Chapter 7 Medication Administration, Part 2 Intravenous Access, Blood Sampling, and Intraosseous Infusion

Intravenous (IV) Access Indications
- Fluid and _______________ replacement
- _______________ administration
- Obtaining venous blood specimens for lab analysis

Types of IV Access
- _______________ venous access
- _______________ venous access
- _______________ access

Peripheral IV Access Sites

Peripheral Venous Access
- Easy to master
- Use larger veins for fluid replacement
- Veins may _______________
- AC or external _______________ is best during cardiac arrest

Central Venous Access
- Veins located _______________ in the body
- Internal jugular, _______________, femoral
- Peripherally inserted central catheter (PICC lines)
- Larger veins that will not collapse in _______________
- Not commonly used by EMS in Texas

Fluid Replacement
- In the prehospital setting, fluid replacement is limited to replacement of _______________ only
  - IV solutions do not replace _______________
  - IV solutions do NOT have _______________ carrying capabilities
  - It takes roughly _______________ units of IV fluids to replace 1 unit of lost blood

Intravenous Fluids

Colloids
- Colloids contain large _______________ that cannot pass thru the capillary membranes
- Colloids remain in the circulatory system for a long time.
- _______________ protein fraction (plasmanate)
- Salt poor _______________
- Dextran
- Hetastarch (Hespan)

Crystalloids
• Contain ___________________________ but no colloids
• Primary out-of-hospital solutions
  • ___________________________ solutions: equal concentrations on opposite sides of a semi-permeable membrane
  • ___________________________ solutions: higher solute on 1 side of a semi-permeable membrane
  • ___________________________ solutions: lower solute on 1 side of a semi-permeable membrane

11 Effects of Solutions on Red Blood Cells
  • ___________________________ Solutions: pulls fluids out of red blood cells and can cause collapse.
  • ___________________________ Solutions: No effect on red blood cells
  • ___________________________ Solutions: pulls fluids into red blood cells causing expansion

12 The effects of hypertonic, isotonic, and hypotonic solutions on red blood cells.

13 Pre-Hospital Fluids
  ___________________________ Ringer’s (LR)
  • Isotonic crystalloid
  • Contains sodium chloride, ___________________________ chloride, calcium chloride, and sodium lactate

Normal saline solution (NS):
  • Isotonic ___________________________
  • Contains 0.9% sodium chloride in ___________________________

14 Pre-Hospital Fluids
  5% ___________________________ in water (D5W)
  • ___________________________ glucose solution
  • Supplies calories needed for metabolism
  • Initially increases circulatory volume, but glucose molecules rapidly ___________________________ across the vascular membrane

15 Other Fluids
  • ___________________________
  • ___________________________ carrying solutions
    – Experimental treatment for ___________________________
    – Perfluorocarbons
    – Hemoglobin-based oxygen-carrying solutions (HBOCs)

16 Packaging of IV Fluids
  • Most packaged in soft ___________________________ or vinyl bags.
  • Container provides important information:
    • Label lists fluid type and ___________________________ date.
    • Medication administration ___________________________.
    • Administration ___________________________ port.
Caution

Do not use any IV fluids after their __________________________ date; any fluids that appear cloudy, discolored, or laced with particulate; or any fluid whose sealed packaging has been __________________________ or tampered with.

IV Administration Sets (1 of 2)

- __________________________: 10 gtts = 1 ml, for giving large amounts of fluid.
  - AKA: A-Set, or Regular set
- __________________________: 60 gtts = 1 ml, for restricting amounts of fluid.
- Blood tubing—has a filter to prevent clots from blood products from entering the body.
- __________________________ volume: delivers specific volumes of fluids.

IV Administration Sets (1 of 2)

- IV __________________________ tubing: extends original tubing.
- Electromechanical __________________________ tubing: specific for each pump.
- Miscellaneous: some sets have a __________________________ that can set the flow rates.

Macrodrip and Microdrip Administration Sets

In-Line Intravenous Fluid Heaters

- Infusing cold IV fluids can induce __________________________
- IV fluids can be __________________________ to near body temperature with heating devices.
- Many __________________________ and models of these devices
- You must be familiar with any such device that you may use

Intravenous Cannulas

- __________________________-the-needle catheter
- __________________________-needle catheter
- Plastic catheter inserted __________________________ a hollow needle

Over-the-Needle Catheter

Hollow-Needle Catheter (Butterfly)

Catheter Inserted Through the Needle

Peripheral IV Access

Starting a Peripheral IV (1 of 6)

Gather equipment
- BSI supplies
- __________________________
• Administration set
• Tape or commercial securing device (Venigard)
• Blood draw equipment: tubes, ____________________________________
• Constricting band (tourniquet)
• Alcohol or Betadine prep

29  □ Starting a Peripheral IV (2 of 6)
Assemble administration set to bag
• ____________________________________ bag
• Fill drip chamber about ___________ full or to line
• Bleed out ____________________________________
Select Sight
• Look for _________________________________, pliable veins

30  □ Starting a Peripheral IV (3 of 6)
Place constricting band ____________________________________ selected sight
• Don’t leave for more than __________ minutes
Cleanse the sight
• Start at the sight and work ________________________________ in a circular motion

31  □ Starting a Peripheral IV (4 of 6)
Inserting the cannula
• Pull skin taut with non-dominant hand
• With bevel __________, insert at a __________° to __________° angle
• Try to feel the “pop”
• See the blood come into ________________________________ chamber
• Advance about __________ cm further after flash

32  □ Starting a Peripheral IV (5 of 6)
Advance catheter into the vein
• Hold needle stationary and advance the Teflon catheter over the needle into the vein to the ________________________________
• Place finger over the vein at the catheter tip and press downward to occlude blood flow
• Remove the metal ________________________________ (needle)
• Dispose of needle into sharps container

33  □ Starting a Peripheral IV (6 of 6)
Remove ________________________________
Attach syringe and draw blood as needed
Attach ________________________________
Open flowmeter ________________________________ run wide open for a few seconds
Adjust flow rate
Loop distal tubing and tape to patient or use Venigard type devise
Label bag (date, time, and EMT-I)
Monitor patient and sight

34. Place the ____________________________________ band.
35. Cleanse the venipuncture site in a ____________________________________ motion.
36. Insert the intravenous ____________________________________ into the vein.
37. Withdraw any ____________________________________ samples needed.
38. Connect the IV ____________________________________.
39. ____________________________________ the site.
40. ____________________________________ the IV solution bag.

Key Points
• Never release the catheter until it is ____________________________________
• Always remove tourniquet ____________________________________ opening
• Observe for ____________________________________
• Make sure fluid drips freely
• The larger the catheter, the more rapid fluids or medications can be delivered
• If one external jugular is blown, do ____________________________________ attempt on the other side

41. Assuring IV Patency
• Drip chamber should drip freely
• If bag is lowered to below site, ____________________________________ should back up into tubing
• Skin should not swell or ____________________________________
• Assuring patency is paramount, especially if drugs are to be given.
• ____________________________________ injected into the skin tissues causes necrosis

42. Peripheral Intravenous Access in an External Jugular Vein
43. Place the patient in a supine or ____________________________________ position.
44. Turn the patient’s head to the side ____________________________________ of access and cleanse the site.
45. Occlude venous return by placing a finger on the external jugular just above the ____________________________________.
46. Point the catheter at the ____________________________________ third of the clavicle and insert it, bevel up, at a 10°–30° angle.
47. Enter the jugular while ____________________________________ on the
plunger of the attached syringe.

49. Intravenous Access With a Measured Volume Administration Set
(____________________________________ )

50. Prepare the tubing.

51. Open the uppermost clamp and fill the burette chamber with approximately
__________ ml of fluid.

52. Close the ________________________________ clamp and open the flow
regulator.

53. Intravenous Access with Blood Tubing

54. Insert the flanged spike into the spike ________________________________
of the blood and/or normal saline solution.

55. Squeeze the drip chamber until it is one third full and blood covers the
____________________________________ .

56. Attach blood tubing to the intravenous
____________________________________ or into a previously established IV
line.

57. Open the clamp(s) and/or flow regulator(s) and adjust the
______________________________ rate.

58. Factors Affecting IV Flow Rates
• ________________________________ band
• ________________________________ at puncture site
• Cannula abutting the vein wall or ________________________________
• Administration set control valves
• IV bag ________________________________
• Completely ________________________________ drip chamber
• Catheter ________________________________

59. IV Access Complications (1 of 4)
1. Pain
• Local infection
• ________________________________ reaction
• Inadvertent arterial puncture
• ________________________________

2. Circulatory overload
• ________________________________ embolism
• ________________________________
• Catheter ________________________________

60 □ IV Access Complications (2 of 4)
• __________________________ reaction: fever from foreign proteins
  – Normally occurs within 30 minutes to 1 hour
  – Can produce headache, body aches, and chills
• __________________________ : inflammation of the vein
• __________________________ formation: blood clot
• Anticoagulants: increases the complications of hematoma or infiltration

61 □ IV Access Complications (3 of 4)
• Most complications are due to ________________________________ fluids or supplies
• If a complication, or suspected complication, occurs:
  -Immediately shut ________________________________ IV
  -Check and recheck ________________________________
  -Contact medical control
  -Carry remainder of ________________________________ and supplies to ER

62 □ IV Access Complications (1 of 4)
• Catheter Shear: place restricting band (tourniquet) ________________________________ to IV Site
• Air Embolism: place restricting band (tourniquet) proximally to IV Site and place patient on left side with head down 30 degrees
• Arterial puncture: remove immediately and apply ________________________________ pressure
• Infiltration: remove immediately and apply direct pressure and ________________________________ if needed

63 □ Changing an IV Bag or Bottle
• Bags should be changed out ________________________________ bag is depleted
• Prepare the new bag or bottle.
  ________________________________ the flow from depleted bag or bottle.
• Remove spike from depleted bag or bottle.
• Insert spike into the new IV bag or bottle.
• Open the ________________________________ to appropriate flow rate.

64 □ Removing air From Tubing
• In the event that the bag is depleted and the tubing contains ________________________________ air, a syringe can be used to remove the air
  • Pinch off line closest to ________________________________
  • Fill drip chamber to appropriate level
  • Insert a syringe closest to patient and ________________________________ until all air is removed

65 □ Intravenous Bolus Administration

66 □ ________________________________ the equipment.
Prepare the ____________________________ .

____________________________________ the label.

Select and ____________________________ an administration port.
  • Normally, this is the port ____________________________ to the patient

Needleless Ports
  • Caution must be used when hooking the ____________________________ to the IV tubing
  • Many IV tubings have ____________________________ ports
  • If a needle is inserted into a needleless port, the port may
  • If the port is needleless, remove the needle prior to administering the drug

__________________________ the line above the port.

Administer the medication.
  • Begin by pushing ____________________________
  • Watch for ____________________________ at needle site
  • If swelling occurs, ____________________________ administration

Run wide open for a few ____________________________ to flush in the medication, then adjust the IV flow rate.

Monitor the ____________________________ .

Medicated Intravenous Infusion Administration

Medicated Infusions
  • Many medicated infusions are ____________________________ and can be administered without mixing
  • Sometimes, mixing of the medication into the IV bag is required
  • Medicated infusions should always be ran “ ____________________________ back” and NOT as a primary line
  • The administration set for medicated infusions is always a _________ drop set

Gather the ____________________________ .

Select the ____________________________ .

__________________________ up the drug.

Select IV fluid for ____________________________ .

__________________________ the medication addition port.

__________________________ the drug into the fluid.

__________________________ the solution.

Insert an administration set and connect to the main IV line with needle and
Heparin Lock (INT) (1 of 2)

Heparin Lock (2 of 2)

- AKA ____________________ lock or INT
- Used when no fluids are desired such as a patient in renal failure
- No fluid is attached
- Must draw blood or pre-fill tubing with NS before attachment to avoid air embolism
- Must flush with __________ - __________ cc of fluid
- Can attach a __________________________ to IV set to administer fluids or drugs if the need arises

Electromechanical Infusion Devices

- Infusion __________________________
- Infusion __________________________
- Allows for precise administration of fluids and medications
- Many are affected by __________________________
- In the prehospital setting, __________________________ pumps normally work best
- Know the equipment that you will use

Infusion Pump

- __________________________ -Type Infusion Pump

Drawing Blood

You should obtain venous blood in the following situations:

- During ________________ access, as time permits, so long as it does not compromise the line
- When __________________________ administration may be needed
- Before drug administration
- Many lab tests are most beneficial prior to the administration of medications

Blood Tubes

- __________________________ and Leur Lock

Obtaining a blood sample with a ____________ ml syringe

Leur Sampling Needle

Drawing Blood

- Blood tubes have __________________________ and will draw the blood into the tube
- Blood can also be injected into the tubes with a syringe. Allow the vacuum to pull the blood in.
- Do not ___________________________. Overfilling can damage the __________ cells
- Fill tubes in the appropriate sequence

Blood Tube Sequence
### Anticoagulant Color

- 1. None
- 2. Citrate Blue
- 3. Heparin Green
- 4. EDTA
- 5. Fluoride Gray

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**Intraosseous Infusion**

- A rigid needle is inserted into the ________________ of a long bone.
- Used for ____________________ situations when a peripheral IV is unable to be obtained.
- Initiate after ________ seconds or ______ unsuccessful IV attempts.
- Used primarily in ________________
- EZ IO can be used in adults as well

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**Intraosseous Needle (Jamshidi)**

**Contraindications to I/O**

- Previous ____________________ procedures or soft tissue injuries at the site
- Fracture to tibia or femur on side of access
- Fractures of the bone selected for I/O
- ____________________ at the insertion site
- Inability to find landmarks
- Osteogenesis imperfecta—congenital bone disease resulting in fragile bones
- Osteoporosis
- Establishment of a ____________________ IV line

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**Intraosseous Infusion (1 of 3)**

- Rotate leg toward the outside to expose the medial, proximal aspect of the ________________
- Pediatric location: 1 to 2 finger widths below the ________________ tuberosity on the flat expanse
- Adult location 1 to 2 finger widths below the ________________ malleolus on the flat expanse

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**Intraosseous Infusion (2 of 3)**

- Cleanse the area
- Perform the puncture
  - insert perpendicular with a ____________________ motion until a decrease in resistance or a pop
  - needle is now in the medullary canal
  - do ____________________ advance it further

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**Intraosseous Infusion (3 of 3)**

- Remove the ____________________ and dispose in sharps
- Attach a saline filled syringe and tubing
• Inject fluid to assure ____________________________________
• Rotate plastic disk to secure the needle
• Remove syringe and attach tubing
• Set flow rate
• Secure as an ________________________________ object

Pediatric and adult intraosseous needle placement sites.

Intraosseous Medication Administration

Select the medication and ________________________________ equipment.

Palpate the puncture site and prep with an ________________________________ solution.

Make the ________________________________ .

Flush With ___________cc of Fluid
  • Despite this photo, do not attach ________________________________ to the jamshidi directly, use an extension set

Connect the IV fluid ________________________________ .

_________________________ the needle appropriately.

Administer the medication. ________________________________ the patient for effects.

Bone Injection Gun (B.I.G.)

FAST1 – Sternal IO
  • Employs an ________________________________ to insert an infusion tube into the top bone of the sternum

EZ-IO
  • Battery-powered IO ________________________________ and needle set

EZ IO Sizes
  • Adults:
    – ___________ kg or greater
    – ___________ ga X ___________ mm
    – Obese size 15ga X 45mm
  • Pediatric
    – Less than ___________ kg
    – 15ga X ___________ mm

EZ IO Sites
  • Mostly used site is the ________________________________ surface of the proximal ________________________________

EZ IO Insertion (1 of 7)
• BSI
• Gather/prepare equipment
  – IV bag and tubing
  – Syringe with NS and attached to tubing (____________________________________ the tubing)
• Maintain aseptic technique
• Locate ____________________________________ tibial insertion site
• ____________________________________ area

119 EZ IO Insertion (2 of 7)
• Ensure the drive and needle are securely ________________________________
• Remove and discard ________________________________ cap
• Begin ________________________________ process

120 EZ IO Insertion (3 of 7)
• Position driver with needle at __________ ° angle to the bone surface
• Gently power the needle until it touches the ________________________________
• Check to ensure that at least __________ mm of catheter is visible

121 EZ IO Insertion (4 of 7)
• Penetrate the bone cortex pulling the trigger and applying gentle, downward
  ________________
• Release the trigger and stop insertion when:
  – A sudden “____________________________” or “give” is felt upon entry
    into the medullary space, or
  – When desired depth is obtained
• If driver stalls and will not puncture the bone, most likely there is excessive
  ________________________________ being applied

122 EZ IO Insertion (5 of 7)
• Remove the driver and ________________________________
• Confirm ________________________________
• Attach the EZ-Connect ________________________________ to the hub

123 EZ IO Insertion (6 of 7)
• Flush with NS
  – __________ cc for pediatric
  – __________ cc for adult
• If conscious, consider giving ________________________________ slowly to
  deaden the tissues
  – Consult protocols for permission and dosages
  – __________ mg/kg to a max of 50mg for adults
  – __________ mg/kg to a max of 50mg for pediatrics

124 EZ IO Insertion (6 of 7)
• No Flush = No Flow, ________________________________ the device
• Attach IV tubing and set rate
• A ________________________________ wrap may be indicated to keep fluids flowing
• Monitor insertion site for ________________________________ and leaks
• Secure site

**EZ IO Removal**
• Gently twist ________________________________ while slowly applying traction
• Do not rock or bend catheter
• ________________________________ the insertion site
• ________________________________ for bleeding or signs of infection

**I/O Complications**

1. ________________________________
   • Infiltration
   • ________________________________ plate damage
   • Complete insertion
   • Pulmonary ________________________________

2. ________________________________
   • Infection
   • Thrombophlebitis
   • Air ________________________________
   • Circulatory overload
   • ________________________________ reaction