Introduction to Clinical Pharmacology

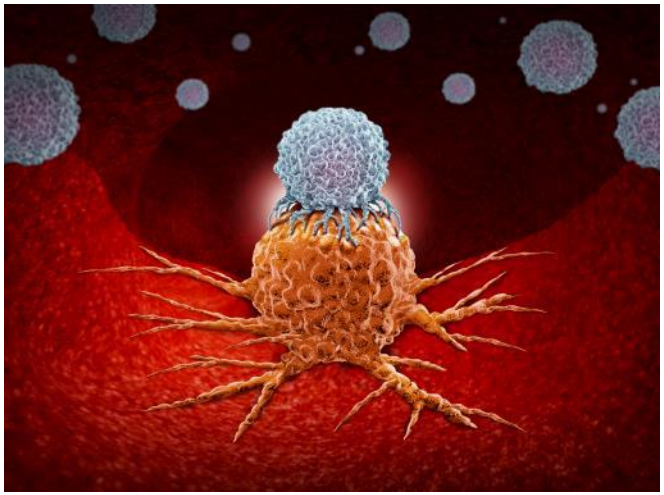
Chapter 51
Immune Modulating Therapies

Learning Objectives

1. List the types of drugs used in the treatment of neoplastic diseases.
2. Explain the uses, general drug actions, general adverse reactions, contraindications, precautions, and interactions of the immunotherapy drugs.
3. Distinguish important preadministration and ongoing assessment activities the nurse should perform with the client taking immunotherapy drugs.
4. List nursing diagnoses particular to a client receiving immunotherapy drugs.
5. Examine ways to promote an optimal response to therapy, how to manage common adverse reactions, and important points to keep in mind when educating clients about the use of an immunotherapy drug.

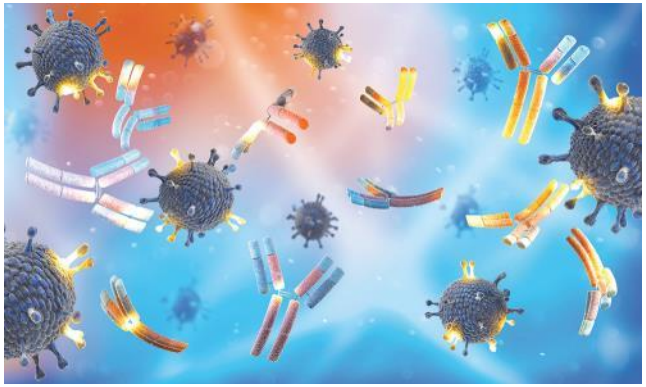
Immunotherapy

- Immunotherapy: common pharmacologic intervention used in cancer care or oncology to treat cancers and to restore or enhance the immune system's natural ability to fight cancer by:
  - Stopping or slowing the growth of cancer cells
  - Preventing cancer from spreading in the body
  - Recognizing cancer cells as foreign bodies and eliminating them



Antigens that Support Passive Immunity

- Tumor-associated antigens (TAA) are found on the surface of tumor cells or within the cell
- Immunotherapy targeting the TAA are monoclonal antibodies (mAbs), cytokines, and cancer vaccines
- Target only the cancer cells so adverse effects are reduced when compared to traditional chemotherapy
- Drugs that work by passive immunity
  - Monoclonal antibodies
  - Cytokines



Cytokines: Actions and Uses

- Cytokines actions: proteins of the immune system involved in cell communication
  - Interferons are antiviral agents with cytotoxic properties; interferon-alpha and –gamma are used in cancer treatment
- Used to:
  - Enhance cytotoxic activities
  - Send signals to inhibit or promote cell death
  - Regulate antibody production and function of B/T cells
  - Interact with antigen presenting cells and NK cells

Cytokines—Adverse Reactions #1

- Immune Response Adverse Reactions:
  - Chills
  - Cough
  - Fever
  - Headache
  - Malaise

Cytokines—Adverse Reactions #2

- Other Adverse Reactions:
  - Nausea, reduced appetite, diarrhea
  - Fatigue, sore throat, muscle aches
  - Skin rashes, injection pain and inflammation
  - Edema in extremities
  - Antibody development
  - Capillary leak syndrome
  - Cytokine storm

Cytokines—Contraindications and Precautions

- Contraindications:
  - Interferons are contraindicated in clients with known hypersensitivity to the drug
  - Not used in pregnancy
- Used cautiously in clients:
  - who drink alcohol habitually; asymptomatic elevation of liver enzymes
  - with cardiac or liver disease, history of seizure disorder, and thyroid problems; reduction in RBCs puts clients at risk for infection
  - who are lactating

Cytokines—Interactions

Interacting Drug	Common Use	Effect of Interaction
Cladribine	Chemotherapy	Increased lymphopenia, adverse interferon reactions
Zidovudine	HIV antiretroviral	Increased adverse reactions of zidovudine
Oral anticoagulants	Prevent blood clots	Prolonged bleeding

Monoclonal Antibodies: Actions and Uses

- Monoclonal antibodies actions: target specific antigens on the surface of tumor cells
- Used to:
  - Flag cancer cells for destruction
  - Block tumor growth and angiogenesis
  - Deliver other agents to a tumor site
  - Improve results of anticancer treatment in conjunction with traditional chemotherapy and/or radiation
- Examples: rituximab, trastuzumab, and bevacizumab

Monoclonal Antibodies—Adverse Reactions

- Integumentary System Reactions:
  - Rash
  - Stevens-Johnson syndrome
  - Hypersensitivity to infusions
  - Infusion reactions

Monoclonal Antibodies—Contraindications

- Contraindications:
  - Monoclonal antibodies should not be used in clients with an active or severe infection
  - Not used in pregnancy; clients should use birth control
  - Lactation (during and 6 months after ending mAbs treatment)

Monoclonal Antibodies—Precautions

- Use cautiously:
  - Live vaccine should not be given before, during, or immediately after mAbs
  - Viral infections like hepatitis B and C can be reactivated during mAbs therapy; antiviral therapy
  - Clients being treated for non-Hodgkin lymphoma with high tumor burden should prophylactically be treated for possible tumor lysis syndrome

Monitor clients for adverse reactions related to cardiac and renal impairment

Monoclonal Antibodies—Interactions #1

Interacting Drug	Common Use	Effect of Interaction
Clozapine, promazine	Management of psychiatric problems	Increased risk for CNS toxicity
Roflumilast	Treatment of respiratory problems	Increase risk for immunosuppression
Vaccines (BCG, COVID-19, rabies)	Prevent viral disease	Decreased risk for immunity to specified pathogen

Monoclonal Antibodies—Interactions #2

A nurse is caring for a client who is prescribed monoclonal antibody. The nurse explains to the client that the drug supports passive immunity. Which of the following best describes the passive immunity of the mAb?

a) It creates memory like a cancer vaccine

b) Signals are sent to white blood cells to attack

c) Targets organelles inside the body

d) The function is much like the protection of our skin

Checkpoint and Other Inhibitors: Actions and Uses

- Checkpoint and other inhibitors: a subclass of monoclonal antibodies that work inside cells interfering with specific cellular activity that caused the malignant change
  - Some block the inhibition of enzymes, proteins, or other molecules involved in the growth and spread of cancer cells
- Example uses:
  - Mutated protein in melanoma is checked by the drug vemurafenib
  - In some leukemia cells two different genes can fuse together and become the checkpoint for imatinib

Pharmacology in Practice Exercise #1

Which of the following drugs is most likely a checkpoint inhibitor?

a) pertuzumab

b) tagraxofusp

c) erlotinib

d) alemtuzumab

Checkpoint and Other Inhibitors—Adverse Reactions #1

- Inflammatory Reactions:
  - Immune-related adverse events
  - Feelings of general malaise that progress toward life-threatening issues

Checkpoint and Other Inhibitors—Adverse Reactions #2

- Integumentary System Reactions:
  - Rash
  - Dry skin
  - Nail changes
  - Hair depigmentation
  - Photosensitivity

Checkpoint and Other Inhibitors—Adverse Reactions #3

- Gastrointestinal System Reactions:
  - Diarrhea progressing to colitis
  - Hepatitis
  - Elevated liver enzymes
  - Risk of bowel perforation (sunitinib for bowel GI tumors)

Checkpoint and Other Inhibitors—Adverse Reactions #4

- Other Reactions:
  - Thyroid inflammation
  - Pulmonary symptoms
  - Neurological changes
  - Inflammatory arthritis
  - Acute pancreatitis
  - Inflammatory endocrine issues
  - Males may experience decreased sperm production
  - Some reactions indicate effective therapy (e.g., acne-like rash or increased blood pressure)

Checkpoint and Other Inhibitors—Precautions

- Caution is used in clients:
  - Taking antidiabetic medications; may experience more drops in blood sugar
  - Taking anticoagulants; monitor for signs of bleeding
  - Who are pregnant or lactating; women should use birth control
  - With pediatric cancer diagnosis
  - Clients taking vismodegib and sonidegib should not give blood for at least a year following treatment

Checkpoint and Other Inhibitors—Interactions

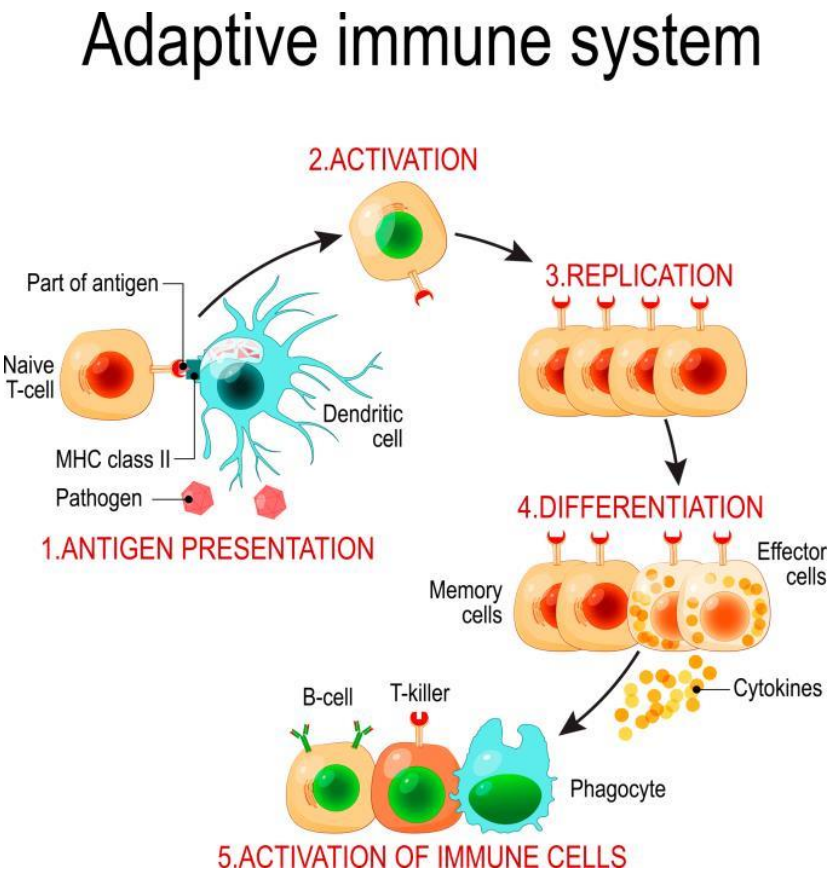
Interacting Drug	Common Use	Effect of Interaction
Antidiabetics	Treat diabetes	Increased blood sugar levels
Clozapine, promazine	Management of psychiatric problems	Increased risk for CNS toxicity
Antihypertensives	Treat high blood pressure	Increased risk of hypotension

Agents that Support Active Immunity

- Adaptive immunity: the body's ability to recognize the antigen/cancer cell as the invader and present it to B or T lymphocytes

  Memory cells will prevent the same illness from affecting the individual in the future

- Examples:
  - Cancer vaccines
  - Adoptive cell therapy



Cancer Vaccines: Actions and Uses

- Cancer vaccine actions: trigger a specific immune response against the tumor as a “foreign” tissue; made to identify molecular targets or genes that are different than normal cells

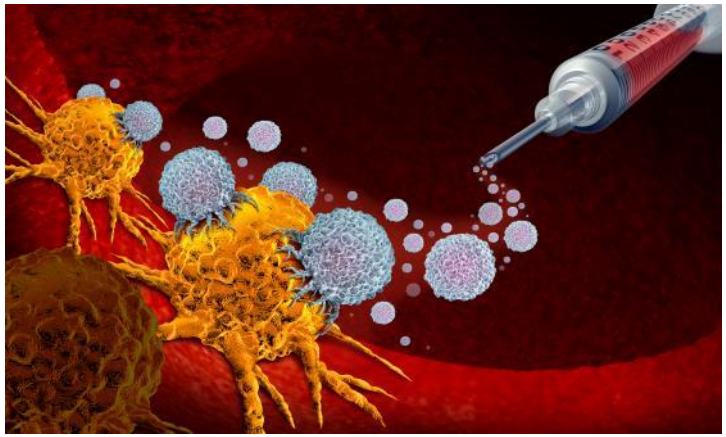
- Used to:

  Delay or stop cancer growth

  Cause tumor shrinkage

  Prevent cancer

  Eliminate cancer cells not killed by other methods



- Example: sipuleucel-T (only one on the market)

Cancer Vaccines—Adverse Reactions

- Adverse Reactions:
  - Nausea, vomiting
  - Fatigue
  - Headache
  - Muscle and joint pain
  - Anaphylactic reactions

Cancer Vaccines—Contraindications and Precautions

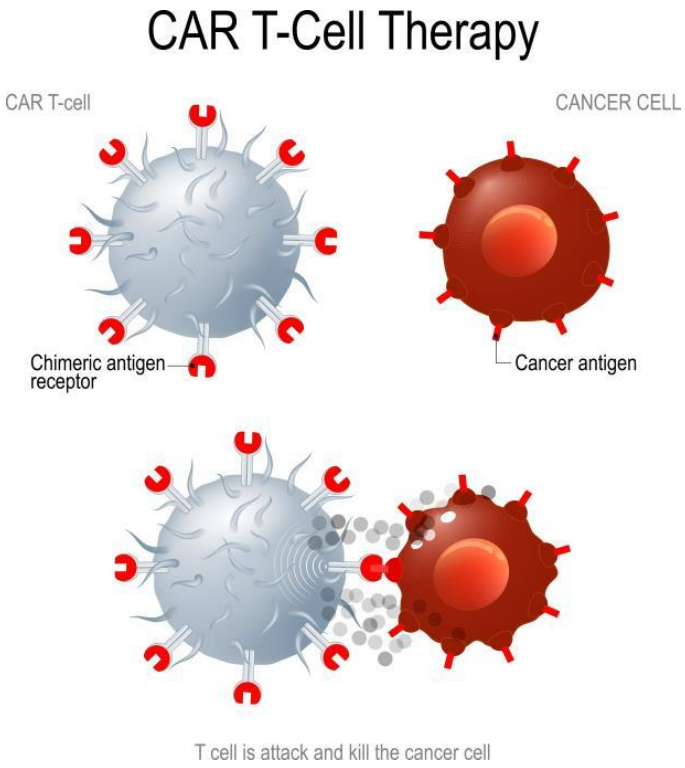
- Contraindications:
  - Should not be given to women
- Used cautiously in clients with:
  - Cardiac and pulmonary conditions; monitor closely

Cancer Vaccines—Interactions

Interacting Drug	Common Use	Effect of Interaction
Immunosuppressants	Reduce inflammatory response	Reduced vaccine effectiveness

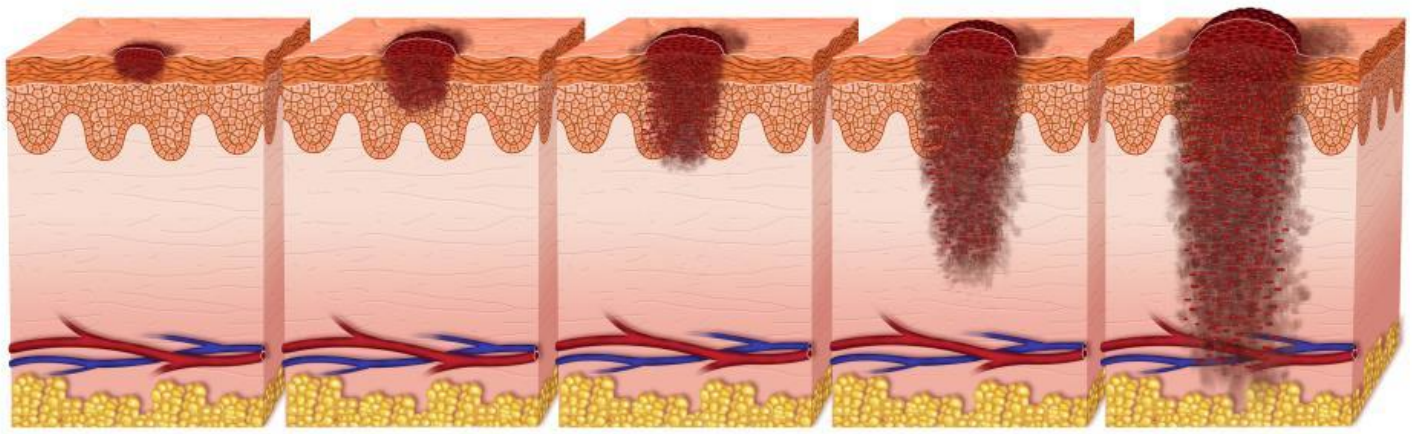
Adoptive Cell Therapy: Actions, Uses, and Precautions

- Adoptive cell therapy actions: type of adaptive immunity using T cells because they learn to distinguish healthy cells from cancer cells; effective for years beyond therapy
  - Chimeric Antigen Receptor T-Cell Transfer (CAR-T): collection of cells from client's blood, engineering them to recognize specific antigens on cancer cell surface; infusing the cells back into the client



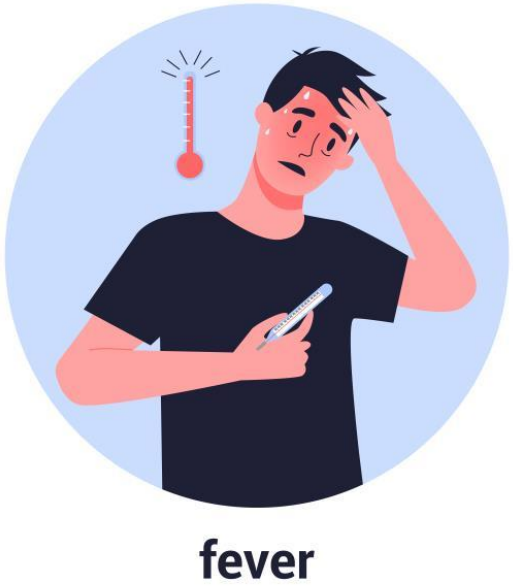
Adoptive Cell Therapy: Actions, Uses, and Precautions (continued)

- Oncolytic Viral Therapy: modifies a virus to infect and destroy cancer cells
  - Used to treat metastatic melanoma
  - Strict precautions must be followed to protect the provider and others handling the drug



Adoptive Cell Therapy—Adverse Reactions

- Adverse Reactions of CAR-T therapy:
  - Extremely high fever
  - Cytokine release syndrome
  - Cytokine storm



fever

Nursing Process—Client Receiving an Immune Modulating Drug for Cancer #1

Preadministration Assessment

- **Objective** Data
  - Note the type and location of neoplastic lesion
  - Stage of the disease: early, metastatic, or terminal
  - Vital signs
  - General appearance: noting skin lesions for baseline integumentary status
  - Neurological and psychosocial assessment to monitor for reactions

Nursing Process—Client Receiving an Immune Modulating Drug for Cancer #2

Preadministration Assessment

- **Objective** Data
  - Lab and Radiologic Tests: ECG, CBC, lipid profile, diabetes screening, and baseline organ function (e.g., liver and thyroid) and autoimmune status
  - Pregnancy testing

Nursing Process—Client Receiving an Immune Modulating Drug for Cancer #3

Preadministration Assessment

- **Subjective** Data
  - Client's knowledge or understanding of the proposed immunotherapy regimen
  - History of bowel issues and habits
  - Previous or concurrent treatments (i.e., surgery, radiation, traditional chemotherapy)
  - Other current disorders such as diabetes not related to cancer
  - Other factors (e.g., age

    financial status, family

    Involvement)

Nursing Process—Client Receiving an Immune Modulating Drug for Cancer #4

Ongoing Assessment

- Flu-like symptoms are expected
- Monitor respiratory status, especially in clients with lung cancer
- Monitor for opportunistic infections
- Monitor for pseudo-progression and educate client

Nursing Process—Client Receiving an Immune Modulating Drug for Cancer #5

Nursing Diagnosis

- Impaired Comfort: Flu-like symptoms related to stimulation of the immune system
- Diarrhea related to generalized inflammatory response in bowel
- Altered Skin Integrity related to integumentary and generalized inflammatory process

Nursing Process—Client Receiving an Immune Modulating Drug for Cancer #6

Planning

- Expected client outcomes depend on the reason for administration but include:
  - Optimal response to therapy
  - Management of adverse drug reactions
  - Confidence in an understanding of the prescribed medication regimen

Nursing Process—Client Receiving an Immune Modulating Drug for Cancer #7

Implementation

- Promoting Optimal Response to Therapy
  - Monoclonal Antibodies:
    - Carefully monitor and observe client for hypersensitivity reaction during IV infusion
    - Drug should be administered slowly and client premedicated with acetaminophen and antihistamine
    - Self-administration: evaluate client understanding of storage of drug, administration technique, potential reactions/site reactions, and disposal

Nursing Process—Client Receiving an Immune Modulating Drug for Cancer #8

Implementation

- Monitoring and Managing Client Needs
  - **Impaired Comfort**
    - Provide client with warm blanket(s)
    - If prescribed, give IV meperidine and plan to premedicate with acetaminophen and indomethacin for next dose if client cannot tolerate flu-like symptoms during administration
    - Encourage clients to balance activity with rest
    - For gastric upset, offer cold and salty foods

Nursing Process—Client Receiving an Immune Modulating Drug for Cancer #9

Implementation

- Monitoring and Managing Client Needs
  - **Diarrhea**
    - Teach client to immediately inform the healthcare provider about changes in bowel habits
    - Inpatient: inspect stools for blood or mucus
    - If ordered, send stool sample to rule out *Clostridium difficile* or other pathogens
    - Instruct client to avoid foods like caffeine, alcohol, and that have high roughage
    - Encourage foods with bulk (e.g., apples, oatmeal, cooked vegetables)

Nursing Process—Client Receiving an Immune Modulating Drug for Cancer #10

Implementation

- Monitoring and Managing Client Needs
  - **Altered Skin Integrity**
    - Instruct client to avoid the sun and wear sunscreen
    - Instruct client to avoid rubbing the area of rash and to wear clothing that is not rough or irritating
    - Client should use mild soaps and sensitive skin moisturizers to help with itching
    - If pustules form, monitor for bacterial infection

Pharmacology in Practice Exercise #2

A client at the infusion center is ready for discharge after completing the first immunotherapy treatment. Which of the following instructions should the nurse give to the client? Select all that apply.

a) Use sunscreen, even on cloudy days

b) Diarrhea is expected, you don't need to call, just eat bulk foods

c) If you feel tired, don't go out and exercise

d) If you experience chills, call so we can premedicate you next time

Nursing Process—Client Receiving an Immune Modulating Drug for Cancer #11

Implementation

- Potential Medical Complication
  - **Infusion Reactions**
    - Teach client that an infusion reaction is expected
    - Expect that drugs made from mouse tissues (-momab, -ximab, -zumab, and –mumab) are at higher risk of causing an infusion reaction
    - Provide client warm blankets
    - Premedicate client as prescribed and reassure client that medications will help ease symptoms

Nursing Process—Client Receiving an Immune Modulating Drug for Cancer #12

- **Implementation—Educating the Client and Family**
  - Include the following points in the client and family teaching plan:
    - Take drug only as directed and do not alter the dose unless advised
    - Use of a calendar, medication box, or alarm on phone can help facilitate remembering to take drug
    - All recommendations given by the oncology healthcare provider are important
    - Effectiveness or action of the drug could be altered if these directions are ignored

Nursing Process—Client Receiving an Immune Modulating Drug for Cancer #13

Implementation—Educating the Client and Family (continued)

- Include the following points in the client and family teaching plan:
  - Keep all appointments for immunotherapy, lab tests, and with the oncology healthcare provider or clinic
  - Do not take nonprescription drug unless approved by primary healthcare provider
  - Avoid drinking alcoholic beverages unless approved by primary healthcare provider
  - Inform physicians, dentists, and medical personnel of therapy with this drug

Nursing Process—Client Receiving an Immune Modulating Drug for Cancer #14

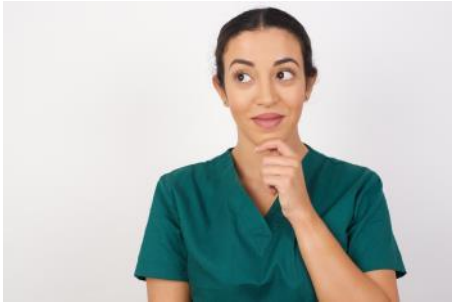
Evaluation

- Was the therapeutic effect achieved and reduced evidence of disease?
- Were adverse reactions: identified, reported, and managed?
  - Client reports comfort, with minimal fever or chills
  - Client does not experience diarrhea
  - Skin remains intact and irritation is reduced
- Did client and family express confidence and demonstrate understanding of drug regimen?

Turn and Talk—Case Study #1

A client has a hematological cancer which is being treated with the interleukin product—tagraxofusp-erzs (Elzonris). The client is brought into the clinic for premedication before the infusion begins and is given a warm blanket as they sit in the infusion room chair.

1. How is the action of immunotherapy different than traditional chemotherapy?
2. What steps will the nurse take as part of the premedication plan for this interleukin infusion?



Turn and Talk—Case Study #2

A client has a hematological cancer which is being treated with the interleukin product—tagraxofusp-erzs (Elzonris). The client is brought into the clinic for premedication before the infusion begins and is given a warm blanket as they sit in the infusion room chair.

3. The client has limited English proficiency, how can the nurse best explain “flu-like symptoms”?