The Greater Miami Valley EMS Council, Inc.
& State of Ohio EMS Region 2

Standing Orders
Optional Skills Training Manual

This document includes the training materials and skills sheets for those procedures that are considered optional components of the Standing Orders. Prior to implementing any of the Departmental Options in the Standing Orders, Council strongly recommends the following:

- Evaluation and approval by the Chief of the Department, including assessment of cost and training requirements.
- Evaluation and approval by Department Medical Director.
- Develop and implement a training plan (specific recommendations are included here for some procedures). Training plans must include any other required components (e.g., paramedics training for "Sedate to Intubate" administration must also be trained in use of a rescue cricothyrotomy device).
- Deliver annual training and competency (written and skills) evaluation of those optional skills/procedures
- Have a defined Quality Improvement Plan.

According to the Standing Orders, "No procedures, techniques, or drugs will be used without the proper equipment or beyond the training or capabilities of the pre-hospital personnel. Nothing may be used without specific pre-approval of the Medical Advisor for the local department or agency." "**Items that are enclosed in braces ({}) are at the option of the Department, and its Medical Director.**"

Departments are strongly encouraged to reproduce the sections of this document that apply to the optional skills, items, and procedures they intend to use. Materials for items not used by your Department may be deleted.

Listed on the next page are the optional items in the 2017 GMVEMSC Standing Orders.

Table of Contents

Optional Procedures

Optional Procedures	EMR	EMT	Adv EMT	Paramedic
BAAM				X
BiPAP				X
CANA Auto-Injector	X	X	X	X
Camera-Assisted Intubation			X	X
Carbon Monoxide Monitoring		X	X	X
Combi-Tube		X	X	X
Cyanide Kits (CyanoKit or traditional)				X
Dawn Soap	X	X	X	X
Digital Intubation			X	X
EtCO2 Waveforms	X	X	X	X
Flow-Restricted Oxygen Powered Ventilation Device	X	X	X	X
IV Pump				X
King Airway		X	X	X
Lighted Stylet Intubation			X	X
Magnesium (Maalox or Mylanta)				X
Magnesium Sulfate (Epsom Salt)				X
Morgan Lens				X
Nitroglycerin Drip				X
12-Lead ECG Acquisition		X	X	X
12-Lead ECG Interpretation				X
Post-Arrest Induced Hypothermia				X
Sedate to Intubate				X
Stockpile (Cipro or Doxy)				X
Sudecon Wipes	X	X	X	X
Warmed IV Fluids			X	X

Optional Skill
King Airway

Scope of Practice EMT-Basic, Intermediate, and Paramedic

Indications
1. Need for tracheal intubation
2. Inability to tracheally intubate
3. Unconscious, apneic, no gag reflex
* for EMT-Basics, the patient must also be pulseless

Contra-Indications
1. Less than 4 feet tall
2. Known history of esophageal disease
3. Ingestion of caustics

Complications
Stimulation of gag reflex
Soft tissue trauma
Tube extraction under high airway pressures

Procedure

	Yes	No
Takes or verbalizes appropriate BSI precautions		
Places the patient in the "sniffing" position (consider c-spine precautions)		
Pre-oxygenates		
Choose the correct size * Size 3 for patients 4 to 5 feet tall * Size 4 for patients 5 to 6 feet tall * Size 5 for patients over 6 feet tall		
Applies a water-soluble lubricant to the distal tip		
Without exerting excessive force, advance the tube until the base of the connector is aligned with the patient's teeth or gums		
Inflate the pilot balloon with the appropriate amount of air * Size 3 = 50ml * Size 4 = 70ml * Size 5 = 80ml		
Attach the Bag-Valve Mask; while ventilating the patient, gently withdraw the tube until ventilation becomes easy and free-flowing. Adjust cuff inflation if necessary to obtain a seal		
Confirm placement * utilize multiple methods		
Ventilate patient at the proper rate and tidal volume		

Greater Miami Valley EMS Council, Inc. & Ohio EMS Region 2 Protocol
COMBITUBE

Indications:

- Can only be used by trained personnel at the EMT-B, AEMT, or EMT-P level with Medical Director Approval... EMT only if apneic and pulseless
- Patient must be adult and in respiratory arrest or have an absent gag reflex.
- After two failed attempts to intubate patient with an endotracheal tube.

Contraindication

- Patient under the age of 16 and/or under 5 feet tall.
- Responsive patients with an intact gag reflex.
- Patients with known esophageal disease.
- Patients who have ingested caustic substances.
- Patient with inhalation burns.

Application

- Pre-oxygenate patient with a BVM at high flow Oxygen.
- Prior to insertion, test cuff integrity by inflating each cuff with prescribed volume of air. Remove air and preset syringes at proper volume.
- Lubricate distal end of Combitube with water-soluble lubricant.
- Remove the oropharyngeal airway.
- If a non-trauma patient, pre-position the head.
- Perform a tongue-jaw lift.
- Following the natural anatomical curvature, insert the Combitube until the upper teeth are between the two black lines on the tube.
- Inflate the blue pharyngeal cuff to 100 cc. Expect the tube to move slightly upward. Remove syringe.
- Inflate the white esophageal cuff to 15 cc. Remove syringe.
- Ventilate with a BVM through blue tube. Auscultate for air at the epigastrium and then the lungs. Watch for chest rise. If equal breath sounds are heard and the chest rises equally, continue to ventilate through the blue tube.
- If upon auscultation, air is heard at the epigastrium, immediately disconnect the BVM from the blue tube and attach it to the clear tube. Ventilate and reassess for breath sounds and chest rise.
- If air is not heard at the epigastrium but chest rise or breath sounds do not occur, insert 10 cc more air into the pharyngeal (blue) cuff.
- Ventilate patient with BVM at appropriate rate.
- If ventilation is achieved through the blue tube, placement is in the esophagus. The stomach can be suctioned through the clear tube. A diverter is provided to direct any vomitus that may come up the tube away from the operator.

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Caution

- Do not force the Combitube. If resistance is met, redirect or withdraw and reinsert.
- When facial trauma has resulted in sharp, broken teeth or dentures, remove dentures and exercise extreme caution when passing the tube to prevent the cuff from tearing.
- If the Combitube is to be removed, first deflate the blue pilot balloon and then the white.
- If you elect to intubate past the Combitube, deflate the blue pilot balloon and move the tube to the left side of the mouth while keeping the white balloon inflated.
- Medications can be given through the Combitube only if the tube has been placed into the trachea. Then medications are injected into the clear tube. .

ADULT PROTOCOL SKILL EVALUATION
SUBJECT: COMBITUBE INSERTION

NAME_____ DATE_____

LEVEL: _____Paramedic _____Intermediate _____Basic

STEPS	1st Testing Comments	2nd Testing Comments
A. List the indications for use of the Combitube.		
B. List the contraindications for use of the Combitube.		
C. List the equipment required to perform Combitube insertion.		
D. Pre-oxygenate patient.		
E. Assemble/check/prepare airway device & other equipment.		
F. Lubricate distal end of Combitube with water-soluble jelly.		
G. Position patient's head properly.		
H. Perform tongue-jaw lift.		
I. Insert device in the mid-line & to the depth that the printed ring is at the level of the teeth.		
J. Inflate the blue pharyngeal cuff with the proper volume & remove syringe.		
K. Inflate the distal white esophageal cuff with the proper volume & remove syringe.		
L. Attach BVM to blue pharyngeal tube and begin ventilations.		
M. If auscultation of breath sounds is positive and auscultation of gastric insufflation is negative, continue ventilation.		
N. If auscultation of breath sounds is negative and auscultation of gastric insufflation is positive, immediately disconnect the BVM from the blue tube and attach it to the clear tube.		
O. Ventilate & reassess for breath sounds & chest rise. If air is not heard at the epigastrium but chest rise or breath sounds do not occur, insert 10 cc more air in the pharyngeal (blue) cuff.		
P. If auscultation of breath sounds is positive and auscultation of gastric insufflation is negative, confirm tube placement, using the End Tidal CO2 Detector for patients with a perfusing rhythm, or the Esophageal Detection Device for patients in cardiac arrest. Be able to discuss the indications and limitations of each device		
Q. Secure device in place & reassess placement after any movement of patient.		

"Sedate to Intubate" Training Outline

"Sedate to Intubate" (StI) Overview
- What is StI?
- How does it differ from RSI?
- Indications
- Benefits
- **Risks**
- Contraindications

StI Pharmacology
- Etomidate
- Midazolam
- Lidocaine

Pre-Requirements
- EKG monitoring
- IV
- PulsOx
- Oxygenation
- Must be convinced that you will be able to intubate!
- Must be trained on, approved on, and have the equipment to perform a surgical cricothyrotomy technique (e.g., PerTrach)

Recognition of the Difficult/Impossible Intubation Patient
- Advanced Airway Assessment (e.g., Mallampati or Samsoon Airway Classes)

Review of Intubation Techniques

Review of PerTrach

StI Use and Sequence

Practice Stations:
- Intubation
- Difficult Intubation Situations
- Rescue Airway Devices
- StI Use and Sequence
- Cricoid pressure to control vomiting, prevent gastric insufflation/distention
- Management of esophageal intubation
- Management of laryngospasm

Practical Testing:
- Intubation
- Difficult Intubation Situations
- PerTrach
- StI Use and Sequence

Written Testing

Course to be objective based (see below). Agenda and time spent on objectives must be approved by Department's Medical Director. QI should be accomplished through Departmental QI and intubation sheets already in use by hospital respiratory therapists.

Sedate to Intubate Learning Objectives:

1. List the indications for rapid-sequence sedation
2. List the steps in performing rapid-sequence sedation
3. Describe and list the indications, contraindications, and dosages for Etomidate
4. Given a scenario, select the most effective means of providing a patent airway.

References:

1. Prehospital Emergency Pharmacology, 5th edition by Brady
2. PHTLS, 5th edition by Mosby}

ADULT PROTOCOL SKILL EVALUATION
SUBJECT: SEDATE TO INTUBATE (OPTIONAL)

NAME_____ DATE_____

LEVEL: _____Paramedic EVALUATOR_____

STEPS	**1st Test**	**2nd Test**	**3rd Test**
A. List indications for Sedate to Intubate Procedure			
B. List potential complications associated with STI			
C .Attempts at other methods			
D. Pre-oxygenate the patient, providing ventilatory support via BVM @ 100% Oxygen if needed. Monitor for risk of gastric distention.			
E. Establish: Cardiac Monitor, IV, and Pulse Oximetry. Have Suction, Intubation Equipment, and Rescue Airway assembled.			
F. If used in patients suspected of increased Intracranial Pressure, administer Lidocaine, 100mg IVP			
G. Etomidate, 0.3mg/kg IVP (Average dose 15-25 mg based on the average patient weighing between 50-100kg). If patient is still resistive to intubation, repeat initial Etomidate dose within two minutes. Follow witnessed waste procedures			
H. Cricoid Pressure			
I. Intubate			
J. Midazolam 2-4mg IV, if patient is resisting post intubation and SBP >100			
K. List procedure for failed attempt			
L. List approved Rescue Airways			

PerTrach

Attached is the PerTrach Evaluation Sheet. If your Department/Agency and Medical Director want you to use the PerTrach, you will then need to be trained and tested on this device, and retested annually. Preceding initial testing, there should be a short videotape on the device, and a practical station. You will first practice the simulated placement of the device. Following that, you will be tested on its use.

The PerTrach is an instrument for establishing a temporary percutaneous airway via a cricothyroid puncture. The Adult version is used for patients age 12 and above. Since this is an emergency airway device, you do not need permission from Medical Control. If it is indicated, do it!

The PerTrach is to be used only when other means of establishing an airway in the emergency situation are impossible, or totally ineffective. Causes of upper airway obstruction include epiglottitis, fractured larynx, foreign body aspiration, airway burns, laryngeal edema, laryngospasms, and massive facial trauma.

No paramedic may utilize this device until after successful completion of the Skill Evaluation.

Indications for use of the PerTrach:

1. Complete airway obstruction not manageable with other airway techniques or devices.
2. Partial airway obstruction which is impeding oxygenation, or which is likely to progress (e.g., laryngeal edema or spasm), and which is not manageable with other airway techniques or devices.

Equipment required to place and ventilate with the PerTrach:

1. Betadine wipe
2. Scalpel
3. PerTrach Needle and Syringe
4. Dilator
5. Bag-valve-mask
6. Oxygen
7. Umbilical tape

Potential complications of PerTrach placement:

1. Bleeding
2. Puncture of the posterior tracheal wall, with esophageal insertion
3. Mainstem bronchus intubation

Methods of tube confirmation:

1. CO2 Detector for patients with a pulse.
2. Pulse oximetry
3. Esophageal detector device (EDD) for patients with no pulse.
4. Bilateral breath sounds - Many people have died following this method of detection.
5. Fogging of the tube.

PerTrach Training Materials Your Department Should Have on Hand

Cuffed PerTrach Tubes
Dilators
Trach blocks
Cric Simulator

"PerTrach Video"

PROTOCOL SKILL EVALUATION
SUBJECT: PerTrach Cricothyrotomy
Combined Adult and Pediatric Evaluation

NAME_____ DATE_____
LEVEL: _____Paramedic

STEPS	**1st Testing Comments**	**2nd Testing Comments**
A. List the indications for use of the PerTrach.		
B. List the equipment required to place and ventilate with the PerTrach.		
C. List the potential complications of PerTrach placement.		
D. Attempt to oxygenate patient during preparations to intubate.		
E. Assemble equipment, and test the cuff on the tube.		
F. Place patient in supine position, and palpate the cricothyroid membrane.		
G. If time permits, prep area with betadine wash.		
H. Pinch the skin over the cricothyroid membrane and make a one to two cm. vertical incision in the midline.		
I. Insert the needle with syringe attached through the incision, perpendicular to the airway. Draw air through the syringe simultaneously with needle insertion, until air is encountered, indicating entry in the trachea.		
J. Remove syringe and incline needle to a 45^{o} angle towards the carina before threading the filiform portion of the dilator into the airway, through the needle. *The device is used with the thumb on the knob, while the second and third fingers are curved under the flange of the tube. Force is applied with the thumb.		
K. Squeeze the wings, then open them outward to split and remove the needle. It is helpful if a second rescuer holds the device in place while the operator uses both hands to split and remove the needle.		
L. Exert pressure, and force the dilator into the airway, placing the tube into a functional position, with the face plate against the skin.		
M. Remove the dilator.		
N. Inflate the cuff with 1 to 6 cc of air, and attach the BVM.		
O. Assess lung sounds, and use as many other methods of tube confirmation as are available. Check for leakage around the tube.		
P. Secure the tube in place with the umbilical tape that is provided.		
Q. List the sizes of PerTrachs, and the ages which are appropriate for each: • 3.0 mm Pediatric PerTrach: Ages 6 months to 1 year • 3.5 mm Pediatric PerTrach: Ages 1 to 4 years • 4.0 mm Pediatric PerTrach: Ages 3 to 10 years • Adult PerTrach		

<u>CAUTIONS</u>

1. Retracting the leader portion of the dilator back through the unsplit needle can result in sheering off the leader, with a resultant endotracheal foreign body. If in doubt about placement, remove leader and needle together.
2. Insertion of the device through the thyroid cartilage can injure the vocal cords and other structures.
3. This is a single use only device.
4. Use great caution to avoid inserting the needle through the back wall of the trachea, and into the esophagus.

When preparing for this skill evaluation, be sure that you are able to meet the objectives A, B, and C.
Paramedic must be able to insert the device, completing steps F through N, within 60 seconds.

QuickTrach

Attached is the QuickTrach Evaluation Sheet. If your Department/Agency and Medical Director want you to use the QuickTrach, they will first need to purchase the QuickTrachs (Adult, Pediatric, or both). You will then need to be trained and tested on this device, and retested during all annual Standing Orders Check-Offs. Preceding initial testing, there should be a short videotape on the device, and a practical station. You will first practice the simulated placement of the device. Following that, you will be tested on its use.

The QuickTrach is an instrument for establishing a temporary percutaneous airway via a cricothyroid puncture. The Adult version is used for patients age 12 and above. Since this is an emergency airway device, you do not need permission from Medical Control. If it is indicated, do it!

The QuickTrach is to be used only when other means of establishing an airway in the emergency situation are impossible, or totally ineffective. Causes of upper airway obstruction include epiglottitis, fractured larynx, foreign body aspiration, airway burns, laryngeal edema, laryngospasms, and massive facial trauma. No paramedic may utilize this device until after successful completion of the Skill Evaluation.

Indications for use of the QuickTrach:
1. Complete airway obstruction not manageable with other airway techniques or devices.
2. Partial airway obstruction which is impeding oxygenation, or which is likely to progress (e.g., laryngeal edema or spasm), and which is not manageable with other airway techniques or devices.

Equipment required to place and ventilate with the QuickTrach:
1. Betadine wipe
2. PerTrach Needle and Syringe
3. Bag-valve-mask
4. Oxygen
5. Attached securing device

Potential complications of QuickTrach placement:
1. Bleeding
2. Puncture of the posterior tracheal wall, with esophageal insertion
3. Mainstem bronchus intubation

Methods of tube confirmation:
1. CO2 Detector for patients who have a pulse.
2. Pulse oximetry
3. Esophageal detector device (EDD) for patients with no pulse.
4. Bilateral breath sounds - Many people have died following this method of detection.
5. Fogging of the tube.

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PROTOCOL SKILL EVALUATION
SUBJECT: QuickTrach Cricothyrotomy
Combined Adult and Pediatric Evaluation

NAME_____ DATE_____

LEVEL: _____Paramedic

STEPS	1ST Testing Comments	2ND Testing Comments
A. List the indications for use of the QuickTrach. *Do not use on patient under 3 years of age.		
B. List the equipment required to place & ventilate with the QuickTrach.		
C. List the potential complications with the use of the QuickTrach.		
D. Assemble Equipment and prep patient with Betadine.		
E. Place the patient in a supine position. Assure stable positioning of the neck and hyperextend the neck. (unless cervical spine injury suspected)		
F. Secure larynx laterally between thumb and forefinger. Find the cricothyroid ligament (in the midline between the thyroid cartilage and the cricoid cartilage). This is the puncture site.		
G. Firmly hold device and puncture cricothyroid ligament at a 90 degree angle.		
H. After puncturing the cricothyroid ligament, check the entry of the needle into the trachea by aspirating air through the syringe. If air is present, needle is within trachea.		
I. Now, change the angle of insertion to 60 degrees (from the head) and advance the device forward into the trachea to the level of the stopper. The stopper reduces the risk of over-insertion of the needle into the posterior wall of the trachea.		
J. Remove stopper. After the stopper is removed, be careful not to advance the device further with the needle still attached.		
K. Hold the needle and syringe firmly and slide only the plastic cannula along the needle into the trachea until the flange rests on the neck. Carefully remove the needle and syringe.		
L. Secure the connecting tube to the 15mm connection and connect the other end to the BVM with supplemental oxygen. Ventilate and use confirmation methods.		

CAUTIONS:

1. Do not use on patient under 3 years of age.
2. To determine when to use a Pediatric 2.0mm it is suggested that a patient needing a 4.0 - 6.5 ETT is appropriate for the Pediatric Quicktrach. The Adult 4.0mm would be based on a 6.5 ETT or >.

Electronic Capnography: End Tidal CO2 Monitors with Waveforms

For Departments that opt to purchase EtCO2 Monitors with waveforms, the following can be utilized to familiarize personnel with the process of reading these monitors.

Key Terms

PaCO2
Partial pressure of CO2 in arterial blood.

EtCO2
End-tidal carbon dioxide: measurement of the concentration of CO2 at the end of exhalation.

Capnometry
Measurement and numerical display of CO2 concentration at the patient's airway.

Capnography
Measurement and waveform display of CO2 concentration at the patient's airway.

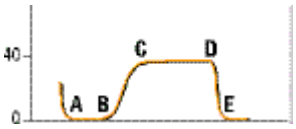
Capnogram
Waveform display of CO2 throughout respiration.

a-ADCO2
Difference between EtCO2 and PaCO2 normally 2-5 mmHg.

Anatomic Dead Space
The portion of inhaled gases that fills the conducting airways and never reaches the alveolar membrane to participate in gas exchange

A Normal Capnogram

The diagram below shows the shape of a normal capnogram.



A-B: A near zero baseline—Exhalation of CO2-free gas contained in dead space.
B-C: Rapid, sharp rise—Exhalation of mixed dead space and alveolar gas.
C-D: Alveolar plateau—Exhalation of mostly alveolar gas.
D: End-tidal value— Peak CO2 concentration—normally at the end of exhalation.
D-E: Rapid, sharp downstroke—Inhalation

Abnormal Capnograms

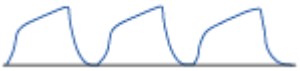
Sudden loss of EtCO2 to zero or near zero

Possible causes:
Airway disconnection
Dislodged ET tube/esophageal intubation
Totally obstructed/kinked ET tube
Complete ventilator malfunction

Sustained low EtCO2 with good alveolar plateau

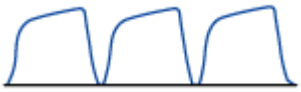
Possible causes:
Hyperventilation
Hypothermia
Sedation, anesthesia
Dead space ventilation

Sustained low EtCO2 without alveolar plateau



Possible causes:
Incomplete exhalation
Partially kinked ET tube
Brochospasm
Mucous plugging
Poor sampling techniques

Elevated EtCO2 with good alveolar plateau



Possible causes:
Inadequate minute ventilation/hypoventilation
Respiratory-depressant drugs
Hyperthermia, pain, shivering

Gradually increasing EtCO2

Possible causes:
Hypoventilation
Rising body temperature/malignant hyperthermia
Increased metabolism
Partial airway obstruction
Absorption of CO2 from exogenous source

Exponential decrease in EtCO2

Possible causes:
Cardiopulmonary arrest
Pulmonary embolism
Sudden hypotension; massive blood loss
Cardiopulmonary bypass

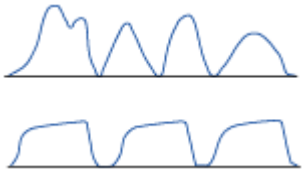
Sudden decrease in EtCO2 to low non-zero value

Possible Causes:
Leak in the airway system
ET tube in hypopharynx
Poorly fitting anesthetic mask
Partial airway obstruction
Partial disconnect from ventilator circuit

Rise in Baseline and EtCO2

Possible causes:
Defective exhalation valve
Rebreathing of previously exhaled CO2
Exhausted CO2 absorber

Spontaneous breathing during mechanical ventilation



Spontaneous breathing efforts may be evident on the CO2 waveform display. The patient on the top demonstrates poorer quality spontaneous breathing effort than the patient on the bottom.

Optional Skill
Acquisition & Transmission of 12-Lead ECG

Scope of Practice EMT-Basic and Intermediate

Indications

Patient ≥ 25 y/o
Suspected Cardiac/AMI Chest Pain or other signs/symptoms of AMI or any non-trauma cardiac event including:
Respiratory Distress
Syncope
Diaphoresis
Weakness
Post-arrest

Contra-Indications

Chest pain from trauma
Pleuritic chest pain

Complications There are no patient-related complications to this procedure

Procedure

	Yes	No
Takes or verbalizes appropriate BSI precautions		
Explain the procedure to the patient		
Prepare equipment		
Prepare the patient: expose chest, prep the skin (dry and shave if necessary)		
Apply electrodes		
Enter patient's age and identifiers (such as name, dob)		
Instruct the patient to lie as still as possible during acquisition		
Acquire ECG		
Transmit to the receiving Emergency Department		
During report (radio/phone), inform them of method of delivery used (fax, receiving station, e/mail, etc).		

Notes

When possible, acquire the 12-Lead ECG prior to moving the patient

Always follow the Manufacturer's recommendations

Paramedic Study Guide: 12 Lead EKGs

by David N. Gerstner, EMT-P

Expectations for Paramedics Performing 12-Lead EKGs

To perform 12-Lead EKGs in the field, you should be able to meet the following objectives:

- Be able to place 4 Limb Leads and 6 Precordial Leads within 90 Seconds
  - Limb Leads at proximal or distal limbs
  - Precordial Leads placed **precisely**, with **no deviation,** and with zero errors
- Be able to discuss when to acquire 12-Lead EKGs
- Be able to list issues relating to hospital care:
  - Notify if you or machine suspect **Acute** MI
    - Please note: if the LP-12 reads it as "MI, age indeterminate," this is less likely to be acute. You should still notify and treat appropriately, but tell the hospital what it says.
  - List documentation required **on** the EKG Strip
  - Rapid transport
  - Deliver EKG to ER physician!
- Understand need to note on chart and EKG if non-standard position (heart moves when patient sits up)
- Understand use of negative complex in aVR as "test" for lead placement
- Artifact, and what to do about it
- Be able to recognize the EKG findings which indicate an AMI
- Be able to localize the MI by the EKG findings
- Be able to recognize the MI "mimics" on the EKG
- Be able to list, from memory, which leads are "anterior leads," which are "inferior leads," which are "lateral leads," and which are the "septal leads."
- Be able to explain the significance of the lead groupings listed above.

More Information

For more information on any of the topics below, there are many resources available, including:

1. The 12-Lead ECG in Acute Myocardial Infarction, by Tim Phalen
2. Mosby's Paramedic Textbook, by Mick J. Sanders

Purpose and Benefits of Prehospital 12-Lead EKGs

In many cases, Acute Myocardial Infarction is now treatable. The treatments, however, are very time-dependent. The more quickly a patient is treated the better the chances for survival.

Performing a 12-Lead in the field can have a tremendous impact on patient care. You've heard the expression, "Time is muscle." Every minute that goes by after a patient starts having symptoms of myocardial ischemia increases the risk of permanent damage to the heart. It also increases the risk of death. There are ways to deal with this: thrombolytic drugs, or clot busters (e.g., tPA, streptokinase, and others), and PCI, or balloon angioplasty. With either treatment, if you want it to work, you must use it right away!

The American Heart Association Guidelines for CPR and Emergency Cardiovascular Care (the basis for ACLS) strongly recommend prehospital 12-Lead EKGs. "We recommend implementation of out-of-hospital 12-lead ECG diagnostic programs in urban and suburban paramedic systems", and call it a Class I (the highest level) recommendation. They also state that the prehospital 12-Lead is cost-effective, and often underused.

If we get the 12-Lead, it may slightly increase the time we spend in the field, but it shortens the time the patient must wait in the hospital for treatment. Typically, the 3 – 5 minutes (or less) we spend to get the 12-Lead saves 20 – 30 minutes in the hospital. The advantage comes from our being able to diagnose the MI, and call them with the information. The ER can then get medications ready, call in a cardiologist, prepare the Cath Lab, and take other steps to treat the MI patient as quickly as possible.

Even when you are only blocks from the hospital, the 12-Lead EKG is like airway management, defibrillation, CPR, or D50. It should not wait until you arrive at the hospital. **Do the 12-Lead at the scene, as quickly as possible, then notify the ER ASAP!**

12-Leads can also change the way we treat patients in the field. As just one example, patients with inferior MIs can be sensitive to nitroglycerine.

Definitions

Stenosis – constriction or narrowing of a passage or orifice. The narrowing of a coronary artery caused by plaque buildup is an example of stenosis. A stenotic artery is a narrowed artery.

Aggregation –clustering, or coming together, of a group of parts. When there is a plaque rupture in a coronary artery, platelets "aggregate" as one part of the clotting process, which may cause a blockage (occlusion) of the coronary artery. Since that blockage is the cause of a myocardial infarction, we want to reduce platelet aggregation, and one way to do that is with aspirin.

Thrombus – a blood clot that obstructs a blood vessel or a cavity of the heart.

Vasoconstriction – vaso refers to blood vessels. Constriction is narrowing. Vasoconstriction is a tightening or narrowing of a blood vessel. Severe vasoconstriction of the coronary arteries can result in a heart attack. That's partly how cocaine can cause myocardial infarctions.

Ischemia – temporary lack of blood supply to a part of the body because of obstructed circulation.

Injury – trauma or damage to some part of the body.

Infarct – an area of tissue that dies because of inadequate blood supply.

Pathophysiology of Myocardial Infarction, and In-Hospital Treatment

A "typical" myocardial infarction begins with an arteriosclerotic coronary artery. That artery may or may not be stenosed (see stenosis, above). A portion of the "plaque" lining the artery ruptures. That rupture leads to the formation of a clot, or thrombus.

At that point, the myocardium (heart muscle) becomes ischemic. The muscle is not injured yet, and no tissue has died (infarcted). It is simply not getting as much blood as it needs. In time, this will result in injury to the cardiac muscle, and later to tissue death (infarction).

Therefore, the **first** EKG changes are signs of ischemia, including hyperacute (big) T waves. Later, the T-waves may become inverted. The patient may also have brief ST depression.

As the ischemia becomes prolonged, some of the heart's muscle tissue is injured by the lack of blood supply. As a result, you'll begin to see **ST elevation in that part of the heart**. An EKG finding of injury in the presence of cardiac symptoms is good enough evidence to give clot-busting drugs. You should know the technical term for clot-busters: thrombolytics. The main thrombolytic drug is some form of tPA.

The idea of clot-busters is to prevent the next stage: infarction. If the patient doesn't get help in time, tissue starts to die, or infarct. At that point, the EKG may show Q-waves from that section of the heart. Eventually, the ST elevation goes away, and we're left with just the Q-waves. If we reach the patient before the ST elevation disappears, even if they have Q-waves, we may still be able to save some of the tissue with tPA or angioplasty.

Angioplasty is also called PTCA, which stands for Percutaneous Transluminal Coronary Angioplasty. The newer term is Percutaneous Coronary Interventions (PCI). (No, you don't need to memorize all that. Just know "angioplasty" and "PCI".) Angioplasty (PCI) is another method of treating an MI. The patient is taken to the Cath Lab, where a cardiologist inserts a catheter into the arteries of the heart. When the stenotic (narrowed) area of the artery is reached, the cardiologist inflates a balloon to push the plaque out of the way, and open up the artery. Many cardiologists think PCI is preferable to tPA. Equally importantly to us, PCI can be used to treat MI patients when tPA is contraindicated.

There are situations other than a thrombus that can result in MI. One example is cocaine use, where the heart is simply working too hard for the amount of blood, and oxygen, that is available. Unstable Angina can also require immediate treatment. The overall group of myocardial emergencies is now referred to as "Acute Coronary Syndromes", or ACS.

Signs and Symptoms of Acute Coronary Syndromes (ACS)

The "classic" MI patient complains of chest pain lasting more than 20 minutes. It is often (not always) described as a pressure pain. The pain may radiate to the left arm, right arm, or both. Pain may also radiate to the neck, jaw, or back. Dyspnea, and nausea (with or without vomiting) are often associated. Other symptoms include anxiety, a sense of doom, agitation, and palpitations. MI patients frequency experience "prodromal symptoms": milder pain or other symptoms that occur hours or days before the actual MI.

However, many patients having MI's do not have any significant chest pain. As many as 30% of MI patients do not have severe chest pain as their primary symptom. Those patients may complain only of abdominal pain, dyspnea, feeling faint, or confusion. They may also have any of the other associated symptoms described above. The majority of those patients' fall into one of three categories:

Elderly
Women
Diabetics

Anginal equivalents are other signs and symptoms that should prompt you to consider performing a 12-Lead. They include:

Dyspnea	General weakness	Syncope or pre-syncope
Palpitations	DKA	

Although it can occur at any age, males over 35, and females over 40 are at significant risk for ACS. Risk increases as age increases. Vital signs vary widely from patient to patient. However, patients with inferior MI's are more likely to be bradycardic, and patients with anterior MI's are more likely to be tachycardic. Asking about the patient's medical and family history can also be helpful. The presence of Cardiac risk factors should increase your index of suspicion for ACS:

Diabetes	Family history of CAD
Smoking	Obesity
Hypertension	Stress
Age	Sedentary

Ischemia can cause dysrhythmias and varying degrees of ventricular failure. Symptoms of these complications may be the only presenting complaints when chest pain is absent. As we said, female, diabetic and/or elderly patients are most likely to present with atypical presentations which include atypical pain and anginal equivalents.

The elderly present more often with dyspnea secondary to sudden decompensated ventricular failure.
Diabetics frequently present with weakness and DKA.
Up to 40% of ACS patients will present with an anginal equivalent.
EMS personnel must learn to recognize these symptoms as potential ACS patients.

What is the value of checking BPs in both arms? It helps identify patients with dissecting thoracic aneurysm.

Pre-Hospital Care

As soon as you suspect a patient may have an Acute Coronary Syndrome (ACS), place the patient on Oxygen, and complete your assessment. Don't forget to ask the patient to rate his or her pain on the pain scale (1-10).

Ask about allergies, including specifically Nitro and Aspirin. As long as the BP is adequate, give one Nitro SL, and repeat that every 3-5 minutes as needed (as long as BP > 100) up to a total of three tablets, **except as noted below**. **Document the BP before and after each Nitro.**

NTG contraindications:

Systolic BP should be at least 100mmHg for NTG administration.
Ask about Viagra, Revatio, or similar drug use in private if possible.
Right ventricular infarct will be discussed in a later module, and is associated with hypotension.

The only absolute contraindication to aspirin (ASA) is known hypersensitivity. Asthmatics may have been instructed not to take aspirin; however, they may receive ASA if they have not had an allergic reaction to it.

Put the patient on a cardiac monitor and pulse-ox. As quickly as you can, obtain a 12-Lead EKG, with the patient supine if that can be tolerated. It is important that you get 12-Leads on patients in any of the following categories:

Adults with potentially cardiac non-traumatic chest pain.
Any suspected AMI.
Be especially liberal with 12-Leads on women, diabetics, and elderly.

Generally, the 12-Lead EKG should be taken **before** moving to the Medic Unit. Give four baby aspirin, and notify the hospital if you think you have a possible MI patient. Transport as rapidly as is possible and safe, starting an IV or Saline Lock while en route.

Provide morphine sulfate or a fluid challenge if needed. Patients with evidence of an acute **inferior** MI may be sensitive to Nitroglycerin and Morphine administration: monitor BP frequently.

As you have the opportunity, obtain additional 12-Lead EKGs during transport, especially after Nitro or other meds. EKGs can change rapidly, and having a record of those changes can be invaluable for the patient's physician, and for the patient. Besides, it's simple to do: once the leads are in place, all that's required is to press the button (and maybe have your driver stop for a few seconds).

Finally, it is critical that you understand that some patients have MI's with NO EKG changes at all. A normal 12-Lead EKG does **not** rule out AMI.

Transport Destination

MI patients need to go to the right hospital. Generally, that means the hospital where the patient's physician practices, where the patient has insurance coverage, where the patient has medical records. Not to the closest hospital!

However, there can be other factors. **Evidence indicates that PCI is more effective than thrombolytics. And for patients with contraindications to thrombolytics, PCI is the only game in town. Without it, the patient can't get any treatment to remove the clot that's causing the MI.**

Many local hospitals perform emergency PCI. In Dayton, Childrens', Wright Patterson, and the VA do not. In our region, as of this writing, Interventional Facilities (i.e., hospitals that offer PCI around the clock) include:

Atrium Medical Center
Fort Hamilton Hospital
Good Samaritan Hospital
Grandview Hospital
Kettering Medical Center
Miami Valley Hospital
Reid Memorial Hospital
Southview Medical Center
Springfield Regional Medical Center
West Chester Medical Center

What are the contraindications to thrombolytic therapy?

Absolute and Relative Contraindications to Thrombolytic Therapy (Adapted from ACLS)		
Time Frame	**Absolute Contraindications**	**Relative Contraindications**
Right Now	Suspected aortic dissection Known intracranial neoplasm Pregnancy (certain lytic agents)	Severe, uncontrolled hypertension (BP > 200/120) Current anticoagulant use Prolonged (> 10 minutes) and potentially traumatic CPR
Past 2 – 4 Weeks	Active internal bleeding (except	Trauma, especially head trauma

	menses)	Major surgery Noncompressible vascular punctures Internal bleeding
Past Year	Non-hemorrhagic stroke or TIA Prior exposure to specific lytic agent	Intracerebral pathology
Ever	Hemorrhagic stroke Prior allergic reaction to streptokinase	Known bleeding disorder

12-Lead Documentation Issues

When you arrive, give the 12-Lead EKG to ER personnel, preferably to the treating physician. Each 12-Lead should have the **at least two identifiers**, such as **Medic number, patient's name, DOB, sex, and the date and time** it was obtained. If you get multiple EKGs, number them, circling the sequential numbers. If you have to take an EKG in a non-standard position, note the patient's position on the EKG, since the heart moves when patient sits up. Make sure that you document all of your 12-Lead findings, whether they are on the same 12-Lead, or multiple tracings.

12-Lead EKGs

12-Lead EKGs are different! That is not only because they offer more views of the heart. They also provide "Diagnostic Quality" vs. "Monitor Quality." Diagnostic quality is needed to evaluate ST elevation. An ST segment that is flat when you're looking at Lead II, may show significant elevation in Lead II on the 12-Lead.

Obtaining the 12-Lead EKG

To make it quicker and easier to obtain a 12-Lead, and knowing that crews tend to put a monitor on patients very early in their care, we recommend going from a 3-lead monitoring system, to a 4-lead monitoring system. You can place the four leads on the patient's left and right shoulders, or anywhere on their arms, then place the two leg electrodes bilaterally anywhere below the waist, which saves you the need to replace electrodes if you decide to perform a 12-Lead.

If you do, all that is required beyond the four limb leads is placing six "precordial" (chest) leads. They are located as follows:

V1 – The Angle of Louis is the prominence on the sternum where the manubrium (top third), the sternal body (bottom two thirds), and the second rib all come together. Locate it by palpating the sternum, then move out along the second rib to the patient's right. Just below the second rib is the second intercostal space. Move down two more interspaces, and position electrode V1 in the fourth intercostal space, just to the right of the patient's sternum.

V2 – Place an electrode in the fourth intercostal space on the opposite side of the sternum for V2.

V3 – See V4.

V4 – From V2, move down to the fifth intercostal space on the patient's left, then move laterally to the mid-clavicular line. The mid-clavicular line is an imaginary line coming straight down the patient's chest from the mid-point of the clavicle. **V4** goes in the intersection of the fifth interspace, and the mid-clavicular line. Next, place an electrode halfway between V4 and V2, and that is V3.

V5 – Find the anterior axillary line by locating the crease where the arm joins the chest. Move down that line to a point just lateral to V4.
V6 – The midaxillary line is an imaginary line running down the body from the middle of the armpit. V6 is located on the midaxillary line, level with V5.

Skin preparation is important (see the discussion on artifact, below). It **is** appropriate to use Alcohol Preps to prep the skin for monitoring electrodes and for 12-Lead EKGs. Just remember, it is **not** appropriate to use Alcohol Preps with **therapeutic** electrodes, such as QuikCombo pads.

You must be able to recognize artifact, and know what to do about it. The primary ways that you can reduce artifact are:

Thorough skin preparation
Hair removal
Solid electrode attachments
Preventing patient movement
Preventing cable movement
Halting vehicle movement
Eliminating Electromagnetic Interference (EMI) (turn off or move away from electrical devices, do not allow patient cables to touch power cords, make sure patient cables and electrodes are in good shape)

Reading the 12-Lead EKG

One of the biggest changes in going from arrhythmia recognition to reading 12-Leads is that, instead of viewing an entire strip, with 12-Leads we concentrate on just one good complex in each lead. Our primary interest in 12-Leads is MI, although it can be helpful in diagnosing many other conditions. As we discussed earlier, in most cases an MI occurs as a result of obstructed blood flow somewhere in the coronary arteries. The location of the clot determines which part of heart muscle is effected.

The heart, like everything else in the body, has arteries to supply the heart muscle with blood and oxygen. The Left Coronary Artery (sometimes called the Left Main), carries 85% of the myocardial blood supply. It branches into the Left Anterior Descending Artery (LAD), and the Circumflex Artery. The remainder of the heart's blood supply is provided by the Right Coronary Artery.

That means an obstruction in the Left Main Artery of the heart will affect a huge portion of heart muscle. On the other hand, if the obstruction is in a distal portion of the Right Coronary Artery, a much smaller portion of heart muscle will be knocked out, and the location of injured muscle will also be very different. A Left Main obstruction would cause substantial changes in the septal, anterior, and lateral leads (see below), and is called "the widow maker."

The muscle that is injured will usually cause changes on the EKG. However, those changes show up primarily in the lead(s) that looks at the location of the injury. So the first level of 12-lead interpretation is simply a matter of knowing two facts:

1. What changes an AMI can cause on the 12-lead {what to look for}, and
2. Knowing which part of the heart that each lead "sees" {where to look}.

You must know what EKG changes represent the three I's: ischemia, injury, and infarct. The first sign of an MI is the presence of ischemia, or ischemic changes. Ischemia is reduced blood flow to one portion of

heart muscle. On the EKG, it is represented by ST depression, or by the so-called "Ischemic T", where the T-wave is inverted (upside down).

The next changes that occur are signs of injury. For the heart muscle to be injured, it has been deprived of blood flow for a longer period. Injury is worse than mere ischemia. ST elevation in two or more contiguous leads indicates injury, and is considered good evidence that the patient is having an MI. ST Elevation is presumptive evidence of an MI. It is the criteria used to start thrombolytics, or to take the patient for angioplasty.

ST elevation is measured in comparison to the EKG baseline, also called the "isoelectric line." We use the T-P segment, the line between the end of the T-wave and the start of the next P-wave, as that baseline. Do not use the P-R segment: it can be elevated or depressed, so it can't be compared to the ST segment.

Sometimes, the ST segment is not only elevated or depressed, but also tilted at an angle. To determine which part of the ST you compare to the T-P segment, look for the "J-Point." The J-Point is the junction between the end of the QRS and the beginning of the ST segment. The J-point is found by looking for the point where the QRS stops and makes a sudden sharp change of direction.

After you find the J-Point, ST segment, and the TP segment, you measure elevation or depression by counting the number of boxes that the ST is higher or lower than the TP. Each little box is 1 millimeter (mm.). When is ST Elevation significant?

1 mm. or more of elevation
Present in two or more <u>contiguous</u> leads

By the way, when we say, "ST elevation is significant" (according to the two criteria just above), it means that we presume the patient is having an Acute Coronary Syndrome, and needs reperfusion (either tPA or PCI).

Finally, Q-waves indicate that the patient has actual tissue death, or infarction. If we restore blood flow while the heart is ischemic or injured (with PCI or tPA), then a true infarction never occurs. Even if Q-waves are present, it doesn't necessarily mean that the infarct is complete. It may still be possible to save some heart tissue, even though some has died. In fact, during the evolution of an infarct, Q waves, ST elevation, and T inversion may occur together.

There are, of course, times when people have Q-waves in their QRS complexes that are normal. How do you tell the difference? Pathologic (meaning produced by disease) Q-waves are wide. They are greater than or equal to (> or =) 40 ms. duration. Physiologic Q waves are < 40 ms.

Make sure you are able to convert seconds to milliseconds. One large block on the EKG paper is equal to 0.20 seconds, or 200 milliseconds (ms.).

A mnemonic to remember the EKG changes for the three I's is "alphabetical order." Infarction, injury, and ischemia are in alphabetical order, and so are the changes: Q-waves (infarct); ST elevation (injury); and ST depression or inverted T-waves (ischemia). Just remember, though, that the signs occur over time, and in reverse order: first ischemia, then injury, and finally infarct.

"Contiguous leads" simply means the leads are anatomically located next to each other. Here are the groups of contiguous leads:

Leads II, III, and aVF look at the "bottom" of the heart. They are called the "inferior leads."

Leads I, aVL, V5, and V6 all look at the left side, or left lateral heart wall. They are called the four "lateral leads."
Leads V3 and V4 look at the front or anterior heart. They are called the two "anterior leads."
Leads V1 and V2 are located on the sternal borders. They look at the septum or dividing wall of the heart. They are called the two "septal leads."

A mnemonic for the precordial leads is "SAL":
V1 & 2 – **S**ternal
V3 & 4 – **A**nterior
V5 & 6 – **L**ateral

Given a lead, you should be able to name the portion of the heart that it coincides with. Given an area of the myocardium, you should be able to say which leads would view it.

Don't forget that higher blockages will hit more of the heart. That means you can have combinations of the groups, such as an "inferolateral" MI (involving some or all of the inferior and lateral leads). A posterior MI is usually associated with an inferior MI.

Reciprocal changes
We have been looking for infarct based upon the presence of ST elevation. As mentioned, not every lead is elevated when AMI is present, only the leads looking at the infarct site. In fact, those leads which look at the infarct site from the opposite perspective tend to produce opposite changes. When a lead "sees" the AMI directly, the segment becomes elevated in that lead. However, when a lead "sees" the infarct from the opposite perspective, the ST segment may be depressed in that lead. Those are called reciprocal changes.
Because of the way the leads are oriented on the patient's body, II, III and aVF are on the bottom looking up. All the other leads are on the top, looking in. Therefore, when AMI produces elevation in II, III, and aVF, it also tends to produce depression in the opposing leads:
II, III, aVF **vs**. I, aVL

NOTE: Not every lead on each side of the seesaw must be elevated or depressed in order to assume reciprocal changes. It'is more a matter of some leads on one end of the seesaw being elevated and some being depressed. Also, not all AMIs with ST elevation produce reciprocal depression. Quite simply… some do and some don't. When reciprocal depression *is* noted, the likelihood of AMI is dramatically increased.

You may have noticed that one lead, aVR, is not in any of the contiguous lead groups. Our principle use for aVR is to "test" lead placement (though it's not perfect). Lead aVR is normally negative. If you look at aVR on a 12-Lead, and the QRS is predominantly **upright**, it means one of two things:

- some limb leads are misplaced, or
- the patient has altered cardiac conduction

MI Mimics

There are conditions other than AMI that can cause ST elevation on the ECG. Some imitators of infarct include:
Left ventricular hypertrophy (LVH)
Bundle Branch Block (BBB)
Ventricular beats

Pericarditis
Early repolarization
Other causes

LVH

Left Ventricular Hypertrophy (LVH) can be the result of an enlarged left ventricle, pumping against increased resistance, or chronic overfilling of the ventricles. Unlike BBB and ventricular rhythms, LVH does NOT usually widen the QRS to 120ms or more. Instead of abnormally widening the QRS, LVH increases its amplitude. There are many formulas for suspecting the presence of LVH. The three step method described here is one of the simpler means of suspecting LVH.

STEP 1

Compare V1 and V2.
Determine which is the deepest negative deflection.
In the deepest lead, count the millimeters of negative deflection.

STEP 2

Compare V5 and V6.
Determine which is the tallest.
In the tallest lead, count the millimeters of positive deflection.

STEP 3

Add the two numbers together.
If their sum equals 35 or more, suspect LVH is present.

Bundle Branch Blocks (BBB)

For decades, the presence of BBB has made it tough to identify AMI, because BBB can both mimic and mask ECG changes used to identify AMI. For now, it is sufficient to know that when a patient's clinical presentation suggests an ACS, and the ECG shows a new, or presumed new, BBB the patient is a candidate for acute reperfusion therapy.

The QRS is widened in BBB due to asynchronous firing of the ventricles. Asynchronous firing of the ventricles also occurs with beats of ventricular origin. It is important to distinguish supraventricular beats from ventricular beats. Evidence of supraventricular activity is needed to differentiate BBB from beats of ventricular origin.

BBB Identification Supraventricular rhythm

BBB widens the QRS (120ms or more). This widening is due to the fact that the ventricles are forced to contract sequentially, thus requiring more time. Other conditions widen the QRS; a common one would be ventricular rhythms, either paced or spontaneous. A differentiating factor between BBB and ventricular rhythms would be the presence of an underlying supraventricular rhythm. Therefore, when a QRS of 120ms or more is produced by a supraventricular rhythm, think BBB. This rule applies in all leads.

The "classic" pattern for RBBB in V1 is an RSR ("rabbit ears"). The "classic" pattern of LBBB in V1 is a QS complex. There are many variations to these classic patterns, complicating the process of distinguishing RBBB from LBBB. In addition, each form of BBB produces a different set of changes in V6. A commonly held misconception is that any notch or distortion of the QRS indicates a BBB. While BBB can cause a notch, a notch does not ensure the presence of a BBB. Therefore, other criteria for BBB recognition are needed. Fortunately, a simple approach does exist.

Always remember, the following rules for differentiating RBBB from LBBB apply **only to V1**.

Differentiation of LBBB from RBBB

After BBB has been determined to exist, look at lead V1. Identify the terminal force of the QRS in V1, and determine if it is positive or negative. To identify the terminal force, first locate the J-point. From the J-point, back up about 40 ms into the QRS. Now determine if the terminal force (tail end) is pointing up or down.

After BBB has been determined to exist, look at terminal force of QRS in V1

Positive = RBBB

Negative = LBBB

Turn signal mnemonic – up is right, and down is left

Ventricular Rhythms

Like BBB, ventricular rhythms can not only imitate an ACS, but can mask the evidence as well.

Pericarditis

There are numerous causes of pericarditis, including viral and bacterial infections, and metabolic causes. The purpose of the following description is not to rule out AMI, but to help the care provider suspect the possibility of pericarditis. The "classic" pericarditis presentation has some distinguishing features.

Classic presentation:

- Sharp chest pain
  (meaning a stabbing nature, not meaning intense)
- Pain can often be localized with one finger
- Pain may radiate to the base of the neck or between the shoulder blades
  (trapezius area)
- Pain is affected by patient movement and respiration
- Pain is affected by patient position

One of the tricks to suspect pericarditis is to lean them forward and see if the pain improves. Another is to see if the pain worsens when they take a drink of fluids. Pericarditis can occur post MI and post cardiac surgery. Also have a high index of suspicion if the patient has had a recent viral or bacterial infection, or IV drug abuse is suspected.

EKG findings can include ST elevation in any lead, and can be in all leads. The ST elevation of pericarditis is caused by inflammation of the epicardium secondary to inflammation of the pericardium. This process is not related to coronary artery disease and, **therefore, ST changes do <u>not</u> tend to follow anatomical groups typically seen with ACS.**

ST elevation in pericarditis may not be anatomically grouped. J-point notching with a "fish hook" appearance is often present, as it is with BER.

Benign Early Repolarization

Benign Early Repolarization (BER) is an example of a normal variant, which produces ST elevation and tall T waves. Changes can occur **in any lead**, but are more common in the *lateral and anterior* chest leads (sometimes lead II and other limb leads).

Anyone, male or female, of any ethnic background can have this pattern on their ECG. However, this pattern is most commonly seen in young adult African-American males.

One ECG sign that should make you consider BER is the notched J-point, creating a fish hook like appearance of the ST segment.

Other Causes

Finally, there are many other factors that can increase the difficulty of 12-Lead interpretation. Numerous medications impact the EKG. One of the most common is digitalis, which causes ST depression with sag.

Conclusion

This has been a short primer/refresher on 12-Lead EKGs. It is not a complete course. We hope you will spend some time with the many books and videos available, and learn more.

Good luck!

12-Lead EKG Format

I	**aVR**	**V1**	**V4**
II	**aVL**	**V2**	**V5**
III	**aVF**	**V3**	**V6**

AMI Recognition/Lead Localization

Lateral	**I, aVL, V5, & V6**
Inferior	**II, III, & aVF**
Septal	**V1 & V2**
Anterior	**V3 & V4**

Lead Localization

I: Lateral	**aVR**	**V1: Septal**	**V4: Anterior**
II: Inferior	**aVL: Lateral**	**V2: Septal**	**V5: Lateral**
III: Inferior	**aVF: Inferior**	**V3: Anterior**	**V6: Lateral**

PCI vs. Thrombolytics: How Far Should You Transport a Patient?

Research shows Angioplasty is superior to Thrombolytics as a reperfusion strategy. Patients with 12 Lead EKG findings consistent with AMI must be treated in an aggressive manner to reduce damage to the myocardium.

The Danish Multicenter Randomized Trial on Thrombolytic Therapy versus Acute Coronary Angioplasty in Acute Myocardial Infarction ("DANAMI-2") compared thrombolysis to Percutaneous Coronary Intervention (PCI, or angioplasty) for MI patients. One question the study tried to answer was whether ambulance transport to an Interventional Facility would be associated with improved outcomes, despite the treatment delay.

The study included 1,572 patients. Patients who presented to hospitals without PCI facilities were randomly assigned to receive a thrombolytic, or to be transferred by ambulance **up to 100 miles** to an Interventional Facility. The results of the study suggest patients were better served to be transported up to 100 miles to an Interventional Facility, rather than receive earlier thrombolysis.

These findings are comparable to what we already know about trauma patients. Trauma patients also do better if they are transported to the right facility that is further away, than to be transported to a hospital without full capabilities that is closer.

Finally, as important as such transports are for the "typical" AMI patient, they are even more critical for patients with contraindications to thrombolytics. Those patients will receive no treatment to restore myocardial blood flow until they arrive in an Interventional Facility.

Hospitals expect the paramedic to read the 12-Lead EKG! Do not simply depend on the computer chip in the EKG monitor to read it for you. If you are uncertain about your EKG interpretation skills, please do two things:

- ✓ First, resolve to improve those skills! More than ever, they make a difference for your patients.
- ✓ Second, if you simply must depend on the computer readout, read it carefully. Old myocardial infarctions, often labeled as "MI of indeterminate age" or similar phrasing, **do not** warrant calling in a very expensive team of physicians, nurses, and other health professionals via a "**Cardiac Alert**." Make certain that the computer says, "**Acute** MI."
- ✓ If *you* read the strip one way, and the *computer* reads it another, give both pieces of information to the Medical Control Physician when you call in. But have the courage of your convictions. You may well be right and the computer wrong.

Patients with Anterior Wall Acute Myocardial Infarctions, especially with ST elevation in three leads are at higher risk for Cardiac Arrest. They are also at high risk for developing CHF or cardiogenic shock, and may develop BBB's, PVC's or 3° blocks.

Performance Improvement/Quality Improvement (PI/QI) is an important part of a 12-Lead EKG program, as it is with every aspect of EMS.

Paramedics should be able to interpret 12-Lead EKGs to the level of the Cardiac Alert Checklist with at least 80% accuracy. The single most important element of the Cardiac Alert program is recognition of an AMI patient by EMS.

Right Ventricular Infarcts

According to the "Treatment Considerations for Inferior Wall AMI (IWMI)" section of the Standing Orders, paramedics should attempt to capture Lead V4R to check for the possibility of a right ventricular infarction (RVI) in all patients with IWMI. Some paramedics may be unfamiliar with V4R.

Lead V4R is simply Lead V4 on the patient's **R**ight side, instead of his left. It provides a better picture of the right side of the heart.

Capturing Lead V4R is very simple. Just complete the following steps:

1. Perform a normal 12-Lead EKG.
2. If there is 12-Lead evidence of an Inferior MI, place one additional electrode on the patient's right side, in the same anatomical location as V4 on the patient's left.
   - ➢ (Locate the fifth intercostal space on the patient's right, then move laterally to the mid-clavicular line. Remember that the mid-clavicular line is an imaginary line coming straight down the patient's chest from the mid-point of the clavicle. **V4R goes in the intersection of the fifth interspace, and the right mid-clavicular line.)**
3. Move the **V4** Lead from the left, to your new electrode on the **right**.
4. Complete another 12-Lead EKG.
5. **Label** this EKG with the patient's name, and the time. **Label V4 prominently as V4R**.

ADULT PROTOCOL SKILL EVALUATION
SUBJECT: 12-Lead EKG Acquisition

NAME_____ DATE_____

LEVEL: _____Paramedic

STEPS	**1st Testing Comments**	**2nd Testing Comments**
Student will demonstrate how to acquire a 12-Lead EKG, completing the following steps within two minutes:		
Expose chest		
Limb lead placement, and placement options		
Precordial (chest) lead placement, with **no deviation**		
Speed (all ten leads must be placed within two minutes)		
While student is acquiring EKG, ask questions on four to five of the following topics at random. Student should be able to answer roughly 75% correctly to pass the station.		
When to acquire according to Standing Orders		
Interface with hospital: Notify if you or machine suspect MI Rapid transport Deliver EKG to ER physician		
Monitor quality vs. Diagnostic quality		
Frequency response Must use **printed** EKG for ST segment analysis		
Calibration		
Paper speeds		
Various limb lead placements		
Importance of anatomical uniformity with precordial leads		
Need for note on chart and EKG if non-standard position (heart moves)		
Negative complex in aVR as "test" for lead placement (though not perfect)		
Hair removal		
Artifact, and what to do about it Skin prep Electrode attachment Patient movement Cable movement Vehicle movement EMI		

ADULT PROTOCOL SKILL EVALUATION
SUBJECT: 12-Lead EKG Interpretation

NAME_____ DATE_____

LEVEL: _____Paramedic

STEPS	**1st Testing Comments**	**2nd Testing Comments**
Show each paramedic five to ten EKGs. In response to your questions, each paramedic should be able to identify the Components of the ECG following with 90% accuracy or better: P-R segment, Q waves, R waves, and S waves J-point, ST segment, T waves, TP segment, etc. QRS complexes Q waves Pathologic (> or = 40 ms.) vs. physiologic (< 40 ms.) ST elevation		
Paramedics should be able to measure time on the EKG using either seconds or milliseconds, and converting from one to the other with 80% accuracy or better.		
Given a series of EKGs with ST elevation, each paramedic should be able to identify the leads with ST elevation, and localize the area infarct as Anterior, Inferior, Lateral, or Septal with 80% accuracy or better.		
Given a series of EKGs with ST elevation, each paramedic should be able to recognize reciprocal changes (ST depression) with 70% accuracy or better.		
Given examples, the paramedic should be able to discuss the evolution of a myocardial infarction and the EKG changes over time, including the following phases: Hyperacute Acute Indeterminate		
Given a series of three to five EKGs, each paramedic should be able to recognize the following with 60% accuracy or better. You may give the paramedic a clinical presentation along with the EKG. LBBB RBBB Ventricular rhythms LVH Ventricular aneurysm Benign early repolarization Pericarditis (S&S: sharp, localizable chest pain, radiates to base of neck, between scapulas) Digitalis (ST depression with sag)		

Cardiac Alert Program

The Intent of the Cardiac Alert Program is to decrease the "Door to Balloon" time for Pre-Hospital AMI Patients. EMS Providers who have patients experiencing symptoms of an AMI, and confirm the AMI with Diagnostic 12 Lead will make early notification to the receiving facility. The receiving facility in return will activate a Cardiac Alert, prompting the response of the On-Call Cath Lab team members.

To have an effective "Team Approach" to the AMI patient, it is essential that EMS Providers have the trust of the In-Hospital professionals. The program must have a built-in system to monitor the accuracy of the field interpretation. If the Field Provider cannot maintain a high percentage of accurate 12 lead interpretations, the program could quickly become a burden on an already tight hospital budget.

Inclusion Criteria

All patients presenting with anginal-type chest pain or an equivalent anginal event may be candidates. The paramedic will perform an initial 12 lead ECG to determine the presence of an Acute Myocardial Infarction.

All patients with evidence of an Acute Myocardial Infarction after performing a diagnostic 12 lead ECG will be considered an included patient for the Cardiac Alert Program. (>1mm ST elevation in 2 contiguous leads)

The EMS Provider will complete the Cardiac Alert Checklist and contact the receiving facility as soon as possible. The EMS Provider must speak directly with the Emergency Department Physician.

Exclusion Criteria for the Cardiac Alert Program:

Patient with a LBBB will not be included

Patients with a Pacemaker rhythm

Greater Miami Valley EMS Council & Ohio EMS Region 2
Quality Improvement Program
EMS CHECKLIST: 12-LEAD EKG USAGE

Patient Name:_____ EMS Agency/Unit:_____

Date:_____ Run #_____ Time of Pain Onset:_____

This form is to be completed by the paramedic for each patient on whom a 12-Lead EKG is performed, regardless of whether the EKG is normal or abnormal.

_____ 1. If patient has 12-Lead EKG evidence of Acute MI, consider transport to an Interventional Facility.

- **Reference the hospital Capabilities Chart in protocol.**

_____ 2.	**CARDIAC ALERT CHECKLIST**	
INCLUSION CRITERIA		
	YES	**NO**
Anginal Chest Pain or Equivalent (weakness, diaphoresis, SOB, syncope, nausea, back or jaw pain, abdominal pain)	☐	☐
Evidence of AMI on 12 Lead: (1 mm of ST elevation in 2 or more contiguous leads)	☐	☐
EXCLUSION CRITERIA		
Is the QRS Greater than 120 ms (LBBB)?	☐	☐
Does the Patient have a Pacemaker Rhythm?	☐	☐
If all boxes in shaded areas are checked, the patient qualifies for a Cardiac Alert. Make contact with Medical Control Physician at receiving facility as soon as practical to relay information.		

_____ 3. Contact hospital by radio or phone when transporting any suspected MI patient. NOTIFY of the following:

- **_____ a) Speak directly to the medical control physician (MCP) whenever possible.**
- **_____ b) Advise MCP ASAP that you are transporting a CARDIC ALERT patient.**
- **_____ c) Give patient report with vitals, history, PE, and other pertinent information.**
- **_____ d) Give your interpretation of 12-Lead EKG, and/or machine interpretation**
- **_____ e) Give name of patient's cardiologist (if known) _____**

_____ 4. On arrival at hospital with a suspected MI patient:

- **_____ a) Give verbal report, speaking directly to the physician when possible, including your evaluation of the 12-Lead EKG.**
- **_____ b) Attach a copy of 12-Lead EKG to this form.**
- **_____ c) Attach a copy of 12-Lead EKG to hospital copy of EMS runsheet.**

- **Label all copies of EKG/12-Lead EKG with patient name, date, and time.**
- **Document Name of Medical Control Physician: _____**
- **Document Name of patient's cardiologist (as above).**

This form must be completed by an EMS certified member. Only one member should question the patient in order to complete this. This checklist MUST be submitted to the ER staff with the patient care report; a copy must be made for our records.

_____

Signature of member completing form Date

_____

Printed name of above member Certification level ID No.

ADULT PROTOCOL SKILL EVALUATION
MORGAN EYE LENS

Indication

- For eye irrigation by paramedics after administration of Tetracaine.

Contraindications

- Penetrating eye injuries
- Suspected or actual rupture of the globe.
- When patient is allergic to Tetracaine

Insertion

- Instill two drops of Tetracaine into the affected eye(s).
- Attach a macro drip set to a 1000 cc bag of NS. Attach the Morgan Eye Lens and flush the line.
- Start minimal flow of irrigation solution.
- Have your patient look down; insert the lens under the upper lid.
- Have your patient look up, retract the lower lid and drop the lens in place.
- Release lower lid over lens.
- If both eyes must be flushed at the same time, insert second lens using steps above.
- Adjust flow rate
- If both eyes must be flushed at the same time, attach a Y tubing to a single bag of NS or use two bags.
- Turn the infusion line(s) on wide open; at least 1000 cc NS should be run into each eye. Medical Control may order a second liter of NS for each affected eye.
- If the patient's medical condition permits, it is helpful to place the patient in a slight Trendelenberg position. This will allow the outflow to run off the end of your gurney.
- Place a container under the head of the gurney to catch the outflow.

Removal

- Continue flow
- Have your patient look up, retract the lower lid and hold position.
- Slide the lens out.
- Terminate flow.
- Documentation
  - Administration of topical anesthetic
  - Type, amount, and length of time for irrigation
  - Which eye/eyes were irrigated
  - Patient tolerance to procedure

ADULT PROTOCOL SKILL EVALUATION
SUBJECT: EYE IRRIGATION WITH MORGAN EYE LENS

NAME_____ DATE_____

LEVEL: _____Paramedic

STEPS	1st Testing Comments	2nd Testing Comments
A. List the indications for use of Morgan Eye Lens.		
B. List contraindications for use of Morgan Eye Lens		
INSERTION		
C. Instill two drops of Tetracaine into the affected eye(s).		
D. Attach a macro drip set to a 1000 cc bag of NS.		
E. Attach the Morgan Eye Lens and flush the line.		
F. Start minimal flow of irrigation solution.		
G. Have patient look down; insert the lens under the upper lid.		
H. Release lower lid over lens.		
I. If both eyes must be flushed at the same time, insert second lens using steps above.		
J If both eyes must be flushed, use second bag of NS or Y connector.		
I. Turn the infusion line(s) on wide open. At least 1000 cc should be run into each eye.		
J. Place in slight Trendelenberg position if patient's medical condition permits to allow outflow to run off end of gurney.		
K. Place a container under the head of the gurney to catch the outflow.		
REMOVAL		
L. Continue flow		
M. Have patient look up, retract the lower lid, and hold position.		
N. Slide lens out.		
O. Terminate flow		
P. Document administration of topical anesthetic, type, amount, and length of time for irrigation, which eye/eyes were irrigated, patient tolerance to procedure.		

GREATER MIAMI VALLEY EMS COUNCIL
EMT- BASIC OPTIONAL SKILLS
2017 EMT-BASIC ALS ASSIST SKILLS TESTING

EMT-BASICS: Use these skill sheets and protocol to study for Skills Testing.

SKILLS TESTERS: Record Pass/Fail.

EMT-B Name_____ Date_____

EMT-Basic	First Test			Second Test		
Skills	Pass	Fail	Instructor/Date	Pass	Fail	Instructor/Date
Assisting with Intubations						
1. Equipment set-up 2. Preoxygenate and position head 3. Cricoid pressure on request 4. Inflate cuff 5. Use of confirmation equipment 6. Tie-down or securing the tube						
{Placement of Pulse-ox}						
IV Preparation Permitted only under supervision of EMT-Intermediate or Paramedic						
1. Selecting Bag (250 ml vs. 1,000 ml), 2. Selecting Tubing 3. Opening Bag and Tubing 4. "Spiking" Bag 5. Sterile Technique 6. Pinching tubing to fill chamber 7. Filling tubing 8. Recap to maintain sterility 9. Taping down IV						
Preparation of Saline Lock Permitted only under supervision of EMT-Intermediate or Paramedic						
1. Equipment 2. Draw up Saline 3. Sterile Technique 4. Inject into Lock 5. Recap to maintain sterility 6. Taping down IV						
Placement of EKG Leads						
1. Placement of three or four electrodes for cardiac monitoring 2. Options (arms vs. chest; legs vs. torso below navel)						

Rapid Sequence Intubation Protocol

Purpose:
Rapid Sequence Intubation, or RSI, has been shown in several studies to help facilitate intubation and improve intubation success rates in the prehospital setting. While it may not be appropriate for all EMS systems, some systems may benefit from the use of paralytic drugs for intubation of patients who require ventilatory management but are too awake, clenched, or combative to tolerate it. As there are certain substantial risks associated with this procedure, thought must be given to several areas of training, implementation, and quality assurance. This proposed protocol details the training program, initial and continuing certification of personnel authorized for the procedure, the protocol itself, and quality assurance procedures to be implemented continuously to ensure that RSI is performed in the best interest of patients.

Certification:
RSI will not be available to all paramedics in the system. Only those paramedics willing to undergo substantial initial training and continuing training will be allowed to perform it. Other required certifications must remain current to maintain certification to perform RSI.

Initial didactic training will comprise the following:
Assessment of ventilatory function and oxygenation
Noninvasive (BLS) ventilatory assistance
Indications for urgent endotracheal intubation.
Recognition of factors that may predispose to difficult intubation
Equipment selection and preparation
Positioning, preoxygenation, and preparation of the patient
Premedication for RSI
Medications used for RSI, indications, contraindications, administration, and pitfalls
Intubation technique
Verifying tube placement
Securing the tube
What to do if the attempt is unsuccessful
Rescue airway techniques:

- Eschmann stylet/Gum Bougie
- Combitube
- King-LT-D or LT-DS
- LMA
- Surgical cricothyrotomy
- Cricothyrotomy using approved device

Monitoring the intubated patient
Troubleshooting

The paramedic must demonstrate proficiency during the following practical evaluations while being directly observed by the MD, AMD, Supervisor, or Training Officer:

- 2 endotracheal intubations on airway simulators
- 3 endotracheal intubations on airway simulator with C-spine immobilization
- 5 surgical cricothyrotomies on pig tracheas using surgical technique or approved device
- 4 intubations using the eschmann stylet (gum bougie) on airway simulators *optional

- 4 digital intubations on airway simulators, with or without use of the gum bougie as the paramedic prefers
- 2 insertions of the combitube on airway simulators
- 3 insertions of the LMA on airway simulators

Any of the above may be substituted if the procedure is performed under direct supervision by above personnel in the field or a clinical setting.

Continuing education requirement:
Once per quarter, RSI certified paramedics must meet with the Supervisor, Training Officer, MD, or DMD and demonstrate proficiency in the following:

- 1 endotracheal intubation on airway simulators
- 2 endotracheal intubations on airway simulator with C-spine immobilization
- 1 surgical cricothyrotomy on airway simulator
- 1 intubation using the eschmann stylet (gum bougie) on airway simulators *optional
- 1 digital intubation on airway simulators, with or without use of the gum bougie as the paramedic prefers
- 1 insertion of the Combitube or King LT-D on airway simulators
- 1 insertion of the LMA on airway simulators

This may be accomplished during the paramedic's regular duty shift.

RSI protocol

Patient selection:
Patients must have evidence of impending respiratory failure, cardiovascular collapse, or endangered airway from any cause. Signs/symptoms may include:

- RR <10 or >30 in adults
- Cyanosis
- Hypoxia, as evidenced by SaO2 <90%
- Copious oral secretions, blood, or foreign material
- Altered mental status impairing patient's ability to protect airway from vomit or secretions
- Facial trauma rendering it difficult for the patient to maintain airway

Not all patients with the above signs/symptoms will necessitate RSI. Of special consideration are patients with severe facial trauma who may be difficult to ventilate using a bag valve mask. It is possible that patients, who, in the best judgment of the paramedic, require aggressive airway control, may not fit into the above categories. Under no circumstances is RSI to be used as "behavioral control" or restraint in patients with otherwise intact airways. Paramedics may seek guidance or approval from medical command prior to initiating the protocol; however, it is not required.

Required equipment:

- Standard equipment for intubation to include stethoscope, BVM, oxygen, laryngoscope, endotracheal tubes, stylet, and **suction**
- **Secondary confirmation devices** such as $EtCO_2$ monitor (waveform), colormetric $EtCO_2$ detector, pulse oximetry, esophageal device detector.
- Eschmann stylet
- **Rescue airway devices** such as the King LT-D or Combitube
- **Surgical airway equipment**
- IV setup and appropriate catheters

- Means of administering medications

Procedure:
If possible, the procedure should be explained to the patient and/or family member to obtain informed consent. Risks and benefits should be explained.
Intubation equipment should be at the patient's side along with rescue devices.
Medications should be drawn up and readied.
A patent IV or IO is required for administering medications for RSI.

- Place oral and nasal airways if patient will tolerate
- Preoxygenate as much as possible with 100% oxygen via BVM or NRB mask.
- The airway should be examined. Any dentures or other dental appliances should be removed if possible.

Premedicate with the following **if circumstances apply (optional):**

- Lidocaine 100mg if the patient has a suspected CVA or closed head injury
- Atropine 0.5mg for bradycardia

Sedate the patient. It is PARAMOUNT that this take place BEFORE paralysis.

- Etomidate 20mg IV (max dose 40mg) in patients who are hemodynamically unstable **OR**
- Versed 5mg IV (may repeat, max dose of 10mg)

Note: if adequate relaxation is achieved, intubation may take place without paralysis. A combination of the above medications may be used if clinically appropriate.

Paralyze the patient

- Succinylcholine 200mg IV

Intubate the patient as per standard procedure
CONFIRM intubation with at least two confirmation techniques
Maintain sedation

- Versed 2-5mg q20min

Maintain paralysis if necessary (DO NOT administer this drug until intubation is confirmed and tube is secure)

- Vecuronium 10mg IV once for 45-60 minutes of paralysis

Limit intubation attempts. After 2 attempts, consider a rescue airway. After 3 attempts, abandon further attempts to intubate the patient.

PARAMEDIC

- Complete airway assessment. Remove dentures or dental appliances.
- Apply cardiac monitor, pulse oximetry, and vascular access. Preoxygenate the patient.
- Prepare intubation equipment, EtCO2, and rescue airway
- Premedicate if indicated (optional):
  - **Lidocaine 100mg** IV if suspected closed head injury or CVA
  - **Atropine 0.5mg** IV if bradycardic
- Sedate the patient:
  - **Etomidate 20mg** IV (may repeat to a total of 40mg) (preferred agent if hemodynamically unstable) **OR**
  - **Versed 5mg** IV (may repeat to a total of 10mg)
- Paralyze the patient:
  - **Succinylcholine 200mg** IV
- Intubate the patient. Maintain continuous waveform capnography.
- Maintain sedation:
  - **Versed 2-5mg** IV q20min
- Maintain paralysis:
  - **Vecuronium 10mg** IV

CLINICAL PEARLS

- The most important decision is knowing when NOT to paralyze the patient or intubate them.
- Succinylcholine and Vecuronium paralyze the muscles but do not affect LOC. ALWAYS SEDATE THE PATIENT.
- Tachycardia may be a sign that the patient is paralyzed but not adequately sedated.
- Etomidate is the sedative of choice for patients with low BP or heart rate.
- If unsuccessful after 2 intubation attempts, consider a rescue airway such as the King LT-D, LMA, or Combitube.
- No more than 3 intubation attempts.
- If you can still ventilate the patient with a BLS airway, a cricothyroidotomy is not necessary.
- INCLUSION CRITERIA:
  - Age 16 or older
  - Has not suffered a paralyzing injury more than one week and less than 6 months ago.

CARDIAC ARREST: {INTRA-ARREST THERAPEUTIC HYPOTHERMIA}

A {Cardiac Monitor with 12-lead as soon as possible}
o {If evidence of AMI, transport to interventional cath center if it indicates STEMI.}
A {Intra-Arrest Therapeutic Hypothermia}
□ ♦ INTRA-ARREST protocol may be beneficial to pediatric patients.
o Trauma is a contraindication to this protocol.
o {Do NOT start protocol if patient is hypothermic (<34°C/93.2°F) or if patient is conscious.}
o {Place ice packs in axillae, groin and neck. Protect skin with towels. Change ice packs every 15 minutes or when needed. Do not delay transport to cool.}
o Complete neurologic exam including GCS and pupil response.
o {As soon as possible in the cardiac arrest algorithm begin chilled (4°C/39.2°F) Normal Saline bolus to a total of 2 L max as rapidly as possible}
o {Treat for appropriate rhythm with medications given in normothermic IV}
o {Notify hospital so they are ready to continue patient cooling}.
o If SBP remains < 100, Norepinephrine 30 drops/min, (max dose 44 drops/min). Titrate to maintain SBP ~100.
A {Treat for shivering.}
□ {Midazolam 2 mg slow IV and may repeat as needed for shivering (SBP > 100)}.
□ {Etomidate 0.3 mg/kg IV (up to 20 mg max) as needed for shivering}
CLINICAL PEARLS:
A Protocol begins with a patient in arrest.
A Inclusion Criteria:
o Arrest not related to blunt/penetrating trauma or hemorrhage.
o Age 16 or older
o Advanced airway in place with an {ETCO2 > 20}
□ Patients may develop metabolic alkalosis with cooling. DO NOT HYPERVENTILATE
o ♦ If advanced airway cannot be obtained, cooling may only be initiated with MCP order.
o GCS < 8 (No purposeful response to pain.)
o No known DNR order exists.
A Goal temperature 32-340 C (89.7-93.20 F)
□ For patients less than age 16, contact MCP.

GMVEMSC Optional Skills Approval Form

Name_____ Date_____

Certification Level: ____PM ____AEMT ____EMT ____EMR

Department Name _____

This is a form that each department may use for optional skills in the GMVEMS Protocol; it is not mandatory. However, this document provides an easy means for the chief and medical director to indicate which Optional Skills and Drugs are approved for use by your department. This document also offers information to your personnel, so that they know which skills are authorized by certification, and which are not.
GMVEMSC also strongly recommends that your department works with your Medical Director to develop a QA/QI Policy for approved Optional Skills & Drugs that are given with higher risk profiles, such as cricothyrotomy, Sedate to Intubate, etc.

Optional Procedures				
Optional Procedures	EMR	EMT	Adv EMT	Paramedic
BAAM				
BiPAP				
Camera-Assisted Intubation				
CANA Auto-Injector				
Carbon Monoxide Monitoring				
Combi-Tube				
Cyanide Kits (CyanoKit or traditional)				
Dawn Soap				
Digital Intubation				
End-tidal CO2 Waveforms				
Flow-Restricted Oxygen Powered Ventilation Device				
IV Pump				
King Airway				
Lighted Stylet Intubation				
Magnesium (Maalox or Mylanta)				
Magnesium Sulfate (Epsom Salt)				

Optional Procedures	EMR	EMT	Adv EMT	Paramedic
Morgan Lens				
Nitroglycerin Drip				
12-Lead ECG Acquisition				
12-Lead ECG Interpretation				
Percutaneous Tracheostomy				
Post-Arrest Induced Hypothermia				
Sedate to Intubate				
Stockpile (Cipro or Doxy)				
Surgical Cricothyrotomy				
Warmed IV Fluids				

_____ _____ _____

Chief's name (please print) Signature Date

_____ _____ _____

Medical Director's name (please print) Signature Date