

**4P0X1 READINESS SKILLS  
VERIFICATION LESSON PLAN  
INPATIENT SERVICES IN A NON-  
STERILE ENVIRONMENT**



**4P0X1 RSVP LESSON PLAN**  
**INPATIENT SERVICES IN A NON STERILE ENVIRONMENT**

**INTRODUCTION:**

**OVERVIEW:**

4a. Given appropriate statements, determine sources of contamination and methods for maintaining an aseptic environment accurately. STS: 12.2.2, 12.2.4, 12.2.5,

4b. Given appropriate reference material, equipment and supplies, prepare an intravenous admixture with no more than one trainer assist. STS: 12.2.3, 12.2.4, 12.2.5, 12.2.6, 12.2.7

- 1) Research incompatibilities and stability information
- 2) Practice aseptic technique
- 3) Compound IV admixture
- 4) Demonstration/Performance

4c. Given appropriate statements, explain procedures for delivering pharmaceuticals to wards and clinics accurately. STS: 13.2.7

**TRANSITION:**

4a. Given appropriate statements, determine sources of contamination and methods for maintaining an aseptic environment accurately.

1) Sources of contamination

- a) Sterile solutions must be free of living microorganisms and particulate matter.
  - i) Examine all shipments for signs of rough handling and/or breakage (e.g., water marks).
  - ii) Check containers for cracks, leaks, turbidity, and particulate matter, which may indicate contamination.
    - (1) Use a light-device to check IV solutions for dark particulate matter.
    - (2) Use a dark background to check for fungal particles.
    - (3) Protect light sensitive solutions from light.
  - iii) Avoid extreme temperatures in storage areas.
- b) Room air contains thousands of suspended particles and microorganisms per cubic foot which can be introduced into sterile products if poor aseptic technique is used.
- c) Being aware of sources of these contaminants can decrease the potential for contaminating sterile products.
- d) Dirty hands
  - i) Normally occurring bacteria (normal flora) are present on our skin at all times.
  - ii) Hand washing rids the skin of a large majority of bacteria, but never all of it.
    - (1) It takes about 30-45 minutes to grow back in significant numbers to be a risk.
    - (2) Hand washing should be reaccomplished at least every 30-45 minutes.
  - iii) Gloves
    - (1) Effectively provide a physical barrier between our skin and the product.
    - (2) Hands must be washed before donning gloves.
    - (3) May give a false sense of security since they are only sterile until they touch something.

- e) Touch contamination – due to use of improper IV preparation techniques.
  - f) Paper towels
    - i) Significant source of air-borne particles from the paper fibers.
    - ii) Some paper towels are better than others.
    - iii) Lint-free cloth towels may also be used instead, but use should be limited to avoid contaminating hands after washing.
  - g) Boxes
    - i) Opening boxes introduces a large amount of air-borne particles into the air.
    - ii) Open them in another room or a good distance from the sterile product area.
  - h) Coughing and sneezing – try to avoid this while preparing an IV. If you do cough or sneeze, dispose of the products you were working with and begin the process over after thoroughly washing your hands and cleaning the preparation area..
  - i) Avoid talking or whistling while preparing IV admixtures.
  - j) Air currents from high traffic areas – as people walk by the IV preparation area, air currents are stirred and particles and microorganisms can be introduced into the hood.
  - k) Ampules
    - i) Glass can be introduced into an ampule when it is broken.
    - ii) Filter needles are always used when working with ampules, whether when drawing the solution up, or when injecting it into an IV solution.
  - l) Cores – use proper vial entry technique to avoid.
- 2) Maintaining an aseptic environment
- a) Wipe down all surfaces with an approved cleaning solution – start high, work downward as dust will settle as you clean.
  - b) Empty all holding bins and wipe them out.
  - c) Use an approved cleaning solution (alcohol, sodium hypochlorite, etc.).
    - i) Isopropyl alcohol

- ii) Diluted bleach solutions (10%)
- d) Mop floor – use a mop head that is to be used only in the IV room to prevent contamination.
- e) Keep contaminants out
  - i) Keep dust producing items out of area if possible.
    - (1) Paper towels
    - (2) Boxes
  - ii) Don't bring wheeled carts into the area.
  - iii) Ill personnel should not work in the IV area.
- 3) Problems with a non-sterile environment
  - a) Excessive traffic flow through the pharmacy area: This results in increased air movement and potential contamination due to dust, dirt, and other contaminants.
  - b) Excessive air flow through the pharmacy area: This results in increased potential for contamination due to air flow through open windows or doors.
  - c) Lack of sterile environment (Laminar Air Flow Hood) and general lack of cleanliness in the working area
- 4) Dealing with the problems of a non-sterile environment
  - a) Decrease traffic flow through the pharmacy area.
    - i) This may be accomplished by separating the entire pharmacy area from routine traffic flow areas.
    - ii) If the pharmacy cannot be separated from traffic flow, the IV admixture preparation area may be physically isolated from the high traffic areas. This may be accomplished by hanging a shielding material (blankets, surgical drapes, etc.) between the IV admixture preparation area and the traffic flow areas.
  - b) Decrease air flow through the pharmacy area.
    - i) Close windows and doors near the pharmacy.
    - ii) If unable to close windows or doors, hang shielding materials between the IV preparation area and the traffic flow areas.

- c) Use preparation devices and techniques that limit potential contamination of sterile products.
  - i) Double needles
  - ii) Premixed solutions
- d) Keep the pharmacy area, and the entire alternate or EMEDS facility clean and uncluttered.
  - i) IV admixture preparation surface should be non-porous and constructed of a material that allows for cleaning with a suitable agent (alcohol, sodium hypochlorite, etc.).
  - ii) Cleaning should be accomplished before and after the preparation of any intravenous medication.
- e) All necessary components required for the preparation of IV admixtures should be available and within easy reach. This includes syringes and needles, gauze pads, medications and diluents, and any other required items.

**TRANSITION:**

4b. Given appropriate reference material, equipment, and supplies, prepare an intravenous admixture with no more than one trainer assist.

- 1) Research incompatibilities and stability information
  - a) Incompatibility occurs when one drug is mixed with others to produce, by physiochemical means, a product unsuitable for administration to the patient.
  - b) 3 types of incompatibilities
    - i) Physical incompatibilities manifest themselves by such visual clues as haze, precipitate, color change, etc. Examples: Potassium Cl and Calcium Gluconate form a precipitate.
    - ii) Chemical incompatibilities are a decomposition of drug substances resulting from combination of parenteral dosage forms. These incompatibilities result from hydrolysis, oxidation, reduction or complexation and can be detected only with a suitable analytic method.

- iii) Therapeutic incompatibilities occur when the combination results in undesirable antagonistic or synergistic pharmacological activity.
- c) Stability
  - i) The ability of a drug to maintain its integrity and therapeutic effects
  - ii) Resistant to chemical change or physical disintegration
- d) Evaluating orders
  - i) Ensure compatibility with medications the patient is already on. Check for therapeutic overlaps, contraindications, and interactions.
  - ii) Research all orders for drug/solution compatibility to prevent physical, chemical, or therapeutic interactions.
  - iii) Determine drug/drug compatibility if more than one medication is ordered for IV administration in the same bag
- e) Complications of an unstable or reactive product
  - i) The medication may not be absorbed by the patient and the patient may suffer from lack of treatment.
  - ii) The medication may not be stable or may lose its potency and again, the patient suffers from lack of treatment.
  - iii) The medication may react to form a compound that is toxic.
  - iv) A medication that has precipitated may be infused into a patient causing capillary blockage in the brain or other parts of the body.
  - v) All of these complications may result in patient mortality/morbidity.
- f) Procedures for researching products for incompatibility or stability information.
  - i) Receive order
    - (1) Scan for all pertinent information
      - (a) Name/SSN
      - (b) Weight – important for dosing
      - (c) Allergies – make sure to screen for cross-sensitivity

(d) Diagnosis/condition

(i) Is/are the medication(s) appropriate?

(ii) Should the patient's condition affect dosing or other factors? (Kidney function diabetes, sodium restriction for congestive heart failure, etc.)

(2) Read for pharmacy orders

(a) Oral medications

(b) IV piggybacks

(i) Check sources to see if medication and ordered fluid are compatible.

(ii) Ensure medication is stable in the volume of fluid ordered.

(iii) Check dosage to ensure it is appropriate.

(iv) Check stability to ensure preparation will be stable for at least 24 hours.

(v) Ensure patient is not allergic to medication and there is no possibility of cross-sensitivity.

(c) Other IV fluids

(i) Perform the same checks as for piggybacks.

(ii) Also check to ensure multiple additives are compatible with one another if ordered.

ii) Look up the primary medication to be administered

(1) Often references will have medications listed in them alphabetically by generic name.

(2) Some references may have products listed in the index.

iii) Read the information provided concerning the solution or other medication you are researching.

iv) When to use or consult a reference

(1) When in doubt, check it out.

- (2) Consult reference(s) when you have an order that you have never made.
- (3) Consult reference(s) when you are unsure about an order.
  - (a) An order that is not usually prescribed
  - (b) A pediatric versus adult order
  - (c) Dose looks excessive
- (4) Actions to take if a problem exists
  - (a) Contact the health care provider when a potential incompatibility or a stability problem arises.
  - (b) Drug/drug incompatibilities can usually be resolved by separating the drugs in one of the following ways.
    - (i) Change the route of one drug to another acceptable route.
    - (ii) Put the drugs into two separate piggybacks and stagger the administration time.
    - (iii) Check with nursing personnel to see if one of the medications may be given by IV push such as promethazine or diphenhydramine – KCL is never given by IV push.
- (5) Sources of reference
  - (a) *Kings Handbook on Injectable Drugs* – information laid out in tables, is loose leaf and therefore can be easily updated.
  - (b) *American Hospital Formulary Services* – good source, will often find unusual or high doses here.
  - (c) *Trissel's Handbook on Injectable Drugs* – organized as a collection of monographs which includes tables on compatibility information. This reference also includes some investigational drugs.
  - (d) Medication package inserts – not always the most current data – very conservative information.

## 2) Practice aseptic technique

- a) Hand washing procedures

- i) Remove all jewelry and scrub hands and arms to elbows with a suitable antibacterial agent.
  - ii) Turn on water. Wet hands and forearms thoroughly and then apply soap.
  - iii) Begin with finger tips, cleaning under fingernails and work your way down to elbows.
  - iv) Scrub using circular motions. Do not scrub using up and down motions.
  - v) Scrub one hand and arm and then the other hand and arm.
  - vi) Pat dry with a towel to avoid leaving particles.
  - vii) Use towel to turn off water instead of touching the faucet handle.
- b) Clean the laminar flow hood, if available, with a suitable disinfectant such as 70% isopropyl alcohol. If one is not available, clean the area that you will be working on thoroughly.
- i) Turn laminar flow hood on for at least 30 minutes before you disinfect it.
  - ii) Begin cleaning the hood using long side-to-side motions on the top surface. Start from the back of the hood and work toward the front.
  - iii) The sides of the hood are cleaned using back-to-front motions again working from the top to the bottom of each side.
  - iv) Then the surface of the hood is cleaned using side-to-side motions. Start from back of the hood and work toward the front.
- c) Clean supplies
- i) Assemble all necessary supplies checking each for expiration dates and particulate material.
  - ii) Plastic containers should be squeezed to check for leaks.
  - iii) Use only pre-sterilized needles and filters. Check the protective covering of each to verify that they are intact.
- d) Position supplies for use
- i) Place supplies on a sterile cloth with smaller supplies closer to the HEPA filter and larger supplies further away from the filter.

- ii) Space supplies to maximize laminar flow.
- e) Area of preparation if laminar flow hood is not available
  - i) The area used for the preparation of IV admixtures should be clean and uncluttered. The surface should be non-porous and constructed of a material that allows for cleaning with a suitable agent (alcohol, sodium hypochlorite, etc.). This cleaning should be accomplished before and after the preparation of any IV medication.
  - ii) All necessary components required for the preparation of IV admixtures should be available and within easy reach. This includes syringes and needles, gauze pads, medications and diluents, and any other required items.
- 3) Compound IV admixture
  - a) Powder in vial
    - i) Wipe rubber stoppers of the medication and suitable diluent with presoaked alcohol pad and allow the top to dry.
    - ii) Inject the diluent into the medication using the following technique.
      - (1) Lightly touch the needle tip to the target area of the upright vial.
      - (2) Force the syringe away from the beveled opening of the needle in a horizontal direction. This causes the needle to have a bowed appearance.
      - (3) Force the bowed needle downward into the rubber stopper. This method uses the point of the bowed needle to pierce the rubber stopper, rather than the entire surface area of a traditionally inserted needle. This method minimizes the potential for “coring”, or the dislodging of a piece of the rubber stopper during insertion. It decreases the chance of particulate matter entering the medication and potentially injuring the patient.
    - iii) Remove the vial and mix the contents (if appropriate) to ensure adequate dissolution.
    - iv) After the powder is fully dissolved, reinsert the needle and remove the required amount of the reconstituted medication.
    - v) Inject the fluid medication into the final container. Appropriately label the final product.
  - b) Liquid in vial
    - i) Wipe the rubber stopper of the medication vial and the final container with a pre-soaked alcohol swab and allow the surfaces to dry.

- ii) Draw into the syringe an amount of air equal to the amount of fluid to be withdrawn from the vial. This is injected into the vial to allow equalization of pressure within the vial if vented needles are not used.
- iii) Needles should always be inserted properly to reduce the potential for coring.
- iv) Withdraw the needed volume from the vial using appropriate technique.
  - (1) Do not touch plunger or needle.
  - (2) Do not block airflow.
  - (3) Ensure that air bubbles are removed from the syringe.
- v) Liquid in ampules
  - (1) Gently tap the ampule against the work surface to remove any fluid in the stem of the ampule. Inspect the ampule for cracks or chips.
  - (2) The colored band encircling the neck of the ampule indicates the break point (weakest point in the glass). If the ampule does not have a colored band, score the ampule neck with an ampule file.
  - (3) Wipe neck of ampule with alcohol pad and allow the ampule to dry.
  - (4) Minimize the potential for injury by using an opening aid or sterile gauze pad to protect the hands from broken glass. With the ampule held at an approximately 30-degree angle (stem upward), place the fingers so that one thumb and forefinger grasps the body and the other thumb and forefinger grasps the stem of the ampule. A secure grip is needed to prevent injury.
  - (5) Point the ampule away from face and break the stem away from the body by firmly moving both hands away from each other while bending the ampule at the neck. If the ampule fails to break open, rotate the ampule slightly so that pressure is exerted at a weaker point.
  - (6) Tilt the ampule, open end pointing downward. Surface tension should keep the solution from spilling out of the tilted ampule. Withdraw the required amount of liquid in the following manner:
    - (a) Place the bevel of the needle in the corner space near the opening
    - (b) The needle should not touch the opening of the ampule. This prevents particulate matter from contaminating the fluid.

- (c) The thumb and forefinger of the hand holding the syringe should slowly pull back the plunger until the desired amount of medication is drawn into the syringe.
- (7) An alternative method may be useful in the case of smaller hands, larger ampules, or larger syringes.
  - (a) Place the opened ampule on its side on the work surface.
  - (b) Both hands are now free to manipulate the syringe. One hand will hold the body of the syringe, while the other hand withdraws the appropriate amount of liquid from the vial.
- (8) The filter needle is removed and replaced with a regular, sterile needle prior to injection into the final container. Filter needles must be used only in one direction (either to draw out or inject fluid). This prevents contamination of the final product with glass particles trapped on the filter. After the medication is transferred to the final container, appropriately label the IV admixture.

#### 4) Demonstration/Performance

- a) Demonstrate and/or assign the 4P051A-04-S01-0302, Pharmacy Journeyman Enhancement CD on proper procedures for preparing an IV admixture
- b) Give trainees an IV admixture order to research and prepare.
  - i) Use Laminar Air Flow Hood or an area taped off on a counter to represent the flow hood.
  - ii) Trainee must prepare the IV admixture correctly using only one assist from the trainer during the process.

#### **TRANSITION:**

4c. Given appropriate statements, explain procedures for delivering pharmaceuticals to wards and clinics accurately.

- 1) Procedures for delivering pharmaceuticals to wards and clinics in alternate or EMEDS facilities are similar to hospital procedures, but the administrative work will differ because these facilities may not have access to computers to automate the process.
  - a) Two systems may be used to dispense medications to patients.

- i) Floor stock – mainly reserved for items that aren't entirely consumed by one patient.
- ii) Consists of standardized bottle of medications from which the nurse can administer doses to patients.
- iii) The pharmacy supplies standardized containers, uniformly labeled, unless the quantity or nature of the drug requires it to be dispensed in the original container.
- iv) Affix a label to all inpatient unit stock containers annotated with the following information.
  - (1) Strength
  - (2) Inpatient unit identity
  - (3) Generic name or trade name, or both
  - (4) Name and contact information of the facility
  - (5) Manufacturer and lot number (or coded equivalent)
  - (6) Additional information to ensure drug potency and patient safety, as required
- b) Unit dose – each dose is placed in an individual package with a label listing the drug name, strength or concentration, lot or batch number, and expiration date.
  - i) Pharmacy personnel dispenses only the doses each patient needs during a designated period – usually doses required for a 24 hours period.
  - ii) Delivery method is usually by cart exchange. Each cart contains the medications needed for one patient in each cart drawer. Pharmacy personnel fills the cart and exchanges it with a cart on the ward containing patient medications.
- c) If a computer system is unavailable, inpatient ordering and dispensing must be accomplished manually.
  - i) AF Form 3066-1, Doctor's orders are used to order medications for patients admitted to the facility. Pharmacy receives a copy of this order.
  - ii) AF Form 3069, Medication Administration Record is used to annotate administration of patient medications. Pharmacy may use this form to determine when medication is needed.
- d) Bulk quantity orders
  - i) Normally requested on DD Form 1150, Request for Issue or Turn-In.

- ii) All schedule II and schedule III-IV drugs must be ordered on a separate request form.
- iii) The pharmacy issues an AF Form 579, Controlled Substances Register, to the ward for each drug maintained on that particular ward.
  - (1) Each time the drug is issued to the ward or clinic, pharmacy personnel must make the appropriate entry and the nurse must initial for receipt.
  - (2) Completed registers must be returned to the pharmacy for accountability and filing.

## 2) Types of orders

- a) Standing order – a standard medication order for patients to receive medication at scheduled intervals.
- b) PRN order – an order for medication to be administered only on an as needed basis.
- c) STAT order – an order for medication to be administered now.
- d) Self-administered medication – intent is to allow for medications such as antacids, vitamins, etc., to be available at the patient’s bedside if the provider so desires.
  - i) Medications may not be self-administered on the ward unless.
    - (1) The drug is written on an AF Form 3066.
    - (2) The drug is not a controlled drug.
    - (3) The provider has indicated that the drug may be self-administered in the patient’s medical record.
- e) Air evacuation prescriptions – a 3 day (72 hour) supply of medication for patients that are being transferred to another facility.

## **TRANSITION:**

**SUMMARY:**

4a. Given appropriate statements, determine sources of contamination and methods for maintaining an aseptic environment accurately.

4b. Given appropriate reference material, equipment and supplies, prepare an intravenous admixture with no more than one trainer assist.

5) Research incompatibilities and stability information

6) Practice aseptic technique

7) Compound IV admixture

8) Demonstration/Performance

4c. Given appropriate statements, explain procedures for delivering pharmaceuticals to wards and clinics accurately.

**CONCLUSION:**

## **REFERENCES:**

Collier, K. Pharmacy Journeyman Course A, Volume 4, Air Force Institute of Advanced Distributed Learning. 2003.

Collier, K. Pharmacy Journeyman Enhancement, Air Force Institute of Advanced Distributed Learning. 2003.

Hunt ML JR. Training Manual for Intravenous Admixture Personnel, 5<sup>th</sup> Edition. 1995. Precept Press.

Pearson, D. Pharmacy Journeyman Course B, Volume 1, Air Force Institute of Advanced Distributed Learning. 2002.

Remington Editorial Board. Remington: The Science and Practice of Pharmacy, 20<sup>th</sup> Edition. 2000. Philadelphia College of Pharmacy and Science.

Trissel, L. A. Handbook on Injectable Drugs, 10<sup>th</sup> Edition. 1998. American Society of Health-System Pharmacists