Cardiac Patient Assessment
&
12 Leads for the EMT-B

Presented by
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Regional STEMI Network
A regional program developed for the rapid treatment and timely transfer of patients with STEMI from the rural hospital to a PCI capable hospital using a standardized protocol.

Leading Causes of Death in Washington, 2009

Note: Deaths categorized by underlying cause.
Source: Death Certificate Data—Washington State Department of Health, Center for Health Statistics.

Acute Coronary Syndromes

Cardiopulmonary arrest (CPA)

Unstable angina/ non ST elevation myocardial infarction (UA/NSTEMI)

ST segment elevation myocardial infarction (STEMI)

“By January 1, 2011, the department shall endeavor to enhance and support an emergency cardiac and stroke care system through:”

• Adopting cardiac and stroke prehospital patient care protocols, patient care procedures, and triage tools consistent with the Emergency Cardiac and Stroke Technical Advisory Committee (ECS TAC) recommendations

• Encouraging hospitals to voluntarily participate in the system by self-certifying they meet cardiac and stroke care criteria recommended by the ECS TAC.
- Giving hospitals "deemed status" to participate if they are certified as primary stroke centers by the Joint Commission or other national certifying bodies
- Having hospitals and EMS participate in quality improvement activities to help measure how well the system is doing
- Allowing the regional trauma quality assurance programs to include emergency cardiac and stroke care

Prehospital Cardiac Triage Tool
Assess Applicability for Triage
Post cardiac arrest with ROSC: -OR-
≥ 21 years of age with symptoms lasting more than 10 minutes but less than 12 hours suspected to be caused by coronary artery disease:
- Chest discomfort (pressure, crushing pain, tightness, heaviness, cramping, burning, aching sensation), usually in the center of the chest lasting more than a few minutes, or that goes away and comes back.
- Pain or discomfort in 1 or both arms, neck, jaws, shoulders, or back.
- Shortness of breath with or without chest discomfort.
- Epigastric (stomach) discomfort, such as unexplained indigestion, belching, or pain.

Other symptoms may include sweating, nausea/vomiting, lightheadedness.

NOTE: Women, diabetics, and geriatric patients might not have chest discomfort or pain. Instead they might have nausea/vomiting, back or jaw pain, fatigue/weakness, or generalized complaints.

Cardiac Hospital Criteria

Level One
- Perform PCI 24/7 within 90 minutes
- Interventional cardiologists and cath lab team available within 30 minutes 24/7
- Cardiac surgery onsite or transfer agreements

Level Two
- Administer fibrinolytics 24/7 within 30 minutes
- ACLS trained providers

Yes: Assess Immediate Criteria
- Post cardiac arrest with ROSC
- Hypotension or pulmonary edema
- EKG positive for AMI (if available)

↓

Yes: See Transport algorithm

No: Assess High Risk Criteria

In addition to symptoms in Box 1, pt has 4 or more of the following:
- Age ≥ 55
- 3 or more CAD risk factors:
  - family hx
  - BP
  - Elevated cholesterol
  - Diabetes
  - current smoker
- Aspirin use in last 7 days
- ≥2 anginal events in last 24 hours, including current episode
- Known coronary disease
- ST deviation ≥ 0.5 (if available)
- Elevated cardiac markers (if available)

Yes: See Transport algorithm

No: Transport to closest hospital
NEW PRACTICE: 12 LEADS FOR EMT-B’S

- Approved for all EMT’s in WA
- "Interpretation of the 12 lead ECG and advanced interventions based on the 12 lead findings is restricted to the Paramedic scope of practice only"
- EMT’s (or advanced EMT’s) may transmit or read the computer interpretation to the receiving hospital

ECG Paper

- One small box = 0.04 seconds
- Five small boxes = 0.20 seconds (1 large box)
- Five large boxes = 1 second
- Thirty large boxes = 6 seconds
- Six-second strips are most commonly used to analyze cardiac rhythm.

Waveforms & Intervals

Let’s talk 12 leads

- Current moving toward positive electrode
- Current moving away from positive electrode
- Current moving perpendicular to axis of the lead

Sinoatrial Node

- Primary pacemaker of heart
- Sets normal heart rate (60-100 beats/min)
- Initiates electrical impulse once per second
- Impulse travels through atria, causing atrial depolarization
  - Represented by upright "P" wave on ECG
Atrioventricular Junction

- Gateway to ventricles
- Briefly slows electrical impulse from atria
  - *Represented by P-R interval on ECG*

Ventricular Conduction

- Once through AV junction, electricity enters ventricles.
  - Bundle of His
    - Left and right bundle branches
  - Purkinje system
    - Disperses electricity throughout entire ventricle
- **QRS complex represents ventricular depolarization.**

Repolarization

- Heart returns to a state of polarization
  - *Represented by the “T” wave on the ECG.*

Waveforms & Intervals

- **P wave** – atrial depolarization
- **PR Interval** - 0.10 - 0.20 sec
- **QRS Complex** – 0.04-0.10 sec
  - Q – First negative deflection
  - R – Positive deflection
  - S – Negative deflection that follows a positive deflection

- **ST Segment** – Isoelectric
- **ST Elevation** – Myocardial INJURY
- **ST Depression** – Myocardial ISCHEMIA
- **T wave** – ventricular repolarization
  - T wave Inversion - myocardial ISCHEMIA
- **QT Interval** – 0.36-0.44 seconds

QRS Variations
ECG Findings

- ST Elevation or New Left BBB Strongly suspicious for injury
- ST Depression or Dynamic T wave inversion Strongly suspicious for ischemia
- Normal or Non-diagnostic ECG Chest pain Suspicious for ischemia

ECG Changes in Acute MI

Injury
- ST Segment Elevation
  - 1 mm or greater in limb leads
  - 2 mm or greater in precordial leads

STEMI

- Initiate “Cardiac Level 1 or STEMI” protocol
  - Notify transport for rapid transport
  - Contact cardiologist/receiving facility
- Reperfusion goals:
  - Door to Balloon (< 90-120 minutes)
  - Door to Door < 90 minutes
    - Transfer to PCI capable facility
    - No lytics
  - Door to Door > 90 minutes
    - Consider full dose fibrinolytics
    - Door to drug (< 30 minutes)
**Limb Leads**

- **Bipolar Limb Leads**
  - Lead I: RA + LA (Lateral)
  - Lead II: RA + LL (Inferior)
  - Lead III: LA + LL (Inferior)

- **Unipolar Limb Leads**
  - AVR: Right arm
  - AVL: Left arm (Lateral)
  - AVF: Left foot (Inferior)

**Precordial Leads**

- **Septal**
  - V1: 4th ICS, right of sternum
  - V2: 4th ICS, left of sternum

- **Anterior**
  - V3: Midway between V2 and V4
  - V4: 5th ICS, midclavicular line

- **Lateral**
  - V5: 5th ICS, anterior axillary line
  - V6: 5th ICS, midaxillary line

**Artifact**

- Abnormal waveforms on cardiac monitor not caused by cardiac conduction problems
  - Poor electrode contact
  - Loose lead
  - Dry electrode
  - Patient movement
  - Muscle tremors
  - 60-cycle interference

**Cardiac Patient Activation**

- STEMI
- Post Arrest
- High Risk
Learn: Rapid STEMI ID AHA

• Understanding STEMI Systems of Care and STEMI recognition
• Basics of acute coronary syndromes (ACS) and triage of STEMI patients
• Acquiring high-quality, 12-lead electrocardiograms (ECGs)
• 12-lead findings that mimic STEMI
• Coronary anatomy related to 12-lead ECG
• Indications for activating a Heart Alert System

ECG ACS Ruler (80-1181)

Features:
• Graphically defines ACS ECG findings for heart injury, ischemia and infarction
• Gives directions how to measure ST deviation with a transparent ‘window’ grid
• Has 2 transparent grids calibrated to 25mm/s paper to:
  Measure the ST segment at the appropriate time after the J point
  Measure PR, QRS and QT intervals
• Identifies infarct location with ECG graphics for specific leads for anterior, inferior and lateral infarct
• Lists normal values for PR, QRS and QT intervals
• Has ruler markings to estimate heart rate, inch and centimeter

Scenario #2

• 47 year old male, indigestion/CP x 18 hours
• History: HTN, Diabetes, Smoker
  - 02:00 CP 8/10
  - 06:35 EMS on scene

Treatment: BLS

I. Scene Size-Up/Initial Patient Assessment
A) Monitor/support ABC’s
B) Be prepared to provide CPR/Defib

II. Focused History and Physical Exam
A) Assess patient for signs and symptoms of ACS
B) Perform 12 lead ECG and check for ***ACUTE MI SUSPECTED*** on computer print out
C) If **ACUTE MI** on print out, alert the receiving hospital ASAP
D) If possible ACS patient – request ALS (ground or Air Medical) response

*Remember the 12 lead may not show a heart attack even if the patient is actually having one
47 year old male
Cardiac risk factors: HTN, Diabetes, Smoker
Indigestion/CP x 18 hours

• Cardiac Activation?
• Initial assessment?
• Initial treatment?
• Destination?

54 year old male with midsternal chest pain x 2 hours “9/10”
History of meth use, family history of CAD

• Cardiac Activation?
• Initial assessment?
• Initial treatment?
• Destination?

Scenario # 4
• 54 year old male with sudden onset diaphoresis, abdominal pain radiating to the chest
• History of meth use, family history of CAD
  1200 Onset of pain
  1210 Call to 911
  1215 EMS on scene

Case Study #2
• 54 year old male c/o flu-like symptoms x 24 hours. Body aches, chest pressure, nausea and vomiting. No fever or chills
  • T 98.2  P 64  R 20  BP 110/68  SpO2 97%
  • Initial treatment?

NSR  PR  .20  QRS  .08  QT  .32
54 year old male c/o flu-like symptoms x 24 hours. Body aches, chest pressure, nausea and vomiting. No fever or chills

- Cardiac Activation?
- Initial assessment?
- Initial treatment?
- Destination?

Question #1
12-lead ECG acquisition has been approved for EMT-B practice in the state of Washington.

A. True
B. False

Question #2
Which waveform represents ventricular repolarization on the ECG?

A. The p wave
B. The t wave
C. The QRS complex
D. The ST segment

Question #3
Which finding on the ECG should result in immediate activation of transport and receiving hospital?

A. ****ACUTE MI SUSPECTED****
B. ST depression
C. t wave inversion
D. Convex ST segments

Question #4
When treating a chest pain patient the most important thing to remember is.

A. Always do a 12 lead ECG
B. ECG’s do not always show a heart attack
C. Preserve the patient’s modesty while applying the ECG patches
D. Always make the patient chew an Aspirin en route to the hospital

Question #5
Acute injury pattern on the 12 lead is almost always caused by:

A. Respiratory distress
B. Pulmonary emboli
C. Penetrating trauma
D. A complete blockage of a coronary artery
Questions regarding this presentation?

Questions?
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Sheila Crow
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