ANTI-NEOPLASTIC DRUGS

MAHNOOR FATIMA

OBJECTIVES

By the end of this unit students will be able to:

- Review the characteristics of normal and malignant cells.
- Explain characteristics of anti-neoplastic drugs.
- Classify anti-neoplastic drugs.
- Discuss the nursing care of patients who are on anti-neoplastic drugs.

ANTI-NEOPLASTIC DRUGS

Cancer is a term used for diseases in which abnormal cells divide without control and are able to invade other tissues. Categories of cancer.

Categorized based on the functions/locations of the cells from which they originate:

Carcinoma: skin or in tissues that line or cover internal organs. E.g., Epithelial cells % reported cancer cases are carcinomas.

Sarcoma: bone, cartilage, fat, muscle, blood vessels, or other connective or supportive tissue.

Leukaemia: White blood cells and their precursor cells such as the bon marrow cells, causes large numbers of abnormal blood cells to be produced and enter the blood.

Lymphoma: cells of the immune system that affects lymphatic system.

Myeloma: B-cells that produce antibodies- spreads through lymphatic system.

Central nervous system cancers: cancers that begin in the tissues of the brain and spinal cord.

Cancer cells can spread to other parts of the body through the blood and lymph systems, this process is called metastasis.

Anticancer drugs

Are any drug that is effective in the treatment of malignant, or cancerous, disease also called antineoplastic drug.

Types of anticancer therapy include

- Chemotherapy 50% patients will undergo chemotherapy, to remove micro metastasis. However, chemotherapy is able to cure only about 10-15% of all cancer patients.
- Radiation therapy If diagnosed at an early stage, close to 50% cancer could be cured.
- Surgery 1/3 of patients without metastasis respond to surgery and radiation.

Characteristics Of Normal And Malignant Cells

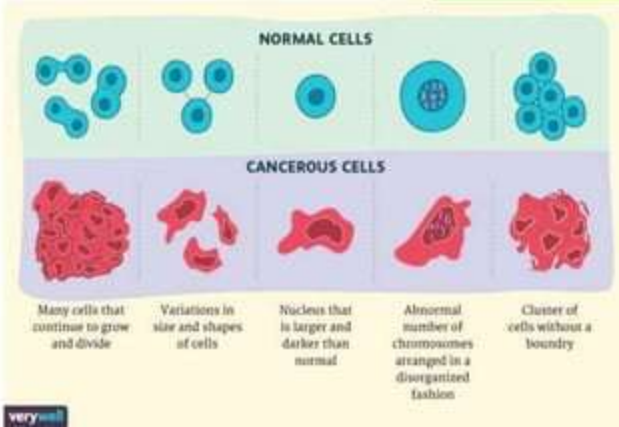
Normal cells follow a typical cycle: They grow, divide and die.

The malignant cell is characterized by:

- ❑ Acceleration Of The Cell Cycle
- ❑ Genomic Alterations
- ❑ Invasive Growth
- ❑ Increased Cell Mobility
- ❑ Chemotaxis
- ❑ Changes In The Cellular Surface
- ❑ Secretion Of Lytic Factors

characteristics of malignant neoplasms include:

More rapid increase in size.
Less differentiation (or lack of differentiation, called anaplasia)
Tendency to invade surrounding tissues.
Ability to metastasize to distant tissues.



Normal Cells		Cancer Cells
Small, uniformly shaped nuclei Relatively large cytoplasmic volume		Large, variable shaped nuclei Relatively small cytoplasmic volume
Conformity in cell size and shape Cells arranged into discrete tissues		Variation in cell size and shape Disorganised arrangement of cells
May possess differentiated cell structures Normal presentation of cell surface markers		Loss of normal specialised features Elevated expression of certain cell markers
Lower levels of dividing cells Cell tissues clearly demarcated		Large number of dividing cells Poorly defined tumor boundaries

Characteristics Of Anti-neoplastic Drugs

Chemotherapy is the use of drugs to inhibit or kill proliferating cancer cells , while leaving host cells unharmed, or at least recoverable.

Proliferating

Based on the DNA changes in cells, proliferating cycle of tumour cells can be divided into 4 phases

1. Pre-synthetic phase (Gap 1 phase or G1 phase).Cells chiefly make preparations for the synthesis of DNA
2. .Synthetic phase (S phase).Cells are synthesizing their DNA.
3. Post-synthetic phase (Gap 2 phase or G2 phase).DNA duplication has been finished and they are equally divided to the two of future sub-cells.
4. Mitosis phase (M Phase).Each cell is divided into two sub cells. Some of these new cells enter the new proliferating cycle, the others become non-proliferating cells unharmed, or at least recoverable.

Non-proliferating

- G0 phase cells have proliferation ability but do not divide temporally(cells include G0 phase resting-phase cells),
- When proliferating cells are suffered heavy casualties, G0 phase cells will get into proliferating cycle and become the reasons of tumour recurrence.
- G0 phase cells are usually not sensitive to antineoplastic drugs, which is the important obstacle to tumour chemotherapy.

GENERAL RULES OF CHEMOTHERAPY

Combination of several drugs with different mechanisms of action, different resistance mechanisms, different dose ,limits toxicities.

Adjuvant therapy: Additional cancer treatment given after the primary treatment to lower the risk that the cancer will come back. Adjuvant therapy may include chemotherapy, radiation therapy, hormone therapy, targeted therapy, or biological therapy

Neoadjuvant therapy: Treatment given as a first step to shrink a tumour before the main treatment, which is usually surgery, is given. Examples of neo adjuvant therapy include chemotherapy, radiation therapy, and hormone therapy. It is a type of induction therapy.

Supportive therapy:

- Antiemetic's (5HT3 antagonists)
- Antibiotic prophylaxis and therapy (febrile neutropenia)
- -Prophylaxis of urate nephropathy (allopurinol)
- Enteral and parenteral nutrition
- Pain analgesic drugs
- Psychological support

CLASSIFY ANTI-NEOPLASTIC DRUGS

The antineoplastic agents are not easily classified. Historically, they are categorized as

(1) alkylating agents

(2) antimetabolites

(3) Anti-Neoplastic Antibiotic

(4) hormones and antagonists

(5) miscellaneous

Categories of Antineoplastic Agents

Classification	Definition	Prototype Drug
Alkylating Agents	React chemically with portions of the RNA, DNA, or other cellular proteins	*Chlorambucil (Leukeran)*
Antimetabolites	Have chemical structures similar to those of natural metabolites	*Methotrexate (Rheumatrex, Trexall)*
Antineoplastic Antibiotics	Not selective only for bacterial cells; toxic to human cells	*Doxorubicin (Adriamycin, Doxil)*
Mitotic Inhibitors	Drugs that kill cells as the process of mitosis begins	*Vincristine (Oncovin, Vincasar)*
Hormones and Hormone Modulators	Used in cancers that are sensitive to estrogen stimulation	*Tamoxifen (Soltamox)*
Cancer Cell Specific Agents	Treat chronic myeloid leukemia (CML) and CD117-positive unresectable or metastatic malignant GI stromal tumors (GIST)	*Imatinib (Gleevec)*

CLASSIFICATION OF ANTINEOPLASTIC DRUGS

CELL CYCLE SPECIFIC [CCS]

1. ANTIMETABOLITE [S-PHASE SPECIFIC]

- FOLIC ACID ANALOGUE= METHOTREXATE,PEMETREXED
- PURINE ANALOGUE= 6-MP , 6-THIOGUANINE,CLADRIBINE
- PYRIMIDINE ANALOGUE =5-FU, CTYRABINE, GEMCITABINE

2. VINCA ALKALOIDS[M-PHASE SPECIFIC]

- VINCRISTINE ,VINBLASTINE

3. TAXANES[M-PHASE SPECIFIC]

.PACLITAXEL, DOCETAXEL

4. EPIPODOPHYLOTOXIN[G2 ARREST]

- ETOPOSIDE, TENIPOSIDE

5. BLEOMYCIN[INHIBITS G2-M TRANSITION

NOTE ;TOPOISOMERASE II INHIBITORS AS EPIPODOPHYLOTOXIN ARE CCS AGENTS WHEREAS TOPO I INHIBITORS AS CAMPTOTHECINS[TOPOTECAN ,IRINOTECAN] ARE CCNS AGENTS

CELL CYCLE NON SPECIFIC [CCNS]

1.ALKYLATING AGENT(ALKYLATE N7 OF GUANINE IN DNA BASE)

.NITROGEN MUSTARD =CYCLOPHOSPHAMIDE, MELPHALAN , CHLORAMBUCIL

.ETHYLAMINE= THIOTEPA

. ALKYLSULPHONATE =BUSULPHAN

. NITROOUREA=CARMUSTINE ,LOMUSTINE, STREPTOZOCIN

. TRIAZINE=PROCARBAZINE , DACARBAZINE, TEMEZOLAMIDE

2. PLATINUM COMPOUNDS

.CISPLATIN ,CARBOPLATIN, OXALIPLATIN

3.CAMPTOTHECINS

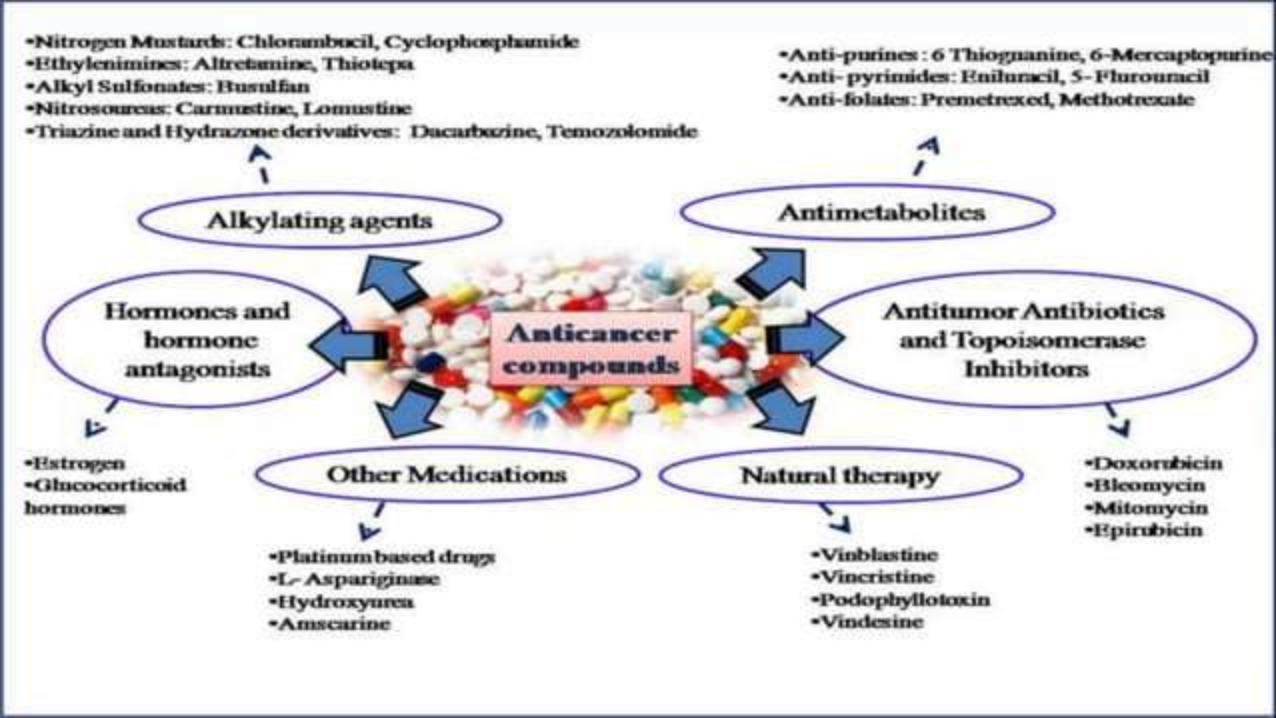
.TOPOTECAN, IRINOTECAN

4. ANTIBIOTICS(EXCEPT BLEOMYCIN)

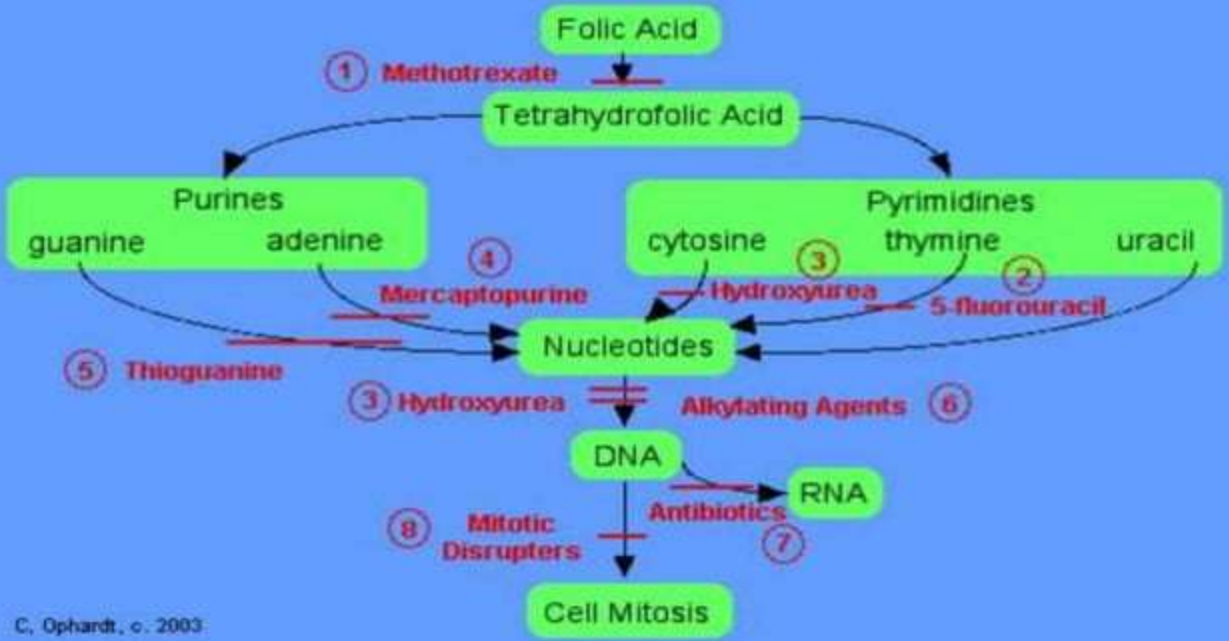
.ANTHRACYCLINE =DOXORUBICIN(ADRIAMYCIN) DAUNORUBICIN,EPIRUBICIN

.DACTINOMYCIN

.MITOMYCIN


•Nitrogen Mustards: Chlorambucil, Cyclophosphamide
•Ethylenimines: Altretamine, Thiotepa
•Alkyl Sulfonates: Busulfan
•Nitrosoureas: Carmustine, Lomustine
•Triazine and Hydrazone derivatives: Dacarbazine, Temozolomide
Alkylating agents
•Anti-purines : 6 Thioguanine, 6-Mercaptopurine
•Anti- pyrimides: Enilunacil, 5- Flurouracil
•Anti-folates: Premetrexed, Methotrexate
Antimetabolites
Hormones and hormone antagonists
Anticancer compounds
Antitumor Antibiotics and Topoisomerase Inhibitors
•Estrogen
•Glucocorticoid hormones
Other Medications
Natural therapy
•Doxorubicin
•Bleomycin
•Mitomycin
•Epirubicin
•Platinum based drugs
•L- Asparginase
•Hydroxyurea
•Amscarine
•Vinblastine
•Vincristine
•Podophyllotoxin
•Vindesine

Mechanisms of Action for Anticancer Drugs



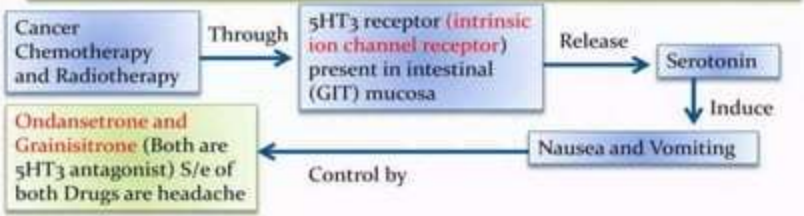
ADVERSE EFFECTS OF ANTINEOPLASTIC DRUGS

Side effects can include:

- Bone marrow suppression
- Bruising easily
- Anaemia
- Hair loss
- Nausea and vomiting
- Loss of appetite
- Diarrheal and constipation
- Changes in mood

Common adverse effects of Anticancer drugs

1. Suppress bone marrow- Penocytopenia (Decrease all count) means decrease WBC counts, RBC counts, Platelet counts
2. Anemia
3. Adversely affect multiplying cells- eg loss of hair (Baldness), wrinkling of hair
4. Decrease sperm count- cause male sterility (oligozoospermia)
5. Decrease ovum count- cause female sterility
6. Nausea and vomiting



NURSING CARE FOR CHEMOTHERAPY

ROLE OF A NURSE

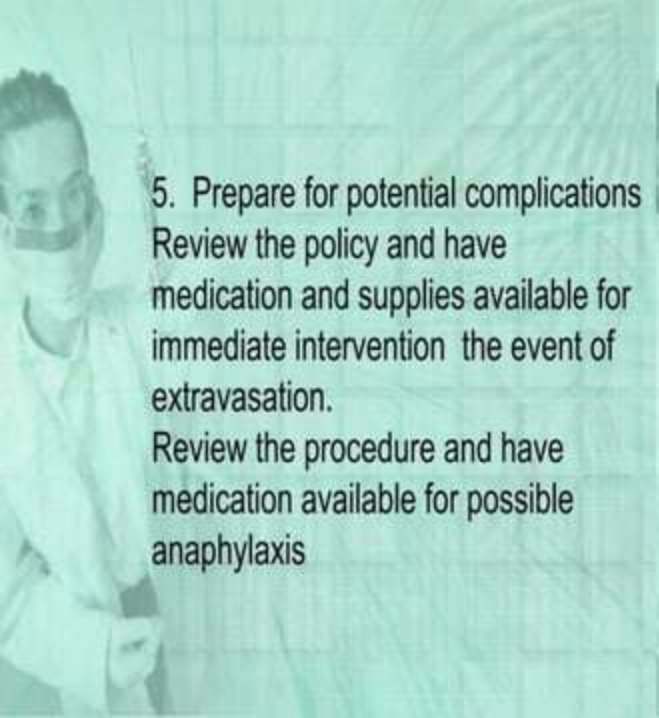
Prior to chemotherapy administration

1 Review- The chemotherapy drugs prescription which should have
-Name of anti-neoplastic agent.
-Dosage
-Route of administration
-Date and time that each agent to be administered.

2. Accurately identify the client

3.Medications to be administered in conjunction with the chemotherapy e.g antiemetics, sedatives etc.

4.. Assess the clients condition including
- Most recent report of blood counts including hemoglobin ,hematocrit, white blood cells and platelets.
-Presence of any complicating condition which could contraindicate chemotherapeutic agent administration i.e. infection, severe stomatitis , decreased deep tendon reflexes, or bleeding .
-Physical status
-Level of anxiety
-Psychological status.



5. Prepare for potential complications
Review the policy and have medication and supplies available for immediate intervention the event of extravasation.
Review the procedure and have medication available for possible anaphylaxis

6.Assure accurate preparation of the agent
-Accuracy of dosage calculation
-Expiry date of the drug to be checked
-Procedure for correct reconstitution and
-Recommended procedures for administration

7.Assess patients understanding of the chemotherapeutic agents and administration procedures.

X. Nursing Management of common side effects of Chemotherapeutic drugs.

.Nausea & Vomiting –

Nausea is the conscious recognition of the subconscious excitation of an area of the medulla closely associated with or part of the vomiting center. Nausea may cause the desire to vomit & it often precedes or accompanies vomiting.

Avoid eating/drinking for 1-2 hrs prior to and after chemotherapy administration
Eat frequent, small meals. Avoid greasy & fatty foods and very sweet foods & candies.
Avoid unpleasant sights, odors & testes
Follow a clear liquid diet
If vomiting is severe inform the physician.
Consider diversionary activities

.Bone marrow Depression – This can lead to
-Anaemia
-Bleeding due to thrombocytopenia
-Infection due to leukopenia

Nursing Actions

Administer packed RBC according to the physician orders.
Monitor hematocrit and haemoglobin especially during drug nadir
Maintain the integrity of the skin

Avoid sources of infection
Maintain good personal hygiene.
Prevent trauma to skin & mucous membranes
Report s/s of infection to physician
Monitor counts
Avoid invasive procedures, no .....
Raise the arm while pressure is applied after removal of a needle or catheter

.Alopecia

Explain hair loss is temporary, and hair will grow when drug is stopped.
Use a mild, protein based shampoo, hair conditioner every 4-7 days
Minimize the use of an electric dyer.
Avoid excessive brushing and combing of th air. Combing with a wide –tooth comb is preferred.
Select wig, cap, scarf or turban before hair loss occurs.
Keep head covered in summer to prevent sunburn and in winter to prevent heat loss.

Fatigue - Assess for possible causes chronic pain, stress, depression and ir sufficient rest or nutritional intake.
-Conserve energy & rest when tired
-Plan for gradual accommodation of activities.
-Monitor dietary & fluid intake daily. Drink 3000 ml of fluid daily, unless contra-indicated, in order to avoid the accumulation of cellular waste product

THANK YOU!!