**IV. Purpose**

The purpose of this policy is to provide direction to paramedics on when and how to establish vascular access in the prehospital setting.

**II. Definitions**

A. **Normal Saline**: Normal saline is a crystalloid solution of sodium chloride. The approved concentration in Santa Clara County is sodium chloride 0.9%.

B. **Saline Lock**: A saline lock is a piece of optional equipment that can be used when fluid boluses or numerous (two or greater) medication administrations are not expected to be necessary. Saline locks should be utilized whenever possible in patients that don’t need immediate fluid resuscitation and/or medication administration.

C. **Fluid Bolus/Challenge**: A fluid bolus or challenge is:

1. **Adult**: 250 ml of a crystalloid solution delivered as quickly as possible, with reassessment of hemodynamic parameters, respiratory status, and lungs sounds before and after fluid delivery.

2. **Adult Trauma and Shock Patients**: In hypotensive trauma and shock patients a fluid bolus is considered to be 500 ml of a crystalloid solution. The respiratory status and lung sounds need to be evaluated before and after each fluid administration.

3. **Pediatric**: 20 ml/kg of a crystalloid solution delivered as quickly as possible, with reassessment of hemodynamic parameters, respiratory status, and lungs sounds before and after fluid delivery.

4. **Newborn (< 28 days)**: 10 ml/kg of a crystalloid solution delivered as quickly as possible, with reassessment of hemodynamic parameters, respiratory status, and lungs sounds before and after fluid delivery.
D. **To Keep Open (TKO):** TKO refers to a rate of 25-30 ml per hour (25-30 micro drops per minute or 5 macro drops per minute). TKO is the default rate for NS infusions unless otherwise specified in a treatment guideline.

E. **Wide Open:** Wide open indicates when the drip regulator is left in the position allowing for maximum fluid flow. Use with extreme caution with wide open drip rates in the elderly, children, renal failure (disease) or patients with pre-existing cardiovascular disease. Reassess lung sounds after every fluid bolus.

III. **Indications**

A. **Vascular access should never be established prophylactically.** Avoid more than three (3) attempts at vascular access per patient unless necessary for emergent treatment.

B. Peripheral veins, such as the anticubital (AC) and dorsal hand veins, are the preferred sites for IV access. **The external jugular vein may be used only after two (2) unsuccessful peripheral attempts or no peripheral veins can be visualized.**

C. Indications for IVs include:

1. **Fluid replacement therapy:**
   a. When large volumes of fluid are necessary, large bore IV catheters (18-14 gauge) shall be used and placed in proximal veins such as the antecubital (AC) and external jugular (EJ).
   b. Large bore access shall be established in patients requiring Adenosine, STEMI, Trauma, and Stroke Alert candidates, and those in cardiac arrest.
   c. Establish two (2) IVs in patients who have, or are at risk for shock.

2. **Medication administration**

IV. **Indications for Intraosseous Access**

A. An intraosseous infusion (IO) is indicated in patients that need immediate fluid or medication treatment and meet at least one of the following criteria:

   1. Altered mental status
   2. Respiratory compromise
   3. Hemodynamically unstable
   4. Cardiac arrest

B. For patients in cardiac arrest, it is preferable to establish immediately an IO instead of trying peripheral vascular access.
C. **IO access is never** indicated for prophylactic vascular access, or for the mildly distressed patient who can safely wait until arrival at the hospital for vascular access.

D. There are two options for IO access the tuberosity of the patient's tibia and the humoral tuberosity. (See *Santa Clara Prehospital Care Policy #700-M08: Intraosseous Infusion*).

E. Any limb with an IO line established in it should be immobilized according to *Santa Clara Prehospital Care Policy #700-M08: Intraosseous Infusion*.

F. For patients fifteen (15) years and under, take special care to avoid the growth plate areas in the tibia. The growth plates exist in children and adolescents on the long bones. Each long bone has at least two growth plates at its extremity: one at each end. Humeral IOs are contraindicated in pediatric patients.

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**General**

- Over-the-needle catheters may be inserted into peripheral veins of the limbs and the external jugular vein.
- External jugular veins should be used only after peripheral attempts or confirmation of no obvious peripheral vascular access is present.
- IVs may be established for fluid therapy, or when IV medications may be required.
- When large volumes of fluid may be required, large bore catheters (18-14 G) should be used, and placed in proximal veins when available (AC, EJ). This includes, but is not limited to, patients requiring Adenosine, STEMI and Stroke Alert candidates, and those in cardiac arrest.
- Establish two (2) IVs in patients who have, or are at risk for decompensation (e.g., for shock).
- Avoid more than three (3) attempts at vascular access per patient unless necessary for emergent treatment.
- Saline locks are optional and may be used when fluid boluses or numerous medication administrations are not expected to be necessary.
- A “fluid bolus” or “fluid challenge” in the adult patient consists of 250 mL of crystalloid solution delivered as rapidly as possible, with reassessment of hemodynamic parameters, respiratory status, and lung sounds before and after treatment.
- “TKO” or “to keep open” indicates a rate of 25-30 mL/hour (25-30 micro drops/minute, or 5 macro drops/minute). TKO shall be the default rate unless otherwise specified in a treatment guideline.
- “Wide open” indicates that the drip regulator is left in the open position. Use with extreme caution in the elderly, children or patients with pre-existing cardiovascular disease. Reassess lung sounds frequently in these patients.
- Document gauge, site, number of attempts, success or non-success, fluid, rate of infusion, paramedic performing procedure, and total amount infused in the pre-hospital setting upon transfer of care or arrival at facility.
- Paramedics may initiate only 0.9% *Sodium Chloride* solution (Normal Saline), but may monitor any crystalloid solution per Title 22 Paramedic Basic Scope of Practice.
Intraosseous

- Any ALS patient for whom immediate fluid or medication treatment is indicated. In addition, patients must have at least one of the following:
  - An altered mental status.
  - Respiratory compromise.
  - Hemodynamic instability.
- IO lines are never indicated for prophylactic vascular access, or for the mildly distressed patient who can safely wait until arrival at the hospital for vascular access.
- An intraosseous line may be established only in the tibia (see 700-M08).
- For patients who are pediatric patients up to 18 years of age special care should be taken to avoid the growth plate areas. The growth plates exist in children and adolescents on the long bones. Each long bone has at least two growth plates: one at each end.
- The limb with an IO line established should be immobilized as if fractured.
- In the child or infant, a "fluid bolus" or "fluid challenge" consists of 20 ml/kg body weight of Normal Saline solution.
- In the newborn, less than 28 days old, a "fluid bolus" or "fluid challenge" consists of 10 ml/kg body weight of Normal Saline solution.
VASCULAR ACCESS

Effective: February 12, 2015
Replaces: June 2012
Review: November 12, 2017

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2. Adult Trauma and Shock Patients: In hypotensive trauma and shock patients a fluid bolus is considered to be 500 ml of a crystalloid solution. The respiratory status and lung sounds need to be evaluated before and after each fluid administration.

3. Pediatric: 20 ml/kg of a crystalloid solution delivered as quickly as possible, with reassessment of hemodynamic parameters, respiratory status, and lungs sounds before and after fluid delivery.

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D. To Keep Open (TKO): TKO refers to a rate of 25-30 ml per hour (25-30 micro drops per minute or 5 macro drops per minute). TKO is the default rate for NS infusions unless otherwise specified in a treatment guideline.
E. **Wide Open**: Wide open indicates to when the drip regulator is left in the position allowing for maximum fluid flow. Use with extreme caution with wide open drip rates in the elderly, children, renal failure (disease) or patients with pre-existing cardiovascular disease. Reassess lung sounds after every fluid bolus.

### III. Indications

A. **Vascular access should never be established prophylactically.** Avoid more than three (3) attempts at vascular access per patient unless necessary for emergent treatment.

B. Peripheral veins, such as the anticubital (AC) and dorsal hand veins, are the preferred sites for IV access. *The external jugular vein may be used only after two (2) unsuccessful peripheral attempts or no peripheral veins can be visualized.*

C. Indications for IVs include:

1. Fluid replacement therapy:
   a. When large volumes of fluid are necessary, large bore IV catheters (18-14 gauge) shall be used and placed in proximal veins such as the antecubital (AC) and external jugular (EJ)
   b. Large bore access shall be established in patients requiring Adenosine, STEMI, Trauma, and Stroke Alert candidates, and those in cardiac arrest
   c. Establish two (2) IVs in patients who have, or are at risk for shock

2. Medication administration

### IV. Indications for Intraosseous Access

A. An intraosseous infusion (IO) is indicated in patients that need immediate fluid or medication treatment and meet at least one of the following criteria:

   1. Altered mental status
   2. Respiratory compromise
   3. Hemodynamically unstable
   4. Cardiac arrest

B. For patients in cardiac arrest, it is preferable to establish immediately an IO instead of trying peripheral vascular access.

C. IO access is *never* indicated for prophylactic vascular access, or for the mildly distressed patient who can safely wait until arrival at the hospital for vascular access.
D. There are two options for IO access the tuberosity of the patient’s tibia and the humoral tuberosity. (See Santa Clara Prehospital Care Policy #700-M08: Intraosseous Infusion).

E. Any limb with an IO line established in it should be immobilized according to Santa Clara Prehospital Care Policy #700-M08: Intraosseous Infusion.

F. For patients fifteen (15) years and under, take special care to avoid the growth plate areas in the tibia. The growth plates exist in children and adolescents on the long bones. Each long bone has at least two growth plates at its extremity: one at each end. Humeral IOs are contraindicated in pediatric patients.