

Comprehensive Chemotherapy and Biological Therapies Course Study Guide



Administration

1. True or False: Chemotherapy consenting is to be performed by the patient's attending physician.
2. A _____ consent is required if the chemo is being used in a new way and/or a new drug is added to the regimen.
3. True or False: A patient can leave their shoes on when height and weight are obtained ONLY if the patient is suffering from peripheral neuropathy.
4. Who determines if actual, ideal, or adjusted body weight is to be used in chemo dosing? _____
5. The Calvert formula is used to calculate the dose of what drug? _____
6. What does the AUC measure? _____
7. True or False: Mrs. S. is receiving Carboplatin dosed with an AUC of 6 and Mrs. H. is receiving Carboplatin with AUC of 2. The nurse knows Mrs. S. may have more toxicity to the drug since her AUC is higher than Mrs. H.
8. A UPMC fellow cannot write orders independently in the first _____.
9. True or False: The nurse should avoid bruised sites, the use of hand/antecubital veins, and sites distal to veins that have experienced venipuncture in the past 24 hours when assessing where to place a new intravenous site for chemotherapy administration.
10. _____ chemotherapy administered IV push should be administered at a rate of 5ml/minute and blood return should be assessed after every 2-_____ml of drug administered.
11. True or False: The most accurate method to measure creatinine clearance is to collect urine for 24 hours to measure level.
12. True or False: When administering an IV push medication the nurse should open the clamp of compatible intravenous solution until increased flow is seen to dilute the agent during administration.
13. During the 2 RN check, the correct patient and dose is to be verified at the _____.
14. Continuous infusion of vesicants must be through a _____.
15. Family and _____ of the patient need taught about excretion safety precautions.
16. Excretion safety precautions last for _____ or _____ days.
17. True or False: When evaluating a patient prior to chemotherapy, the nurse notes the patient recently had weight loss. The nurse recalculates the dose and discovers a change in the dose greater than 10%. The next step for the nurse is to notify the attending physician that the patient will need re-consented because of the dose adjustment.

Alkylating Agents

1. Alkylating agents are cell cycle non-specific. They work on _____ and resting cells.
2. Alkylating agents are effective in slow growing tumors and large tumors that have few actively _____ cells.
3. List three toxicities common in all alkylating agents:
 -
 -
 -

4. Which class of drugs can cross the blood brain barrier, increasing a patient's risk for CNS toxicities?

5. _____ is the solvent for carmustine (BCNU).
6. The _____ formula is used to calculate Carboplatin dosage.
7. True or False: Temozolamide (Temodar) effectively crosses the blood brain barrier.
8. Patients may feel intoxicated during the administration of _____.
9. Patients are prophylactically medicated with anticonvulsants before receiving _____ and for 24 hours after the last dose to prevent seizures.
10. True or False: Oxaliplatin should only be mixed with D5W.
11. Which drug should ALWAYS be given with Mesna? _____
12. Pulmonary fibrosis is a late complication of patients who receive _____.
13. The platinum alkylating agents include _____, _____, and _____.
14. Cisplatin (Platinol) is a _____ emetogenic drug.
15. Pretreatment hydration is administered to prevent this toxicity of cisplatin: _____
16. True or False: Cisplatin (Platinol) should be administered before paclitaxel (Taxol) to prevent delayed paclitaxel excretion and increased toxicity.
17. True or False: Electrolyte levels need to be closely monitored and often supplemented for cisplatin (Platinol).
18. The more treatments a patient receives _____ the risk for reaction with carboplatin (Paraplatin).
19. A dose limiting adverse event associated with oxaliplatin (Eloxatin) is _____.
20. Patients should avoid cold fluids for 5 days after receiving _____ to help prevent _____.

Antimetabolites

1. List two common side effects of antimetabolites:
 -
 -
2. True or False: High doses of methotrexate should not be administered to patients with abnormal renal function.
3. Leucovorin rescue begins _____ after the end of the methotrexate infusion.
4. When receiving pemetrexed (Alimta) patients are pretreated with _____ and _____ to decrease toxicity of the drug.
5. True or False: A patient is scheduled to receive treatment with pemetrexed. You notice the patients platelet count is 75,000 cells/mm³. Your next step is to call the clinic to determine if the current cycle is to be held based on low platelet count.
6. Which pyrimidine analog is indicated for the emergency treatment of adult and pediatric patients following a fluorouracil or capecitabine overdose? _____
7. True or False: IV push administration of 5-FU increases mucositis and diarrhea side effects.
8. Leucovorin is administered with 5-FU to _____ the effects of 5-FU.
9. Administering leucovorin with 5-FU _____ the cytotoxicity.

10. True or False: Capecitabine (Xeloda) is administered orally.
11. When taking capecitabine (Xeloda) patients should be educated to take the drug _____ of a meal.
12. True or False: When taking Xeloda patients should be instructed to call the clinic with any changes to general health.
13. List three side effects of Xeloda:
 -
 -
 -
14. True or False: Due to possibility of severe toxic reactions, patients are pre-medicated prior to receiving their first dose of floxuridine (FUDR) outpatient.
15. High dose cytarabine (Ara-C) increases risk for _____, therefore patients will be ordered to have neuro exams completed each shift.
16. When a patient is receiving gemcitabine (Gemzar) the CBC is monitored because _____ is a toxicity of the drug.
17. Gemzar acts as a _____ and patients receiving radiation therapy should not receive Gemzar concurrently.
18. Fludarabine (Fludara) causes severe immunosuppression. Patients need monitored for signs and symptoms of _____.
19. True or False: A side effect of clofarabine (Clolar) is capillary leak syndrome, requiring close patient monitoring.

Antitumor Antibiotics

1. Name the two classifications of antitumor antibiotics:
 -
 -
2. Patients receiving anthracyclines are at risk for acute and chronic _____ toxicity.
3. Patients receiving anthracyclines should receive baseline and routine _____ to monitor LVEF.
4. _____ is used for anthracycline extravasation.
5. Doxorubicin (Adriamycin) will turn the patient's urine and sclera _____.
6. Mitoxantrone (Novantrone) will turn the patient's urine _____.
7. If your patient has an extravasation with an anthracycline, the area should be treated with _____ compresses.
8. Large doses of anthracyclines over a lifetime are associated with _____ toxicity.
9. List two signs and symptoms of congestive heart failure (CHF):
 -
 -
10. What drug may be used to protect the heart with anthracyclines? _____

11. Not including cardiac, list three toxicities associated with anthracyclines:

-
-
-

12. List the cumulative lifetime dose of the following:

Doxorubicin - _____ mg/m²

Daunorubicin - _____ mg/m²

Idarubicin - _____ mg/m²

Mitoxantrone - _____ mg/m²

Epirubicin - _____ mg/m²

Bleomycin - _____ units

13. A test dose of _____ should be administered for the first two doses.

14. Baseline _____ and _____ with each cycle are indicated for Bleomycin to assess for lung toxicity.

Chemotherapy Error Prevention

1. Nurses _____ obtain a verbal order for chemotherapy.

2. List two factors that contribute to errors:

-
-

3. By teaching the patient about their prescribed treatment they may become the final barrier to _____ medication errors.

4. True or False: Patients are allowed to crush or split their oral chemotherapy medications to make it easier to swallow.

5. Following a chemotherapy spill the nurse should first make sure the _____ is safe.

6. After obtaining the spill kit, the nurse dons the PPE in the kit. She cleans up the spill using all the supplies in the spill kit. After washing her hands the final step is to _____.

7. True or False: It is acceptable to use abbreviations for units of measurements with chemotherapy medications.

8. True or False: Trailing zeros are acceptable to use.

9. Two _____ trained nurses should independently validate drug calculations prior to drug preparation.

10. What is the definition of a medication error? _____

11. List five risks associated with chemotherapy administration:

-
-
-
-
-

Extravasation

1. List three signs and symptoms of an extravasation:
 -
 -
 -
2. All or some (circle answer) extravasations will have visible signs and symptoms.
3. True or False: The nurse should take photos of a suspected extravasation even if there are no signs and symptoms.
4. When a patient complains of pain at the injection site while receiving a vesicant chemotherapy, what is the nurses first action? _____
5. A _____ is an agent that is capable of forming a blister or tissue necrosis when extravasated.
6. Vesicants should only be infused through a central line that _____ easily and has positive _____.
7. True or False: Warm compresses are used to treat extravasations with plant alkaloids and etoposide.
8. Cool compresses are used to promote vasoconstriction to localize the extent of the absorption. List three drugs where cool compresses are indicated following extravasation:
 -
 -
 -
9. True or False: The nurse notices an erythematous streak along the vein after administering nitrogen mustard to her patient. The patient reports no pain. The nurse would then treat the erythematous streak with warm compresses and instruct the patient to continue the warm compresses QID for the next 3 days.
10. True or False: Nurses are permitted to inject antidotes into a port and/or chest wall of a patient following an extravasation of a drug.
11. Dexrazoxane (Totect) is an agent used following _____ extravasation. It is administered _____ over three days.

Growth Factors

1. _____ is the most common dose limiting toxicity of chemotherapy.
2. Myelosuppression results in _____, _____, & _____.
3. True or False: Infection is the most common cause of death in a patient with cancer.
4. What does ANC stand for? _____
5. Write out the formula to calculate ANC:

6. List the severity of neutropenia:
 - < 2, 0000 _____
 - < 1,500 _____
 - < 1,000 _____
 - < 500 _____

7. What growth factor is used to decrease the length or severity of neutropenia? _____
8. True or False: Neupogen should be initiated prior to the start of chemotherapy.
9. A patient being mobilized for stem cell transplant can use an opioid analgesic to help with _____, which is a common side effect of Neupogen.
10. GM-CSFs stimulate the proliferation and differentiation of _____ and _____ lines.
11. What blood values would you monitor in a patient receiving growth factors? _____
12. Erythropoietin is naturally produced in which organ? _____
13. ESAs are indicated in patients with non-_____ malignancies.
14. Nplate is used when a patient is _____.

Hormonal Agents

1. True or False: Hormonal therapies can be used on tumors that are hormone receptor negative.
2. True or False: Breast cancer that is Estrogen Receptor (ER) and Progesterone Receptor (PR) positive is a hormone positive breast cancer.
3. List the three types of hormonal therapy classes used in the treatment of breast cancer:
 -
 -
 -
4. Match the drug to its corresponding hormonal therapy class:

<u>Drug</u>	<u>Class</u>
Fulvestrant	Aromatase Inhibitor
Tamoxifen	Selective Estrogen Receptor Modulator
Anastrozole	Selective Estrogen Receptor Downregulator
5. What is the mechanism of action for tamoxifen? _____
6. List three side effects of tamoxifen:
 -
 -
 -
7. True or False: Patients receiving treatment with an aromatase inhibitor require Vitamin D supplements and/or bisphosphonates, exercise, and screening every 2 years for monitoring of drug induced osteoporosis.
8. True or False: Hormonal treatment for breast cancer can vary depending if the woman is pre- or post-menopausal.
9. True or False: First line therapy for prostate cancer includes LHRH agonists.
10. Acute side effects of LHRH analogs include:
 -
 -
 -
11. What is the mechanism of action for antiandrogens? _____
12. True or False: Flutamide is an oral hormonal therapy used for treatment of prostate cancer.

13. True or False: Other agents used to treat prostate cancer include female hormones.

Hypersensitivity Reactions

1. True or False: A hypersensitivity reaction is an immune mediated response.
2. Our _____ immune system is specific and acquired over time.
3. Which class of drugs has a higher risk of reaction with larger number of treatment cycles? _____
4. True or False: You suspect an infusion reaction in your patient. The first step you take is to stop the infusion and then call for help.
5. Which of the monoclonal antibodies are known to cause infusion reactions? _____
6. When is a patient receiving carboplatin most likely to react? _____

Interferons, Interleukin 2, L-asparaginase, and Vaccine Therapy

1. True or False: Side effects of interferon therapy include flu-like symptoms, depression, anxiety, hypotension, and nausea.
2. Patients receiving interferon therapy must be assessed for _____ on each contact.
3. Biological response modifiers (IL2), modify the relationship between the immune system and the _____.
4. Three side effects of IL2 include:
 -
 -
 -
5. Capillary leak syndrome (CLS) is a potential side effect of IL2. The earliest manifestations of CLS are _____, _____, _____, and _____ and can begin 2 hours after the first dose.
6. For patients receiving IL2, daily monitoring includes _____.
7. True or False: A patient with severe side effects from IL2 may have a dose reduction to allow continuation of treatment.
8. What circulating amino acid does L-asparaginase break down? _____
9. True or False: L-asparaginase effectively crosses the blood brain barrier.
10. List two side effects of L-asparaginase:
 -
 -
11. Why are reactions less common with peg-asparaginase? _____
12. What level needs checked before each dose of L-asparaginase? _____
13. Sipuleucel-T (Provenge) is a _____ treatment, requiring patients to undergo autologous leukapheresis where the CD54+ cells are activated with _____ creating an autologous vaccine.
14. Talimogene laherparepvec (TVEC) is a live herpes simplex virus type 1 (HSV-1) vaccine used in the treatment of _____.

Miscellaneous Drugs

1. True or False: Thalidomide is safely used in pregnancy.
2. Patients receiving arsenic trioxide require _____ monitoring before and during therapy for prolonged QT interval.
3. Serum electrolytes including _____, _____, and _____ need monitored in patients receiving arsenic trioxide.
4. True or False: Patients and prescriber must complete REMS monthly survey prior to dispensing of thalidomide and/or revlimid.
5. Tretinoin and arsenic trioxide can result in what unique syndrome? _____
6. How is this syndrome treated? _____
7. Patients receiving bortezomib (Velcade) require _____ and _____ lab level monitoring.
8. Everolimus (Afinitor) is an _____ inhibitor and is administered orally _____ food.
9. Why would you be concerned about a patient having emergency surgery while on temsirolimus or everolimus? _____
10. How would you assess for neurotoxicity of bortezomib?
 - a. Ask the patient to repeat three unrelated words immediately, one minute later, then five minutes later
 - b. Watch the patient pick up a coin
 - c. Watch your patient ambulate

Monoclonal Antibodies

1. Match the suffix with the type of monoclonal antibody the suffix describes:

<u>Suffix</u>	<u>Monoclonal Antibody</u>
_____ ximab	A. Chimeric
_____ omab	B. Human
_____ umab	C. Humanized
_____ zumab	D. Murine

2. True or False: Rituximab (Rituxan) is directed against CD38 antigens on B-Lymphocytes.
3. True or False: Monoclonal antibodies can be associated with hypersensitivity/infusion reactions.
4. True or False: Bevacizumab (Avastin) blocks angiogenesis and is therefore associated with quicker wound healing.
5. List the types of monoclonal antibodies in decreasing risk (from most reactable to least reactable) of infusion reaction (humanized, chimeric, fully human, murine):

6. True or False: You have a patient receiving bevacizumab (Avastin), a VEGF inhibitor. Your patient mentions an elective surgery they scheduled to have completed five days following their infusion. Your next step would be to educate the patient about delaying any elective procedures for at least 28 days following their last dose of Avastin due to associated surgical risks.
7. In addition to bevacizumab (Avastin), what is another VEGF inhibitor? _____
8. Your patient is receiving an endothelial growth factor receptor (EGFR) inhibitor. You conduct patient education regarding the development of a(n) _____ rash.
9. True or False: You know your patient receiving blinatumomab (Blincyto) has a higher risk of infusion reaction than your patient receiving rituximab (Rituxan) because Blincyto is a murine monoclonal antibody.
10. _____ and _____ are 2 severe and life threatening side effects of Blincyto.
11. Trastuzumab (Herceptin) is indicated for _____ cancer patients who have tumors that express _____.
12. Checkpoint inhibitors are *immunomodulatory* antibodies that are used to enhance the immune system. Primary targets for checkpoint inhibition include PD-1, PD-L1, and CTLA-4. Drugs that target these sites include: _____

Hints:

- It is important to understand the type of monoclonal antibody – murine, chimeric, humanized, fully human – when thinking about the infusion risks to the patient.
- It is important to understand the target of the monoclonal antibody to guide the side effect profile and nurse to patient education.
- New monoclonal antibodies are added frequently. Be sure to stay alert for new drugs and where they fit in!

Target	Monoclonal Antibody
CD3	Blinatumomab
CD19	Blinatumomab
CD20	Obinutuzumab, Ofatumumab, Rituximab
CD22	Inotuzumab Ozogamicin
CD30	Brentuximab
CD33	Gemtuzumab
CD38	Daratumumab
CTLA-4	Ipilimumab
EGFR	Cetuximab, Necitumumab, Panitumumab
HER2 Neu	Ado-trastuzumab, Pertuzumab, Trastuzumab
PD-1	Nivolumab, Pembrolizumab
PD-L1	Atezolizumab, Avelumab, Durvalumab
PDGFR - α	Olaratumab
RANKL	Denosumab
SLAMF7	Elotuzumab
VEGF	Bevacizumab, Ramucirumab, Ziv-Aflibercept

Organ Toxicities

1. What are the three ways that nausea and vomiting can be categorized? _____
2. Vomiting is categorized as number of times vomited in a day and time period between occurrences. Nurses should include the _____ of emesis in patients' daily output.
3. What percentage of patients receiving chemotherapy is estimated to experience mucositis? _____
4. List three nursing considerations for mucositis:
 -
 -
 -
5. List three risk factors for cardiac toxicity:
 -
 -
 -
6. _____ is used as a protectant for the heart.
7. _____ is the class of drugs most commonly implicated in cardiac toxicity.
8. The cumulative dose of Doxorubicin is recommended not to exceed _____ - 500mg/m² in adults. Nurses should verify cumulative dose of drug when checking chemotherapy.
9. True or False: Patients should have a MUGA or ECHO ordered following their first dose of doxorubicin (Adriamycin).
10. What is the most common dose limiting toxicity in cancer treatments? _____
11. What is the most feared side effect of chemotherapy? _____
12. What drug is used with high dose cyclophosphamide to prevent hemorrhagic cystitis? _____
13. True or False: Capillary leak syndrome is a toxicity in which intravascular fluids leak into the tissue space causing generalized edema and can lead to organ failure.
14. True or False: Cytokine release and hyper-proliferation of lymphocytes is a toxicity arising from the immune system.

Plant Alkaloids

1. _____ is the most neurotoxic of all vinca alkaloid drugs.
2. List three ways neurotoxicity manifests:
 -
 -
 -
3. When a patient is receiving vincristine (Oncovin), the nurse knows the drug is excreted through the _____; therefore, dose reduction based on _____ function may be required.
4. True or False: Plant Alkaloids can be safely administered intrathecally.
5. True or False: Constipation is a frequent side effect in patients receiving vincristine.

6. True or False: Your patient receiving vincristine mentions feeling of numbness and tingling in his fingers and toes. You know neurotoxicity is a major side effect of vincristine. Your first action is to call the physician to report neurotoxicity signs and symptoms PRIOR to administering the ordered medication.
7. What is the treatment for early and late diarrhea that results from irinotecan administration?
 - Early - _____
 - Late - _____
8. Etoposide can cause _____ with rapid infusion.
9. When administering etoposide, patients should be monitored for signs and symptoms of anaphylactic reactions including:
 -
 -
 -
10. True or False: Your patient is starting treatment with etoposide and asks about the need to purchase a wig due to her hair falling out. You educate the patient that a wig will not be necessary since most patients do not lose their hair when receiving etoposide.
11. Circle the drugs where non-PVC tubing is needed for administration:
 - a. Etoposide
 - b. Paclitaxel
 - c. Docetaxel
 - d. Vincristine
 - e. Abraxane
12. Premedication for cabazitaxel includes _____, _____, _____, and _____.
13. Your patient is receiving docetaxel infusion. You prepare to administer pre-medications because of the risk of hypersensitivity reaction and anticipate seeing what drugs ordered? (Select all that apply)
 - a. Steroids
 - b. Histamine 1 – Blockers
 - c. Histamine 2 – Blockers
 - d. Pepcid
 - e. Zofran

Principles of Cancer Drug Therapy

1. Single agent chemotherapy is called _____ and multiple-agent chemotherapy is called _____ chemotherapy.
2. _____ chemotherapy kills the cells.
3. _____ chemotherapy suppresses growth of cells.
4. Why is combination therapy given to patients? _____
5. By using multiple agents the chance of _____ to chemotherapy decreases.
6. True or False: Administering drugs as a continuous infusion helps to increase cytotoxicity of cancer chemotherapies that are cell cycle specific.

Protectants

1. List the five drugs used as protectants:
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 -
 -
 -
 -
2. _____ rescues the bone marrow and mucosa from high dose methotrexate (MTX).
3. Methotrexate blocks the pathways of folic acid into the cell. _____ restores the folate stores required for DNA/RNA synthesis.
4. Dexrazoxane (Zinecard) is used to protect the _____ from doxorubicin administration.
5. Dexrazoxane (Zinecard) increases _____ depression.
6. Amifostine (Ethyol) helps prevent xerostomia in patients receiving _____ therapy to the head and neck regions.
7. Mesna is a _____ protectant given with ifosfamide and cyclophosphamide.
8. Mesna is ALWAYS used with _____ treatments.
9. True or False: Patients receiving an autologous stem cell transplant will receive palifermin (Kepivance) 3 consecutive days before and 3 consecutive days after myelotoxic therapy.

Tyrosine Kinase Inhibitors

1. True or False: Tyrosine Kinase Inhibitors (TKIs) are all oral agents.
2. Nearly all TKIs are _____ substrates, so you must consider drug-drug interactions with strong inducers and inhibitors of _____.
3. True or False: Imatinib (Gleevec) should be administered at least 1 hour after a meal and with a full glass of water.
4. True or False: Patients can crush dasatinib (Sprycel) for ease of swallowing.
5. Ibrutinib (Imbruvica) should be avoided in patients with baseline _____ impairment.
6. List three signs of edema or fluid retention that a patient may exhibit who is receiving a TKI for treatment of CML:
 -
 -
 -
7. True or False: Oral agents are generally administered at home by the patient. Patients should be thoroughly assessed for adherence and compliance to the prescribed treatment regimen and educated on proper medication handling and dosing.
8. Erlotinib (Tarceva) should be taken on a(n) _____ stomach.
9. A possible severe side effect of afatinib (Gilotrif) is _____.

10. When taking sorafenib (Nexavar) patients are required to have their _____ monitored weekly for the first 6 weeks then periodically afterwards.
11. True or False: You are starting your patient on a TKI. The patient reports they eat a grapefruit every day for breakfast. You should perform teaching related to the interactions between grapefruits and certain medications.
12. List three tyrosine kinases cabozantinib (Cometriq/Cabometyx) inhibits:
 -
 -
 -
13. True or False: Melanoma patients treated with a BRAF inhibitor are at risk for development of new squamous cell carcinomas (SCC) of the skin. Patients who develop a new SCC of the skin should go to their dermatologist to have the SCC excised.
14. Which of the following is not an appropriate educational topic for a patient receiving a TKI?
 - a. Food and drug interactions
 - b. Oral adherence
 - c. Organ toxicities
 - d. Signs and symptoms of extravasation
15. Which TKI's must be administered with food? _____
16. Which TKI's must be administered on an empty stomach or 1-2 hours before or after a meal?
