate assessment, interpretation, treatment, and documentation for ST-segment monitoring.

INSTRUCTIONS

This package is designed to be a supplementary review to any previously acquired knowledge and experience regarding ST-segment monitoring. Prior to reading this package, review the Critical Care Clinical Practice Guideline, Cardiac Monitoring (Adults): Setup, Lead Placement, and ST-Segment Monitoring. To successfully complete this review, some sites and programs in the WRHA may require the learner to submit a completed validation exercise and display an understanding of the correct answers in discussion with the educator.
NORMAL CARDIAC CYCLE REVIEW

Review of the components of the cardiac cycle:

- **P wave**: first wave in the cardiac cycle that represents atrial depolarization.
- **P-R Interval (PRI)**: includes P wave and PR segment, measured from the beginning of the P wave to the beginning of the QRS.
- **QRS**: series of deflections (Q, R, S) that normally follow a P wave and represents ventricular depolarization.
- **ST-segment**: From the end of the QRS complex to the beginning of the T wave. Represents early ventricular repolarization and is normally isoelectric.
- **J point**: point where the QRS complex and ST-segment meet.
- **T wave**: waveform following the QRS complex that represents ventricular repolarization.
- **Q-T Interval (QT)**: onset of QRS complex to end of the T wave that represents both ventricular depolarization and repolarization.
CLINICAL CONDITIONS FOR ST-SEGMENT MONITORING

ST-segment monitoring is a recommended standard of care for patients whose clinical condition warrants ischemia monitoring (e.g. Acute Coronary Syndrome (ACS), Myocardial Infarction (MI), cardiac surgery, signs and symptoms of angina). It is reasonable to initiate ST-segment monitoring for >24-48 hours or until MI is ruled out.

Myocardial ischemia causes the cells of the myocardium to become either more or less excitable. This change is most apparent in the ST-segment of the ECG. ST-segment depression or elevation reflects ischemia or injury to myocardial tissue.

Ischemia detection via ST-segment monitoring has always been an important component in managing cardiac patients. ST-segment monitoring enables the detection and documentation of potential episodes of ischemia as reflected by ST-segment changes. However, ST-segment monitoring is equally important to detect “silent ischemia” which occurs in absence of other classic symptoms for high risk patients or in patient populations unable to communicate signs and symptoms of ischemia (e.g. sedated or mechanically ventilated patients).

LEAD PLACEMENT

Lead placement will be dependent on patient population and reason for monitoring, patient specific clinical presentation or as per program/unit specific guidelines.

Recommended monitoring leads are:

1. Dysrhythmias: Leads II (supraventricular arrhythmias) & V1 (wide complex arrhythmias)
2. ST-segment fingerprint: Lead selection based on the coronary artery or surface known or suspected to be affected by the ischemic process (identified via invasive angiography or 12 Lead ECG).
3. ACS Leads: III & V3
4. Demand Ischemia (non-cardiac populations): V5
ENSURING ST-SEGMENT ACCURACY

Ensure lead placement is accurate according to the Cardiac Monitoring (Adults): Setup, Lead Placement, and ST-Segment Monitoring. For example, when monitoring V1, the V lead must be placed at the 4th intercostal space, right sternal border.

Optimize signal quality by ensuring electrodes are changed as per manufacturer’s recommendation and as need (PRN) with the skin prepped appropriately. If the patient is actively mobile consider taping with waterproof tape to keep in place.

Depending on the cardiac monitor software capabilities, you may need to ensure the J Point is correctly established on admission. Review with unit Clinical Educator (see Appendix A).

CONSIDERATIONS WITH ST-SEGMENT MONITORING

At times, ST-segment changes may not be representative of ischemia. Numerous conditions may mimic ischemia or make ST-segment monitoring unreliable, including the following:

- Artifact
- Body position changes
- Arrhythmias such as atrial fibrillation/flutter (due to an irregular isoelectric line)
- Continuous ventricular pacing
- Left bundle branch block
- Tachycardia
- Drug effects (such as digitalis and diuretics)
- Electrolyte imbalances (such as calcium and potassium)
- Conduction disturbances (including LBBB and WPW syndrome)
- Hypothermia
- Left ventricular hypertrophy
- Endocarditis
- Pericarditis
- Old infarcts

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WHAT TO DO IF ST-SEGMENT CHANGES ARE NOTED

If ST-segment changes are noted, consider and assess the following:

- Assess the patient:
  - Perform vital signs
  - Auscultate the heart and lungs
  - Are they symptomatic?
  - Are they moving/could this be artifact?
  - Is there a change of more than 1 or 2 mm that lasts more than one minute from previous value?
  - Is the J point correctly identified (depending on the cardiac monitor software capabilities)?
  - Are the electrodes intact and placed appropriately?
  - Could this be expected resolution from a recent cardiac event? (e.g. STEMI)

Based on the above information, if you are concerned that this is a significant change:

- Inform the MD
- Call for a 12-lead ECG
- Obtain bloodwork (as ordered)

WHAT TO DOCUMENT AND WHERE

Print a rhythm strip. Mount and analyze the rhythm strip on the ECG monitoring record sheet. Ensure documentation of which lead is being monitored.

Document the ST-segment on admission and PRN. If continuous monitoring is required as per clinical condition or per unit/program protocols or guidelines, document q4h and PRN.

Document vital signs and assessment data using unit a specific flowsheet or nursing documentation tools. See Appendix C for unit specific examples.

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IN SUMMARY

Establishing a patient specific ST-segment level, rather than an isoelectric ST-segment level, is important because the patient’s baseline ST-segment level is rarely isoelectric.

Set cardiac monitor alarms to detect changes in ST-segment elevation or depression greater than 2mm.

ST-segment elevation or depression of 1 to 2 mm that lasts for at greater than one minute can be clinically significant and warrants further patient assessment.

Supine is the optimal patient position to establish baseline ST-segments.

Key point to remember, it is about monitoring trends.

REFERENCES:


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APPENDIX A: PHILIPS MONITOR SETUP

**When:** Upon new patient admission, after they have been on the monitor for about one minute to establish a baseline (e.g.: when adjusting monitor alarm limits for the first time).

1. Touch any ECG rhythm.
2. Touch “Adjust ST Points”.
3. Touch anywhere on the pop-up screen to change the displayed Lead. Select the QRS complex with the most distinguishable change from QRS complex to T wave. Use the < and > arrows to move the “ISO Point” cursor to the ISO electric line. This is best found - with the least amount of artifact - between the P wave & the QRS complex.
4. Touch “Select Point”.
5. Use the < and > arrows to move the “J Point” cursor to the position where the QRS complex becomes the T wave (see Point E on the next page).
6. Touch “Apply Changes”.

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7. Note that the “ST Point” is 60 milliseconds after the J Point. This is where ST elevation or ST depression is measured (Point F).

8. “X” out of the pop up window.

9. Document the ST numeric for the two appropriate leads for the patient.

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APPENDIX B: SPACELABS MONITOR SETUP

1. Select the ECG Menu in the main screen
2. Select Alarm Limits, then ST Alarms.

3. Monitor default alarms detect changes in ST-segment elevation or depression greater than 2mm. Select Multi ST=2.00 to adjust ST alarm limits for multiple leads if needed. Select ST Leads to include or exclude in ST Lead alarms.
4. Monitor displays ST-segment values in the main screen.
APPENDIX C: DOCUMENTATION EXAMPLES

ICU Vital Signs Flowsheet:

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EPR CAAF:
For the GE telemetry monitors: Click on the patient’s telemetry box then click on patient data. Click on the numeric trends option. ST-segment measurements will be displayed by time column.

ST-segment measurements:
I: 0mm      III: +1.2mm      aVR: 0mm      V3: +1mm
II: +1.2mm  aVL: +1.2mm      aVF: 0mm