

BLOCK 10 – Module 1 – Dosage Calculations, IV Medications, Blood Transfusions, and Parenteral Nutrition Therapy

Dosage Calculations (PowerPoint)

- **IV Solutions**
 - Provides rapid therapeutic effect
 - Can lead to immediate serious reactions
 - **Isotonic:** parenteral solution within osmolarity of 270-300 mOsm/L.
 - When infused, fluid d/n move into or out of body cells. Pt is at risk for fluid overload.
 - **Hypertonic:** fluids greater than 300 (parenteral nutrition is this)
 - Used to correct fluid and electrolyte and acid-base imbalances by moving water out of the bodies cells into the blood stream.
 - **Hypotonic:** fluids less than 270
 - Fluid moves into the cells.
- **IV and IV Push Medications**
 - **IV Push**
 - IV push medications are injected directly into the IV port using a syringe.
 - Flush the line before and after giving med with 10 ml of normal saline or per facility protocol
 - **Adverse Reactions**
 - Severe adverse reactions may occur quickly
 - Hypersensitivity to IV medications can occur immediately
 - *The most severe reaction is anaphylaxis
 - ➔ **Dramatic and acute, marked by sudden onset of rapid articaria and respiratory distress**
 - *The most common anaphylaxis causing medication is Penicillin at parental administration
 - **Nursing Responsibilities**
 - Medication indications and proper dosage
 - Contraindications and precautions
 - Appropriate dilution, rate of infusion, pH & osmolarity, and compatibility with other IV meds
 - Never assume that IV administration is the same as giving the medication by other routes
 - Preparing Medications for IV administration, follow these safety rules:
 - Check expiration date
 - Maintain sterile technique
 - Inspect the medication, diluent, and solution for particles or cloudiness
 - **Documentation**
- **Nursing Responsibilities**
 - **Six Rights**
 - Right medication
 - Right dose
 - Right time
 - Right client
 - Right route
 - Right documentation; document immediately after giving the medication, if not given indicate why on the MAR and nursing notes
 - **Three Medication Checks**
 - Check #1: compare the med label to the MAR as you remove the medication from the storage area
 - Check #2: compare the med label to the MAR as you prepare each medication

- Check #3: compare the med label to the MAR at the client's bedside before you give each medication
- **Drug Compatibility**
 - Refers to the chemical stability of two or more IV medications when administered together
 - When administering two or more IV medications in one IV line, determine the compatibility of each medication with the other
- **Managing Incompatibility**
 - Too many IV medications ordered
 - Limited number of IV access ports
 - Resolution:
 - Stagger IV medications
 - Flush IV line with normal saline solution
 - Suggest central line
- **Premedication Assessment**
 - Reduces risk of adverse events
 - Provides baseline for evaluating IV medication intervention
 - Review: health history (esp allergies and labs), medication data (contraindication), vital signs, physical assessment (check IV site for redness or drainage), client's learning needs
- **Reconstitution and Labeling of Drugs**
 - Reconstitution: done with powdered meds.
 - Common diluents
 - Normal Saline (0.9%)
 - Sterile Water for injection
 - Dextrose 5% in water
 - Some medications in double chambered vials (one with powder, one with diluent)
 - Solution containers must be labeled:
 - Client's name, room number, date, and name & amount of solution and medication, expiration date and time, initials or name of RN giving the meds
- **Client Teaching**
 - Name of medication
 - Desired action
 - Frequency of administration
 - Possible adverse effects
 - Report pain or swelling at or distal to IV insertion site
- **Documentation**
 - Med, dose, route, if bolus, push or piggy back, time, signature, if med is withheld or refused, document this and the reason in the MAR and add a nurses note. Document clients response to med, appearance of IV site before, during and after admin., amount and type of fluid being infused with, if a pump is being used or gravity, time when infused, flow rate, amount and type of fluid used for flushing before and after med admin.

Blood Transfusion Therapy (Chapter 40 – pg. 821-827)

- **Blood Types**
 - Based on the presence of **antigens: ABO system**
 - A antigen (type A blood)
 - B antigen (type B blood)
 - Both A and B antigens (type AB blood)
 - Neither A nor B antigens (type O blood)
 - *O blood type can't receive any blood but O type*

- **Rh factor** must be checked
 - People who have Rh-positive blood can receive an RBC transfusion from an Rh-negative donor, but Rh-negative people should not receive Rh-positive blood
- **Antibodies**
 - Must check for compatibility to prevent any reaction

Compatible blood types	
If you have:	You can only receive:
Type A	Types A and O
Type B	Types B and O
Type AB	Types A, B, AB and O
Type O	Type O
If you have:	You can only donate:
Type A	Types A and AB
Type B	Types B and AB
Type AB	Type AB
Type O	Types A, B, AB, O

ABO antigens and antibodies		
Blood type	Antigens on red cells	Antibody in plasma
Type A	A	Anti-B
Type B	B	Anti-A
Type AB	A and B	No Anti-A or Anti-B
Type O	No A or B	Anti-A and Anti-B

- **Indication for the need of Blood Transfusions**
 - Anemia □ RBC is given
 - Thrombocytopenia □ platelets are given (platelet less than 80,000)
 - Deficiency in coagulation factors □ FFP
 - Sepsis/ neutropenic infections □ WBC
 - Low albumin □ albumin is given to expand circulatory volume
 - Treats hypovolemia, burns, adult resp. distress, sever nephrosis, cirrhosis,
 - Traumatic injuries, extensive burns, dehydration, shock □ whole blood
- **Blood Products**
 - Packed cells, platelets, fresh frozen plasma, albumin, cryoprecipitate, whole blood
 - **Packed cells:** Most commonly give to pt who experience blood loss through surgery or trauma, or those with problems that destroy RBC. Given for anemia., or hemoglobin 6-10
 - **Platelets:** Given for thrombocytopenia. blood compatibility is not required. Platelets usually taken from a pool of donors. Platelets are fragile and should be given with 15-30 upon arrival.
 - **fresh frozen plasma:** admin if PT or PTT 1.5 times normal range. frozen immediately after being donated. ABO compatibility is required for donor. Infuse rapidly as pt can tolerate, usually from 30-60 min.
 - PT: blood sample taken, tissue sample mixed with sample to count the PT time. INR is used to standardize the value. Normal INR: 0.8-1.2, if on coumadin or warfarin, want 2.0-3.5.
 - PTT: time for a fibrin clot to form. Used for heparin therapy. Normal is 25-35 seconds. If on heparin, expect to be 1.5-2 times normal range.

- **Albumin:** replace low values. Expands circulating volume. Used to treat hypovolemia, burns, adult respiratory distress, severe nephrosis, cirrhosis.
- **cryoprecipitate:** admin for sepsis or neutropenic infection not responding to therapy, clotting problems. Usually given IV push over few minutes.
- **whole blood:** given in traumatic injuries, extensive burns, dehydration and shock.
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- **Types of Blood Transfusions**
 - **Blood donors:** a donor gives their blood to be used and transplanted to another person
 - **Autologous:** involves the collection and infusion of the patient's own blood
 - Eliminates compatibility problems and reduces the risk for transmitting blood borne diseases
 - Autologous transfusions are most common before surgery
 - **Intraoperative ("blood savage"):** the recovery and reinfusion of a patient's own blood from an operative field or from a bleeding wound
 - This blood is used for trauma or surgical patients with severe blood loss
- **Indications/Nursing Responsibilities**
 - Anemia, thrombocytopenia, burns, shock, traumatic injuries, coagulation problems, dehydration, volume expansion, low albumin, sepsis/neutropenic infections
- **Appropriate interventions**
- **Proper documentation**

Nursing Process, Safety, Infection Control, Proper Documentation

- **Initiation of Blood Transfusion Therapy (Pg. 822 – Table 40.12)**
 - During transfusions the nursing actions focus on prevention or early recognition of adverse transfusion reactions
 - A prescription is needed, specifies the type of component, the volume, and any special conditions
 - **PRIORITY ACTION:** is to determine that the blood component delivered is correct and that identification of the patient is correct
 - Assess lab values □ hemoglobin ,hematocrit, albumin, PT, PTT
 - Verify order
 - Obtain specimen for type and cross match □ ABO and Rh Factor
 - Educate patient
 - Obtain patient consent
 - Initiate IV
 - Always use Y-connector tubing
 - Always use Normal Saline (0.9%)
 - Always use an IV pump
 - Obtain baseline vital signs
 - Assess client history for prior reaction
 - Obtain blood from blood bank
 - Inspect blood for discoloration, gas bubbles, or cloudiness = bacterial growth or hemolysis
 - Verify using two nurses
 - verify pt name, record number, blood type, blood unit number, expir date and document
 - Use blood warmer and special filters if indicated
 - NOT Useful Ringer's lactate and dextrose in water are not used for infusion with blood products because they may cause clotting or hemolysis of blood cells
 - NEVER add to or infuse other drugs with blood products because they may clot the blood during transfusion
- **During/Management of Blood Transfusion Therapy**
 - Remain with the patient during the first 15-30 minutes of the transfusion

- Any severe reaction usually occurs with infusion of the first 15 minutes or 50 mL of blood
- Monitor vital signs after the first 15 minutes then every hour after that *or per agency protocol*
- Infuse at prescribed flow rate
 - Monitor for overload, respiratory status, sudden increase in anxiety, breath sounds, neck vein distention
 - **Older adults** may need blood infused at slower rates
 - Most at risk for heart failure and fluid volume excess
 - Assess circulatory, renal, and fluid status
 - Monitor vital signs closely
 - Lower rates of transfusion (maximum of 4 hours)
- Ask patient to report any unusual sensations such as chills, shortness of breath, hives, or itching
- Notify primary care provider immediately for any signs of reaction
 - Electrolyte imbalances are possible during transfusion
- Complete transfusion within 2-4 hours to avoid bacterial growth
 - *Time begins once the blood is picked up from the blood bank*
- **Post/Discontinuation of Blood Transfusion Therapy**
 - Obtain vital signs
 - Note time transfusion was completed
 - Dispose of the blood administration bag appropriately
 - Reassess lab values
 - Complete paperwork
 - Document client's response to transfusion

Blood Transfusion Reaction or Complication

- **Types of Reactions**
 - **Hemolytic:** caused by ABO blood type or Rh incompatibility. Onset immediate
 - S/S: fever and chills (mild) or disseminated intravascular coagulation (DIC) and circulatory collapse (life threatening)
 - Other S/S: apprehension, headache, chest pain/tightness, low back pain, tachycardia, tachypnea, hypotension, nausea, anxiety, hemoglobinuria, a sense of impending doom
 - Reaction may be immediate or may not occur until subsequent units (as little as 10 mL) have been transfused
 - N/I: discontinue immediately, remove tubing, send pt blood, urine and remaining donor blood to lab for testing, notify physician, monitor vitals, fluid I&O
 - Complications: shock, death, cardiovascular collapse or renal failure
 - **Febrile:** occurs most often in the patient with anti-WBC antibodies, which can develop after multiple transfusions, WBC transfusions, and platelet transfusions. *Reaction to leukocytes or platelet from the donor blood*
 - Onset usually occurs 30 mins to 6 hours after infusion
 - S/S: chills, tachycardia, fever, flushing, muscle pain, headache, anxiety, hypotension, and tachypnea
 - N/I: use WBC filter and administer antipyretics as ordered.
 - **Allergic (anaphylactic):** most often seen in patients with other allergies
 - S/S: wheezing, dyspnea, chest tightness, cyanosis, hypotension, urticarial, itching, bronchospasm, or anaphylaxis
 - Onset occurs during or up to 24 hours after the transfusion
 - N/I: maintain airway, admin O2, IV fluids, antihistamines, vasopressors and corticosteroids as ordered.
 - **Bacterial:** occur from infusion of contaminated blood products (especially those contaminated with a gram-negative organism)

- S/S: tachycardia, hypotension, fever, chills, and shock
- Onset is typically rapid
- N/I: obtain serum lactate levels, obtain blood cultures before antibiotic admin, admin antibiotics and low dose steroids as ordered, monitor vitals, O2 therapy with poor tissue perfusion, may need insulin, sepsis may cause microvascular abnormalities causing small clots therefore may need heparin therapy. Also monitor for DIC, heparin may be needed in the early stage, administer clotting factors in late phase, admin protein C to control inflammatory response
- **Circulatory Overload:** occurs when a blood product is infused too quickly (older adults)
 - S/S: cough, chest tightness, tachycardia, tachypnea, headache, hypertension, bounding pulse, crackles, distended jugular veins, peripheral edema, dyspnea, orthopnea, sudden anxiety, restlessness, and confusion
 - N/I: slow rate, admin O2, monitor vital signs, notify provider, admin diuretics as prescribed.
- **Transfusion-Associated Graft-Versus-Host Disease (TA-GVHD):** rare but life threatening problem that occurs more often in immunosuppressed patients. T-cell attacks host's tissues
 - Manifestations occur within 1 to 2 weeks
 - S/S: thrombocytopenia, anorexia, nausea, vomiting, chronic hepatitis, weight loss, and recurrent infection
 - 80-90% mortality rate
- **Nursing Responsibilities**
 - **Appropriate interventions**
 - Stop transfusion immediately if a reaction is suspected
 - Remove blood tubing at catheter hub to prevent any further infusion
 - Save the blood bag with the remaining blood and the blood tubing for testing at the laboratory following agency protocol
 - Hang new tubing and 0.9% Normal Saline to maintain patency of IV
 - Explain to the client the reason that the blood is being discontinued
 - If patient arrests, initiate code and start CPR
 - If patient is conscious, short of breath, or anxious, place in Fowler's position (unless contraindicated)
 - **What to do if blood CANNOT be infused within the 4-hour time limit:**
 - Take down blood bag and document amount given (DO NOT send bag to Blood Bank unless transfusion reaction suspected)
 - Maintain IV with 0.9% Normal Saline
 - Monitor vital signs for complications
 - **Pitfalls to Avoid**
 - Do NOT administer any blood component without proper blood tubing or filter (if required)
 - Do NOT transfuse a unit of blood over 4 hours (time begins once picked up from blood bank)
 - Do NOT add medications, including those intended for IV use, to blood components or infuse through the blood administration set
 - Do NOT flush the contents of the blood transfusion tubing, which would allow more of the reaction-causing blood to enter the patient
 - Do NOT use any solution other than 0.9% Normal Saline
 - Do NOT label blood specimen for type and/or cross match anywhere other than at the patient's bedside
 - **Proper documentation**
 - If blood cannot be infused w/in 4 hour limit, stop transfusion and document amount given. Do not send back to bank unless transfusion reaction suspected.

Nursing Process, Safety, Infection Control, Proper Documentation

- i. PN: IV introduction of nutrients needed for metabolic functioning.
- a. Initiation, Management, and Discontinuation of Partial Parenteral Nutrition (PPN)
 - i. PPN: parenteral nutrition that has a lower concentration of glucose and can be given through a peripheral vein. Normally used if PPN is given for short-term (less than 10 days).
 - ii. Initiate: May use peripheral vein.
- b. Initiation, Management, and Discontinuation of Total Parenteral Nutrition (TPN)
 - i. TPN: contains glucose, amino acids, vitamins, and minerals.
 - ii. Lipids are fat emulsion of 10-20%. It contains triglycerides, egg phospholipids, glycerol, and water. If lipids are needed with TPN, they are given intermittently or mixed in with the TPN solution.
 - iii. Initiation: Need to use central vein.
 - A. Remove TPN and lipids from the refrigerator at least an hour before hanging
 - B. Inspect solution
 - C. Infuse via dedicated line or lumen of a CVC
 - D. Ensure filter is used
 - E. No bolus injections
 - F. Infuse at constant rate over 24 hours
 - G. Ensure new bag is on the unit & ready to hang
 - H. Have Dextrose 10% available
 - iv. Management:
 - A. Pt at risk for dehydration and hypovolemic shock due to the hypertonic solution being infused, so water is moved from inside the cells to outside the cells.
 - B. Monitor glucose several x/day till stable
 - C. I&O and weight monitored daily
 - D. Labs: CBC, electrolytes incl. mag & phos, and blood gases, liver function, plasma proteins, PT,
 - E. plasma and urine osmolarity,
 - F. nutrition assessment repeated at 2 week intervals. Lab
 - v. Discontinuing:
 - A. Client fed before discontinuation
 - B. Wean gradually to allow pancreas to adjust to glucose levels.
 - C. Document intake, body weight, lab results.
- c. Initiation, Management, and Discontinuation of Patient-Controlled Analgesia (PCA)
 - i. Advantages/disadvantages of PCA
 - A. Advantages:
 - a. Rapid pain relief
 - b. Client in control
 - c. Avoids excess drowsiness
 - d. No IM injections necessary
 - e. Physician still prescribes dose schedule
 - f. Relieves nursing staff of excess work
 - B. Disadvantages:
 - a. Machine cost
 - b. IV must be in place
 - c. Nausea and vomiting
 - d. Respiratory depression
 - e. Confusion
 - f. Client must understand technology
 - g. Potential machine failure
 - ii. PCA errors
 - A. Improper client selection
 - B. Inadequacy of monitoring: still need to monitor for rx such as resp depression
 - C. Client/family education: over sedation due to trying to keep pt comfortable.

- D. Drug product mix-ups: some meds are prepackaged in similar boxes, and have similar names.
 - E. Practice-related problems
 - F. Device design flaws: pumps not requiring users to review all settings before infusion starts, pumps requiring dose to be programmed in ml rather than mg, and pumps that allow free flow.
 - G. Inadequate staff training: may not receive enough pump training.
 - H. Prescription errors: doctors may make mistakes, in dose, or drug pt is allergic to. Be alert to overlapping of drugs.
- iii. N/I:
- A. Improper client selection
 - B. Inadequacy of monitoring
 - C. Client/family education
 - D. Drug product mix-ups
 - E. Practice-related problems
 - F. Device design flaws
 - G. Inadequate staff training
 - H. Prescription errors

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