

Purpose: To outline the process to be followed in patients requiring vascular access according to Marquette County EMS Medical Control protocols.

A. Indications

1. For the purpose of fluid or medication administration according to Marquette County EMS Medical Control protocols.
2. External jugular cannulation should be initiated in patients in whom access is necessary and peripheral vascular access is not accessible or is contraindicated.
3. Intraosseous placement should be initiated in those pediatric whom vascular access is essential and peripheral or external jugular vascular access is not accessible or is contraindicated.
4. Umbilical vein catherization is indicated in newborn resuscitation.

B. Definitions

1. **Essential** - when the establishment of an IV is crucial for resuscitation or medication administration; i.e., cardiac arrest, multi-system trauma, internal hemorrhage.
2. **Indicated** - when the establishment of an IV is indicated at some point in patient care, but is not needed for the above; i.e., dehydration, uncomplicated chest pain, abdominal pain, stroke.

C. Prophylactic IV lifelines via Saline Lock may be initiated in patients in which IV access for medication administration may be necessary but IV fluid therapy unlikely.

D. IV fluid therapy will be initiated in those situations in which fluid resuscitation may be indicated.

E. Contraindications

1. To peripheral vascular access:
 - a. No peripheral sites available
 - b. Burns overlying available peripheral sites unless no other sites available
 - c. Infection overlying available peripheral sites
2. To intraosseous infusion:
 - a. If infiltration occurs (rare), do not reuse the same bone
 - b. Do not place in a fractured or crushed extremity.
3. To umbilical vein catherization:
 - a. Inability to identify the umbilical vein or place the catheter.

F. Special Considerations (Side effects/Complications)

1. Initiation of vascular access generally should not delay patient transport to the hospital.
2. General side effects or complications: infection, air embolism, catheter shear, hematoma, arterial puncture, fluid overload
3. External jugular cannulation:
 - a. Air embolism is a significant risk; occlude catheter hub with gloved finger while preparing to attach IV tubing.
4. Intraosseous placement:
 - a. Complications include subperiosteal infusion, osteomyelitis, sepsis, fat embolism, and bone marrow damage.
5. Umbilical vein catherization:
 - a. Should not be attempted unless the single, large umbilical vein can easily be identified.
 - b. To be initiated after transport has begun.

G. Medication Administration

1. All blood and/or crystalloid solutions may be administered through the vascular sites listed in this policy.
2. Approved medications may be administered via these vascular sites, using appropriate administration techniques for each.

H. Standards for IV attempts

1. **Essential:** attempts performed as necessary
2. **Indicated:** two attempts total
3. Document any reasons for deviation.

I. Venipuncture sites

1. Essential IV's - any peripheral site (including external jugular) where large bore (18 ga or larger) can be started.
2. Indicated IV's - peripheral site below the knee or elbow is preferred.
3. Central Lines - under NO circumstances should central lines (eg. subclavian vein, internal jugular vein, femoral vein) be placed.

J. Needle size for IV placement

1. Adult TKO 18 ga - 20 ga catheter
2. Adult trauma, internal bleeding, cardiac arrest 14 ga - 16 ga
3. Child 20 ga - 24 ga catheter

K. Flow Rates

1. Flow rates for all IV's are to be at rates TKO unless otherwise indicated by specific protocol or Medical Control.
 - a. 25 ml/hr should be administered "to keep vein open" in adult or child patients. (25 micro gtts per min. or 4-5 macro gtts per min.)
 - b. The use of saline locks is encouraged in place of prophylactic TKO IV lines.
2. The amount of fluid infused along with the IV rate is to be noted on the EMS Medical Record.
3. Any reason for variation from standard flow rates must be documented on the EMS Medical Record.
4. The standard fluid bolus volume will be 300 ml unless otherwise noted by protocol.
5. Medicated drips should be piggybacked to main IV line or saline lock.

L. Solutions - Protocol or Medical Control dictates choice of solution

1. Normal Saline 0.9%
 - a. May be used to keep vein open
 - b. Used to flush medications
 - c. Used for volume infusion
 - d. Used for fluid hydration
2. D₅W
 - a. As the base solution of dilution for IV drip medications (eg. lidocaine, dopamine)
3. Lactated Ringers
 - a. As the base solution for trauma

M. IV Tubing

N. Procedures

1. Utilize universal precautions
2. Procedure for Peripheral Vascular Cannulation
 - a. Gather and prepare equipment
 - i. IV catheter
 - ii. Povidone Iodine or alcohol preps
 - iii. 20 ml syringe
 - iv. Dressing and tape
 - v. Normal Saline lock cap and solution, if applicable
 - vi. Saline flush if applicable
 - b. Position patient
 - c. Place the tourniquet on the extremity
 - d. Cleanse the skin with alcohol prep
 - e. Make your puncture while maintaining vein stability
 - f. Watch for flashback. If you have no blood return and you are in the vein, remove the needle hub and attach syringe to assist in aspirating for blood. Once you have a blood return, advance the catheter as per normal IV technique and attach the IV tubing or Normal Saline lock cap.
 - g. Instill Normal Saline flush if Normal Saline lock placed
 - h. Secure catheter and IV tubing (remember not to restrict other vascular structures by applying dressing too tight)

O. Procedure for External Jugular Cannulation:

1. Gather and prepare equipment
 - a. IV catheter
 - b. Povidone Iodine or alcohol preps
 - c. 20 ml syringe
 - d. Dressing and tape
 - e. Normal Saline lock cap and solution, if applicable
2. Position patient supine (Trendelenburg, if possible)
3. Turn head to opposite side of venipuncture (if no C-spine injury is suspected)
4. Cleanse the skin with alcohol prep
5. Tourniquet the vein by using the side of your finger above the clavicle to facilitate filling the vein.
6. Make your puncture midway between the angle of the jaw and the middle of the clavicle while maintaining vein stability with your finger as the tourniquet effect.
7. Watch for flashback. If you have no blood return and you are in the vein, remove the needle hub and attach syringe to assist in aspirating for blood. Once you have a blood return, advance the catheter as per normal IV technique and attach the IV solution or Normal Saline lock cap, covering catheter with gloved finger while preparing to attach the IV tubing.
8. Instill Normal Saline flush if Normal Saline lock placed.
9. Secure IV catheter and tubing.

P. Procedure for Intraosseous Placement

1. If peripheral or external jugular veins are readily attainable, catheterization via those sites should be immediately attempted. If no peripheral or external jugular IV sites are readily attainable, it is acceptable to immediately proceed with Intraosseous infusion if deemed **essential**.
2. Placement of the IO line by the following technique:
 - a. Have all IO equipment ready prior to bone penetration.
 - b. Expose the extremity and stabilize it.
3. Selection of site
 - a. In children less than five years of age, the preferred order of insertion sites is proximal tibia, distal femur, and medial malleolus.
 - b. In adults and older children, proximal tibia, distal tibia, proximal humerus (specific devices).
4. Scrub the insertion site with alcohol prep. Strict adherence to aseptic technique is essential.
5. Insertion
 - a. Proximal Tibial Technique. Insert the needle, one finger's breadth below the tibial tuberosity or slightly medial to midline, perpendicular to the skin directed away from the epiphyseal plate, and advance to the periosteum. The bone is penetrated with a slow boring or twisting motion until you feel a sudden "give" (decrease in resistance) as the needle enters the marrow cavity.
 - b. Medial Malleolus Technique. Insert the needle, midline 1 to 2 cms above bony prominence of medial malleolus, perpendicular to the skin, directed away from the epiphyseal plate. Advance to the periosteum. The bone is penetrated with a slow boring or twisting motion until you feel a sudden "give" (decrease in resistance) as the needle enters the bone marrow.
 - c. Distal Femur Technique. Place sand bags or rolled towels under the knee. Stabilize the proximal thigh. Insert the needle, 2-3 finger-breadths above the femoral condyles in the midline, perpendicular to the skin directed away from the epiphyseal plate. Advance to the periosteum. The bone is penetrated with a slow boring or twisting motion until you feel a sudden "give" (decrease in resistance) as the needle enters the marrow cavity.
 - d. Proximal humerus. Follow manufacturer guidelines and training program.
6. Attempt to confirm marrow placement by removing the stylet and aspirating blood and bone marrow.
7. If unable to aspirate, attach 12 ml syringe with Normal Saline and gently infuse Normal Saline.
8. Observe for Normal Saline leakage or tissue swelling.
 - a. If neither occur, proceed.
 - b. If either occur, select a different site
9. Connect the appropriate IV equipment (Normal Saline locks not indicated in IO placement)
10. Administer the appropriate fluids and/or drugs
11. Stabilize the entire Intraosseous needle/device as if to secure an impaled object
12. Notify Medical Control of the IO placement
13. If the IO is unsuccessful after 2 attempts, contact Medical Control.
14. Check site frequently (swelling, displacement).
15. Contact Medical Control for pain management orders as applicable.

