Registered Nurses/Graduate Nurses/Registered Psychiatric Nurses/Licensed Practical Nurses/Graduate Practical Nurses identified by their Manager will be certified to administer oral chemotherapy drugs for cancer & non-cancer patients in accordance with the policy of the clinical unit.

Registered Nurses/Graduate Nurses/Registered Psychiatric Nurses identified by their Manager will be certified to administer injectable chemotherapy drugs for non-cancer patients in accordance with the policy of the clinical unit.

DATE: January 2013

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ACKNOWLEDGMENTS:

Adapted from learning packages Chemotherapy Drugs: Nursing Management of the Cancer Patient

Coordinated by:

Teresa Pidduck  Clinical Nurse Educator, Core, RUH

Special Thanks to:

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NOTE:

In January 2013 these two learning packages were combined and review questions were amended accordingly. No content was updated at this time.
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1.0 INTRODUCTION/GENERAL INFORMATION

This package provides the basic information necessary for the nurse to understand chemotherapy drug administration theory and nursing care.

Registered Nurses, Graduate Nurses, Registered Psychiatric Nurses, Licensed Practical Nurses, and Graduate Practical Nurses identified by the managers in designated practice settings, will be certified in administering chemotherapy drugs for which their unit & designation is targeted.

The Nurse will:
- Review the learning package and complete the review questions.
- Demonstrate the skill in administration of chemotherapy drugs as targeted.

2.0 THEORY

2.1 DEFINITIONS

Throughout the package reference will be made to the following terms:

Chemotherapy – a chemical agent used to treat diseases. The term usually refers to a drug used to treat cancer. Most chemotherapy drugs are highly toxic and considered to be carcinogenic, mutagenic &/or teratogenic. Most chemotherapy drugs are also cytotoxic meaning they are detrimental or destructive to cells within the body.

Cytotoxic Drugs – known to be highly toxic and considered to be carcinogenic, mutagenic, or teratogenic. They are known as chemotherapy or antineoplastics and are therapeutic agents, used primarily for the treatment of malignant disease.

Hazardous Drugs – cytotoxic and non-cytotoxic drugs that are considered to be carcinogenic, mutagenic or teratogenic. Many result in adverse reproductive outcomes and can cause organ toxicity at low doses.

Mutagenic – able to produce a permanent change in the genetic material of a cell. Also referred to as genotoxic.

Carcinogenic – able to cause the development of cancer.

Teratogenic – able to cause abnormalities in an embryo or fetus that may lead to birth defects.
2.2 INTRODUCTION TO CANCER THERAPY

2.2.1 How Do We Define Cancer?
Cancer has been described as a large group of malignant diseases with some or all of the following characteristics:

a) Abnormal cell proliferation
b) Lack of controlled growth and division that leads to the formation of tumors and to invasion of tissues close to tumor cells
c) Ability to metastasize to distant site(s) and establish secondary tumors.

Normal cells may undergo changes because of:

a) Spontaneous transformation
b) Exposure to chemical or physical carcinogens or biological agents such as viruses
c) Genetic alterations resulting in a cell with malignant properties

Grading and Differentiation
Differentiation is based on how closely tumor cells resemble normal cells in their structure and maturity. The higher the grade of differentiation, the more aggressive the tumor (with G4 being the highest grade).

Staging
Staging determines extent of disease. Solid tumor staging includes assessment for involvement of three factors:

a) TNM
   - T-tumor: The primary tumor is measured to determine the depth of invasion
   - N-nodes: Lymph nodes in the area of the primary tumor are examined for evidence of disease. Size, number and location are documented
   - M-metastasis: Studies determine if the primary tumor has spread to distant locations.

b) Hematological malignancies like lymphoma, leukemias and multiple myeloma are staged I – IV, I – early disease, IV – extensive disease.

c) Pediatric tumors are not always staged according to these criteria.

2.2.2 How Do We Treat Cancer?

a) Surgery
   - a local treatment that may remove all or a part of the primary tumor
   - may be the method of obtaining a pathology specimen
   - may be the only treatment required or may be preceded or followed by other treatment modalities
   - may also be utilized to alleviate or lessen intolerable symptoms.

b) Radiation therapy
   - a local treatment in which a beam is directed at a precise target
   - may follow surgery to prevent recurrence of the primary tumor
   - may follow chemotherapy when chemotherapy cannot be given in the doses needed for curative therapy
   - more effective in some diseases than others.

c) Chemotherapy
   - a systemic treatment involving the distribution of chemotherapy drugs throughout the body by the blood stream
   - may be used as a single drug or in combination and are limited by toxic effects on normal tissues.
hormonal therapies may have a tumoricidal effect in hormone sensitive tumors because of the reduction or blockage of the source of the hormone or the receptor site where the hormone is active

most chemotherapy drugs are used in the treatment of persons with cancer but they can also be used for non-oncology indications, such as rheumatoid arthritis, lupus, nephritis and multiple sclerosis

d) **Biotherapy/targeted agents**

- systemic treatment that may modify the patient’s immune defences
- may be combined with other treatment modalities
- may promote tumor regression and stimulate hematopoiesis.

### 2.2.3 How Does Chemotherapy Work?

Chemotherapy drugs inhibit tumor growth or kill tumor cells by interfering with the cell’s function and reproduction in a number of ways. They may bind to or damage DNA, interfere with cell growth or proliferation or with DNA syntheses, or may disrupt the growth and function of both healthy and diseased cells.

The malignant cell has lost control over its growth. It no longer responds to the same control mechanisms that a normal cell does. The cancer cell divides continuously causing the number of new cells to be greater than the number of cells lost, resulting in a tumor mass.

The tumor contains millions of cells that are at varying phases of the cell cycle. The effectiveness of the chemotherapy drug is dependent on how successful it is in altering or stopping the cell cycle.

The cell life cycle is a reproductive process occurring in both normal and malignant cells.

- **a) Gap 0 (G0) resting phase:** Cells are not actively proliferating. Cells in G0 phase are considered protected from exposure to many chemotherapeutic agents.
- **b) Gap 1 (G1):** Cells begin an active phase of reproduction with the synthesis of proteins and RNA.
- **c) Synthesis (S):** DNA is synthesized (most vulnerable phase)
- **d) Gap 2 (G2):** Further protein synthesis occurs and preparation for mitotic spindle
- **e) Mitosis (M):** Cell division occurs. This is the shortest phase of the cycle.

With each course of therapy, a dose of chemotherapy kills only a fraction of the cancer cells. Repeated courses of chemotherapy must be used to reduce the total number of cancer cells.

Chemotherapy should:

- affect as many phases of the cell cycle as possible including the resting phase
- be effective in the “S” phase where the cell is synthesizing DNA in preparation for division. The cell is most vulnerable in this phase
- recruit cells from the resting phase back into the cell cycle where they are more vulnerable
- maximize toxic effects on malignant cells and minimize toxic effects on normal cells

Drugs are classified according to pharmacological action or their effect on cell formation.

- **a) Cell-cycle or phase-specific drugs** exert effect within a specific phase of the cell cycle. These drugs have the greatest tumor-cell kill when given in divided but frequent doses, or as a continuous infusion with a short cycle time. Classifications include antimetabolites, plant alkaloids and miscellaneous agents.
b) All-cycle or **phase non-specific drugs** exert effect in all phases of the cell cycle, including the resting phase and are also effective in treating tumors with more slowly dividing cells. These drugs are given intermittently allowing for recovery from dose – limiting toxicities such as bone marrow suppression before the drug is repeated. Classifications include alkylating agents, anti-tumor antibiotics, hormonal therapies and nitrosureas.

### 2.3 CANCER THERAPY ROLES, USES, AND RESPONSES

#### 2.3.1 What are the Roles of Cancer Therapy?

- **a) Cure**
  - the desired outcome for all patients, but one that is not always achievable
  - refers to the prolonged absence of detectable disease/eradication of all cancer so the patient would have the same life expectancy as an individual without cancer
  - applies to highly-proliferative tumors treated with a single treatment modality or combined treatment modality (ie leukemias, Hodgkin’s Disease, lymphomas, testicular carcinoma, Ewings Sarcoma, Osteogenic Sarcoma, Neuroblastoma, etc)

- **b) Control**
  - an extension of life when cure is unrealistic thus prolonging survival
  - preventing the growth of cancer cells without complete elimination of the disease
  - applies to leukemia, lymphomas and many solid tumor cancers

- **c) Palliation**
  - comfort when supposed cure or control of the disease is impossible
  - reduction of side effects and tumor-related symptoms including pain

#### 2.3.2 How is Chemotherapy Used?

- **a) Adjuvant Therapy**
  - therapy following primary treatment modality such as surgery or radiation
  - targets minimum disease or micrometastases for patients at high risk of reoccurrence

- **b) Neoadjuvant Therapy**
  - use of chemotherapy prior to surgery or radiation to decrease tumor size and to make the tumor more responsive to therapy, to improve surgical removal and/or decrease the likelihood of micrometastases

- **c) Combination Therapy**
  - administration of two or more drugs to treat cancer to allow each drug to enhance the action of the other or to act synergistically with them (ie MOPP regime for Hodgkin’s disease consists of Nitrogen Mustard, Vincristine, Procarbazine and Prednisone).

- **d) Chemo prevention**
  - the use of selected drugs to prevent cancer in high-risk individuals (ie administration of tamoxifen to women whose history indicates they are at an increased risk of developing breast cancer).

- **e) Myeloablation**
  - administration of high-dose chemotherapy for obliteration of the bone marrow in preparation for peripheral blood stem cell or bone marrow transplantation.
2.3.3 How Do We Know the Chemotherapy is working?

Factors Affecting Response to Treatment

a) Tumor Burden
   - the number of tumor cells (the smaller the number of cells, the higher the response)

b) Rate of Tumor Growth
   - chemotherapy is most active against rapidly growing tumors

c) Combination vs Single-Agent Therapy
   - tumors have a number of different kinds of cells, therefore, a combination of agents with different mechanisms of action increases the proportion of cells killed at any one time
   - reduces the possibility of drug resistance
   - has minimally overlapping end organ toxicity
   - may use principle of synergy to maximize the effects of another drug

d) Dose Intensity
   - a reduction in the amount of time between standard doses of chemotherapy increases dose intensity and therefore can diminish tumor regrowth. Delays and dose reduction may have a negative impact on patient survival.

e) Use of Antihormonal Agents
   - some tumors grow more rapidly in the presence of a certain hormone
   - administration of an antihormonal agent can suppress that growth

f) Drug Resistance
   - tumor cells may be inherently resistant to chemotherapy drugs or develop resistance after exposure to the drug(s)
   - may be a temporary response
   - use of combination therapy can prevent development of drug resistance

Measuring Response

A tumor is assessed through surgical examination, physical examination, imaging studies and/or serum tumor markers

Categories of tumor response are:

- Complete response (CR) - absence of all signs and symptoms of cancer for at least one month
- Partial response (PR) - at least a 50% reduction of measurable tumor mass for one month without the development of new tumors
- Stable disease (SD) - a reduction in tumor mass of less than 50% or less than a 25% increase in tumor growth
- Progressive disease (PD) – growth of 25% or more or development of new tumors
- Relapse – after CR, a new tumor appears or the original tumor reappears
2.4 CHEMOTHERAPY FOR NON-CANCER TREATMENT

2.4.1 Ectopic pregnancy: Methotrexate Treatment

Why It Is Used
Methotrexate can be used to:
- End an early ectopic pregnancy.
- Prevent the growth of any embryonic or fetal cells that are left behind after surgery to end an ectopic pregnancy.

How It Works
Methotrexate stops the growth of rapidly dividing cells, such as embryonic, fetal, and early placenta cells.

During the week of the methotrexate injection, the pregnancy hormone levels (human chorionic gonadotropin, or hCG) are tested several times to determine continued treatment. The drop in hCG levels, is a sign that the pregnancy is ending (hCG levels sometimes rise during the first few days of treatment, then drop).

Methotrexate treatment is most likely to succeed:
- When the pregnancy hormone (hCG) levels are low (less than 5,000).
- During the first 6 weeks of pregnancy.
- When the embryo has no heart activity.

Administration
Methotrexate is typically given by I.M. injection. Two injection sites are sometimes used to administer one dose. This method increases absorption of all of the medicine.

Methotrexate can be given by mouth. But ectopic pregnancy treatment success rates are lower with oral use than with injections.

Side Effects
Severe side effects from methotrexate treatment are usually related to longer-term use, such as for cancer treatment. Using alcohol or certain medicines during treatment can also lead to severe methotrexate side effects.

Patients should completely avoid the following until treatment has finished:
- Vitamins containing folic acid, including prenatal vitamins
- Alcohol
- Penicillin

During treatment with methotrexate, patients should only use a non-steroidal anti-inflammatory drug (NSAID) for pain with doctor’s approval. NSAIDs can affect the level of methotrexate in the body.

Common side effects of methotrexate treatment for ectopic pregnancy include:
- Abdominal pain. Cramping abdominal pain is the most common side effect, and it usually occurs during the first 2 to 3 days of treatment. Because abdominal pain is also a sign of a ruptured ectopic pregnancy, report any abdominal pain to the doctor.
- Vaginal bleeding or spotting.
- Nausea, vomiting, and indigestion.
- Fatigue, light-headedness, or dizziness.
2.4.2 Autoimmune Diseases

Autoimmune disorders currently number more than 80 and have the potential for rising higher.

Autoimmune diseases are a group of diseases characterized by an abnormal and inappropriate immune system response that results in destruction to the body's own cells and tissues. The destruction may be specific against a specific organ (organ specific) or may involve several organs and/or systems (systemic). Four common types of autoimmune disorders and their chemotherapy treatments are: systemic lupus erythematosus (systemic), MS (organ specific), rheumatoid arthritis (systemic), and myasthenia gravis (organ specific).

2.4.3 Immunosuppression And Chemotherapy Treatment

The purpose of using antineoplastic chemotherapy treatment for non-malignant indications is to suppress the abnormal autoimmune response.

The destructive properties of chemotherapy drugs include the side effects of myelosuppression, anemia, thrombocytopenia, and especially neutropenia that result in immunosuppressive effect.

Considerations when patients are prescribed these drugs:

- Parameters of acceptable ranges of lab values, such as white blood count, hemoglobin, hematocrit, platelets, and neutrophils, liver enzymes, and renal indicators (creatinine and blood urea nitrogen), should be established or investigated before the administration of these immunosuppressive drugs.

See IV Reference Manual /CPS/Lexicomp for more information.
### 2.5 CLASSIFICATION OF ORAL CHEMOTHERAPY DRUGS FOR CANCER TREATMENT

<table>
<thead>
<tr>
<th>CLASSIFICATION/MECHANISM OF ACTION</th>
<th>MEDICATION NAMES</th>
<th>INDICATIONS</th>
<th>NURSING CONSIDERATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alkylating Agent</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cell cycle phase-nonspecific.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breaks the DNA strand, thereby interfering with DNA replication.</td>
<td>Altretamine, Busulfan, Chlorambucil, Cyclophosphamide, Melphalan, Temozolomide</td>
<td>Cancers: ovary, cervix, endometrial, testicle refractory anaplastic astrocytoma lung, breast leukemias Hodgkin's and non-Hodgkin's lymphoma multiple myeloma neuroblastoma retinoblastoma preparation for stem cell/bone marrow transplant bone marrow disorders Waldenstrom's macroglobulinemia Choriocarcinoma Burkitt's lymphoma Rhabdomyosarcoma Ewing's sarcoma</td>
<td>Alkylating agents can cause pulmonary toxicity. <em>Busulfan</em> – crosses blood/brain barrier and can cause seizures in high doses. Administer seizure prophylaxis. <em>Chlorambucil</em> – contraindicated in patients with seizure history and within one month of radiation and/or cytotoxic therapy. <em>Cyclophosphamide</em> – causes hemorrhagic cystitis. Give dose early in the day. Ensure adequate hydration. Have patient empty bladder frequently. An indwelling catheter may be necessary with high doses. When giving a high dose, administer with Mesna. Pelvic irradiation potentiates hemorrhagic cystitis. May cause a hypersensitivity reaction and can be toxic to the kidneys. To prevent nasal stuffiness and facial flushing, slow infusion. <em>Melphalan</em> – Myelosuppression may be delayed and prolonged.</td>
</tr>
<tr>
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</tr>
<tr>
<td>Nitrosourea</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cell cycle phase-non-specific.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breaks DNA helix &amp; interferes with DNA replication.</td>
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<tr>
<td>Antimetabolite</td>
<td></td>
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</tr>
<tr>
<td>Generally cell cycle phase-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capecitabine, Mercaptopurine</td>
<td>Cancers: Breast (metastatic), lung</td>
<td><em>Capecitabine</em> – Causes hand-foot syndrome. <em>Methotrexate</em> – Follow high doses with...</td>
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</tbody>
</table>
| specific with the majority of their activity during the S phase of the cell cycle. | Methotrexate Thioguanine Tegafur-uracil | • colon (metastatic) and other GI carcinomas  
• soft tissue sarcoma  
• esophagus, head & neck, testicular  
• osteogenic sarcoma  
• non-Hodgkin lymphoma  
• other lymphomas  
• leukemias  
Non-Cancer: (methotrexate)  
• psoriasis, rheumatoid arthritis | Leucovorin & vigorous hydration. Monitor serum methotrexate levels. Instruct patient on strict mouth care and photosensitivity precautions. Patient should not take multivitamins with folic acid. Causes nail changes, hand-foot syndrome and radiation recall. Can be toxic to the liver and kidneys and can cause pneumonitis. Can be given intrathecally. |
| Miscellaneous  
• Varied mechanisms.  
• Can be cell cycle phase-specific or non-specific. | Tretinoin (ATRA) Hydroxyurea Imatinib Mitotane Procarbazine | • Hematologic conditions  
• Hodgkin’s Disease  
• acute promyelocytic leukemia (APL)  
• GI stromal tumors  
• CML  
• malignant melanoma  
Cancers of:  
• Uterus  
• Cervix  
• Non-small cell lung  
• Brain  
• Head and neck  
• Renal cell  
• Ovaries  
• Prostate  
• Adrenal cortex  
Non-Cancer: (Hydroxyurea)  
• psoriasis, sickle-cell anemia | Hydroxyurea – dose needs to be adjusted according to blood counts but changing too frequently can result in response delay. Patients need strict mouth care. Lymphoma patients are at a higher risk of developing Tumor Lysis Syndrome.  
*Imatinib mesylate* – weigh patients OD and monitor fluid retention. Potency is affected by many other medications. May interact with warfarin. Monitor CBC, differential and liver function tests.  
*Procarbazine* – avoid foods high in tyramine (red wine, ripe cheese, yogurt, bananas). Can cause neurotoxicity. |
<table>
<thead>
<tr>
<th>Drug</th>
<th>Indication</th>
<th>Dosing/Route (for specific dose information see IV Medication Reference Manual, Lexicomp, or CPS)</th>
<th>Side Effects</th>
<th>Nursing Considerations</th>
</tr>
</thead>
</table>
| **Cyclophosphamide** (alkylating agent, typically with corticosteroid) | Proliferative lupus nephritis                                             | Given IV once a month                                                                         | Nausea/vomiting (high, level 4, 60-90%), Hemorrhagic cystitis, Myelosuppression, Gonadal toxicity, Alopecia, Teratogenicity, & Secondary malignancies   | - Pre-medications: Antiemetics: combination of corticosteroid and 5HT3 antagonist  
  - Baseline & prior to each dose/cycle: CBC with diff., platelet count, electrolytes, serum creatinine  
  - Pre & post dose hydration to promote good urine output. Administer as early in day as possible to decrease metabolites remaining in bladder overnight.  
  - For doses greater than 600mg/m2, wake non-catheterised pts to empty bladder every 2 hours for the first 24 post treatment.  
  - Consider administration with Mesna (a chemoprotectant).  
  - Delayed nausea and vomiting management; ongoing long-term screening for malignancy, infertility |
|                                          | Refractory multiple sclerosis with overall good health status, off-label   | Pulse dosing IV monthly reduces toxicity and should be reduced if evidence of renal dysfunction (reduced creatinine clearance). |                                                                                                                                                                                                           |                                                                                                                                                                                                                    |
|                                          | Rheumatoid arthritis, off-label                                           | Given orally or IV monthly for 6 months then every 2-3 months.                                 |                                                                                                                                                                                                           |                                                                                                                                                                                                                    |
| **Chlorambucil** (alkylating agent of the nitrogen mustard type) | Rheumatoid arthritis, off-label                                           | Given orally                                                                                   | Myelosuppression, hepatotoxicity, pulmonary fibrosis, peripheral neuropathy                                                                                                                                | - Premedication: None  
  - CBC with diff., liver function/enzymes, pulmonary function,  
  - Neuropathic dysfunction that affects safety and activities of daily living                                                                                                                                     |
<table>
<thead>
<tr>
<th>Drug</th>
<th>Indication</th>
<th>Dosing/Route (for specific dose information see IV Medication Reference Manual, Lexicomp, or CPS)</th>
<th>Side Effects</th>
<th>Nursing Considerations</th>
</tr>
</thead>
</table>
| Mitoxantrone                           | Multiple sclerosis, FDA-approved to reduce neurological disability and/or frequency of relapses. | Given IV every 3 months with a maximum lifetime cumulative dose of 140 mg/m².                 | Cardiotoxicity (ejection fraction reduction), alopecia, myelosuppression, nausea and vomiting (moderate 30-60%), risk of leukemia | - Premedications: Antiemetics: combination of corticosteroid, 5HT3 antagonist.  
- Pre-treatment cardiac screening, EKG, CBC with diff.  
- Long-term screening for malignancy  
- Delayed nausea and vomiting management. |
| Methotrexate                           | SLE arthritis, serositis, cutaneous, and constitutional symptoms           | Given orally or IM every week                                                                  | Mucositis, stomatitis, renal and liver, myelosuppression, nausea and vomiting (low, level 2, 10-30%) | - Premedications: Antiemetics: single or combination of corticosteroid, metoclopramide and/or phenothiazide  
- Oral assessment  
- Baseline CBC with diff, platelet, serum creatinine and bilirubin and with each dose/cycle.  
- Consider leucovorin as renal protectant  
- Delayed nausea and vomiting management. |
| Ectopic Pregnancy                      |                                                                             | Given IM as a single dose. A second dose may be required.                                       |                                           |                                                                                        |
| Psoriasis                              |                                                                             | Given IV weekly until optimal response achieved.                                               |                                           |                                                                                        |
| Secondary progressive multiple sclerosis, off-label |                                                                             | Given orally weekly to provide some benefit in slowing the progression of dysfunction          |                                           |                                                                                        |
| Rheumatoid arthritis                   |                                                                             | Given every 12 hr for 3 doses per week orally then weekly. The onset of action may take 3-6 weeks. |                                           |                                                                                        |
2.7 FUNDAMENTALS OF ADMINISTERING/PRINCIPLES OF SAFE HANDLING

2.7.1 What are the Routes of Administration of Chemotherapy Drugs?

<table>
<thead>
<tr>
<th>ROUTE</th>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
<th>COMPLICATIONS</th>
<th>NURSING IMPLICATIONS</th>
</tr>
</thead>
</table>
| Oral                 | • Ease of administration                        | • Inconsistency of absorption         | • Drug-specific complications | • Age specific concerns  
|                      |                                                  |                                      |                        | • Patient education  
|                      |                                                  |                                      |                        |   • compliance  
|                      |                                                  |                                      |                        |   • techniques for handling drugs |
| Topical              | • For use in dermatologic conditions            | • Risk of exposure                    | • Drug-specific complications | • Patient education  
|                      |                                                  |                                      |                        |   • technique for safe application  
|                      |                                                  |                                      |                        |   • Use of proper precautions as it is applied externally |
| Subcutaneous/        | • Ease of administration                        | • Requires adequate muscle mass and   | • Infection  
| Intramuscular        | • Decreased side effects                        | tissue for absorption                 | • Bleeding  
|                      |                                                  | • inconsistent absorption             | • Pain            | • Monitor platelet count & ANC  
|                      |                                                  |                                      |                        | • Use smallest gauge needle possible  
|                      |                                                  |                                      |                        | • Prepare injection site with an antiseptic solution  
|                      |                                                  |                                      |                        | • Assess injection site for signs and symptoms of infection |
| Intravenous          | • Consistent absorption                         | • Sclerosing of veins over time       | • Infection  
|                      |                                                  | • Requires nursing time               | • Phlebitis      | • Check for blood return before, during and after drug administration |
|                      |                                                  |                                      | • Infiltration |                                             |
2.7.2 How is the Appropriate Dose Determined?

Why is it necessary to verify the chemotherapy dose?

- the goal of chemotherapy is to minimize normal tissue toxicity while eradicating the cancer cells
- patients have varying responses to chemotherapy drugs
- chemotherapy drugs typically have a lower therapeutic index than other pharmacological agents. This is significant because the difference between an under-dose and an over-dose is small and the consequences can be life threatening
- therefore, it is important that we do everything possible to ensure the safety and well being of the patient receiving chemotherapy
- verification of chemotherapy dose is a critical step in chemotherapy administration

How do I know that the chemotherapy dose is correct?

- the method that is used depends on the patient
- milligrams per kilogram is the method most commonly used in children younger than the age of one or weighing less than 10 kg
- in most other cases, chemotherapy is usually dosed by the square meter of body surface area or the BSA. BSA has been chosen rather than body weight as the basis for calculation for two reasons.
  1. BSA provides a more accurate comparison of activity and toxicity for certain drugs
  2. BSA can be more closely correlated with cardiac output, which determines the blood flow to the liver and kidneys, thus influencing drug elimination.

How do I calculate the BSA?

- in Saskatoon Health Region, all BSA calculations (unless otherwise indicated) are based on the formula of Mosteller

\[
BSA \ (\text{or m}^2) = \sqrt{\frac{\text{height (cm)} \times \text{weight (kg)}}{3600}}
\]

- you need the patient’s actual, not stated, body weight and height for this calculation
- BSA should be re-calculated to adjust dosing when the actual body weight has changed by greater than 5-10%
- The side effects of chemotherapy and disease progression may have a significant impact on the patient’s body weight.

Are there other factors to consider when determining the chemotherapy dose?

- for patients who are clinically obese (i.e. 30% overweight) or have an abnormal accumulation of fluids (i.e. ascites), an ideal body weight may be preferred for the BSA (versus the actual body weight). This is determined by the physician.
• there are several specific individual drugs that have their own formula for determining the appropriate dose
• a creatinine clearance calculation may be required for the administration of specific drugs or for individuals who have impaired renal function
• there are many other laboratory values that may impact drug dose (i.e. WBC, platelets, etc.)
• cachexia, altered liver function, possible drug interactions and age of the individual (i.e. children or the elderly) are all factors that may alter the chemotherapy dose

What is the procedure for determining the correct chemotherapy dose?

Documentation on the medication administration record will reflect that two "chemotherapy certified" nurses completed this procedure (i.e. two signatures).

1. Obtain and document the patient’s current height and weight.
2. Calculate BSA
   NOTE: For pediatric patients weighing less than 10 kg, calculate the dose using mg/kg
3. Calculate the dose using the BSA method.
4. Multiply the value calculated above by the prescribed unit dose that is written on the original physician’s order sheet. Do not refer to a photocopy. This confirms that the dose is appropriate for the patient.
5. Compare this value with the information provided in the CPS, drug product monograph or other approved reference that describes the chemotherapy regimen. This confirms that the dose is appropriate for the drug.
6. If there is a discrepancy, notify the pharmacist (and physician if a new order or further clarification is required). Ensure that you document this communication in the nurse’s notes.
7. Proceed with chemotherapy administration procedure only after you have verified that the chemotherapy dose is correct.

Example

Mrs Gray is a 50yr old Female who is undergoing concurrent Radiation therapy and Chemotherapy, for treatment of her Glioblastoma Multiforme. Dr Ventricle has ordered Temozolomide 75mg/m² PO OD starting on day 1 of treatment. Mrs Gray weighs 90kg and is 155cm tall.

Calculate Mrs Gray’s BSA (show calculations):

\[
BSA = \sqrt{\frac{155 \times 90}{3600}}
\]

\[
90kg \times 155cm \div 3600 = 3.87
\]

\[
\sqrt{3.87} = 1.96 \text{ m}^2
\]

What is Mrs Gray’s Dose of Temozolomide??

1.96m² X 75mg/m² = 147 mg

What will be Mrs Gray’s actual dose based on the tablet strengths available: 5mg, 20mg, 100mg, 140mg, 180mg, 250mg (round dose to nearest 5mg)??

1 – 140mg and 1 – 5mg tablets
2.7.3 Why do we need to handle chemotherapy drugs safely?

Many drugs used in the treatments of cancer are considered to be hazardous to healthcare workers. These drugs require special handling because of their potential health risks.

Occupational exposure to hazardous drugs can occur when safe handling measures fail or when they are not used.

Nurses can be exposed during drug transport, administration, during the disposal process, when handling patient excreta, and in the event of spills.

Points of exposure can include inhalation of aerosols and drug particles, absorption of drugs through direct contact with skin or mucous membrane, ingestion through contaminated food, beverage or other hand to mouth behaviour, injection through accidental needle stick, or drug vaporization.

Potential occupational health risks of chemotherapy drugs include:

a) the drug being a probable or possible carcinogen
b) exposure during pregnancy may cause defects in fetuses, adverse reproduction outcomes (ie spontaneous abortions)
c) toxicity to skin, mucous membranes, corneas or organs
d) chromosomal damage
e) acute symptoms from accidental exposure (ie headaches, nausea, dizziness, irritation).

Safe levels of occupational exposure to hazardous agents cannot be determined and no reliable method of monitoring exposure exits.

It is imperative that those who work with hazardous drugs adhere to practices designed to minimize occupational exposure.

2.7.4 What do I need to do to protect myself?

The use of Personal Protective Equipment (PPE) is one of the best ways for healthcare workers to prevent occupational exposure to hazardous drugs. PPE can be defined as gloves, gowns, respirators as well as eye and face protection.
### PERSONAL PROTECTIVE EQUIPMENT (PPE)

<table>
<thead>
<tr>
<th>PROTECTIVE EQUIPMENT</th>
<th>ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NON-STERILE NITRILE GLOVES</strong></td>
<td>ADMINISTRATION – all routes</td>
</tr>
<tr>
<td></td>
<td>▪ wear 2 pairs with topical administration</td>
</tr>
<tr>
<td></td>
<td>SPILL CLEAN-UP</td>
</tr>
<tr>
<td></td>
<td>▪ wear 2 pairs</td>
</tr>
<tr>
<td></td>
<td>WASTE DISPOSAL</td>
</tr>
<tr>
<td></td>
<td>PATIENT CARE – when in potential contact with</td>
</tr>
<tr>
<td></td>
<td>body fluids</td>
</tr>
<tr>
<td><strong>GOWNS</strong></td>
<td>ADMINISTRATION – all routes except oral capsules</td>
</tr>
<tr>
<td></td>
<td>or tablets</td>
</tr>
<tr>
<td></td>
<td>SPILL CLEAN-UP</td>
</tr>
<tr>
<td></td>
<td>▪ use disposable gown in spill kit</td>
</tr>
<tr>
<td></td>
<td>WASTE DISPOSAL</td>
</tr>
<tr>
<td></td>
<td>PATIENT CARE – when in potential contact with</td>
</tr>
<tr>
<td></td>
<td>body fluids</td>
</tr>
<tr>
<td><strong>FACE/EYE PROTECTION</strong></td>
<td>ADMINISTRATION – all routes except oral capsules</td>
</tr>
<tr>
<td></td>
<td>and tablets</td>
</tr>
<tr>
<td></td>
<td>SPILL CLEAN-UP</td>
</tr>
<tr>
<td></td>
<td>▪ always wear face protection</td>
</tr>
<tr>
<td></td>
<td>WASTE DISPOSAL</td>
</tr>
<tr>
<td></td>
<td>PATIENT CARE – when in potential contact with</td>
</tr>
<tr>
<td></td>
<td>body fluids</td>
</tr>
<tr>
<td><strong>RESPIRATORS</strong></td>
<td>SPILL CLEAN-UP</td>
</tr>
<tr>
<td></td>
<td>surgical masks do not provide respiratory protection</td>
</tr>
<tr>
<td></td>
<td>halfmask respirator with HEPA filter</td>
</tr>
<tr>
<td></td>
<td>the mask must meet or exceed the following criteria:</td>
</tr>
<tr>
<td></td>
<td>▪ ability to filter particles one micron in size</td>
</tr>
<tr>
<td></td>
<td>▪ has a 95% filter efficiency, tested in the unloaded</td>
</tr>
<tr>
<td></td>
<td>state</td>
</tr>
<tr>
<td></td>
<td>▪ be suitable for prolonged usage</td>
</tr>
<tr>
<td></td>
<td>▪ ability to fit different facial sizes</td>
</tr>
<tr>
<td><strong>SHOE COVERS</strong></td>
<td>SPILL CLEAN-UP</td>
</tr>
</tbody>
</table>

- inspect gloves for defects and pinhole leaks before use
- powder-free gloves are preferred because the powder may absorb contaminants, leading to aerosolization and increased risk of touch contamination
- gloves must be changed at least hourly or immediately if contaminated, torn, or punctured
- wash hands with soap and water after removal of gloves
- disposable, low permeable, long-sleeved gown with knit cuffs and back closure
- change the gown everytime it is contaminated, between patients and when gloves are changed
- eye/face protection must be worn when there is a hazard of eye contact
- for drug administration work below eye level to reduce the likelihood of eye and facial splashing
- use eye wash facilities in the event of splash to the eyes
- surgical masks do not provide respiratory protection
- halfmask respirator with HEPA filter
- the mask must meet or exceed the following criteria:
  ▪ ability to filter particles one micron in size
  ▪ has a 95% filter efficiency, tested in the unloaded state
  ▪ be suitable for prolonged usage
  ▪ ability to fit different facial sizes
- SPILL CLEAN-UP
2.7.5 What Are Safe Handling Considerations During Administration of Chemotherapy Drugs?

a) Always wear PPE.
b) Work below eye level.
c) Ensure that a spill kit and hazardous waste container are available.
d) Place a disposable, plastic-backed absorbent pad underneath the work area or oral syringe to absorb droplets of the drug that may spill.
e) Always wear gloves when handling tablets or capsules with the assumption that exposure is possible. Whenever possible, oral chemotherapy drugs to be compounded or crushed must be prepared in a biological safety cabinet and Pharmacy will prepare liquid formulations for administration through feeding tubes. In rare circumstances when this is not possible (due to stability issues, for example), follow the policy for crushing and making liquid formulations on the nursing unit.

Note: To dissolve a tablet or capsule, place the medication in a capped “Dissolve-a-Dose” tube and add diluent (sterile water or saline). Securely attach cap and mix gently until medication is dissolved. Open the small outer cap and attach an oral syringe and withdraw the entire contents of the tube. For enteric coated tablets, contact Pharmacy as above.

Note: To crush a dose that can’t be dissolved (ie. coated tablet), place the tablet(s) into an oral syringe and replace the plunger. Draw 0.5-1 ml of water into the syringe to “wet” the tablet. Place a cap on the syringe and turn the plunger with a grinding motion to create a course powder. Draw several mls of water into the syringe and let the medication dissolve for several minutes. Shake periodically. Administer.

f) Use detergent supplied in spill kit and water to wash surfaces that have come in contact with chemotherapy drugs.
g) Discard all contaminated material and disposable PPE in the appropriate chemotherapy waste container.
2.8 MANAGING SIDE EFFECTS

- all cancer therapies can cause side effects or toxic effects on normal tissue
- combined modality has potential for more side effects than single modality
- side effects when severe can limit therapy
- side effects can be exacerbated by:
  a) impaired renal or hepatic function
  b) comorbid conditions
  c) protein-calorie malnutrition
  d) age (infants & elderly)
- normal tissues affected by chemotherapy drugs are those with high growth fractions:
  a) bone marrow
  b) mucosal cells of the GI tract
  c) hair follicles and skin
  d) organs of the reproductive system
- educating the patient about the side effects can help in their prevention and management
- specific chemotherapy drugs can cause cardiac, pulmonary, hepatic, ocular, renal and neural toxicities as well as hemorrhagic cystitis and pancreatitis, sometimes months after therapy. These systems must be monitored before, during and after drug administration.
- Patients who received chemotherapy drugs for ovarian cancer, pediatric cancers, Hodgkin’s disease, lymphoma, testicular cancer and stemcell/bone marrow transplants are at a higher risk of developing secondary malignancies (usually leukemia) months to years after treatment for primary cancer.

2.8.1 BONE MARROW TOXICITIES

Definitions:

Myelosuppression – suppression of bone marrow activity. Most common dose-limiting side effect and can be the most lethal toxicity.

Nadir – after chemotherapy, the point at which the lowest blood cell count is reached. It usually occurs 7 – 10 days after treatment. Platelets & WBC counts are the first to drop depending on the drug(s) used.

(Continued on next page)
<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>RISKS/MANIFESTATIONS</th>
<th>MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEUTROPENIA</td>
<td>abnormally low white blood count (WBC’s).</td>
<td>Life threatening infections</td>
</tr>
<tr>
<td></td>
<td>chemotherapy decreases the neutrophil count as mature neutrophils die and are not replaced</td>
<td>Prolonged hospital stays</td>
</tr>
<tr>
<td></td>
<td>Normal WBC count is 4 – 11 x 10^9/L</td>
<td>Dose reductions &amp;delays</td>
</tr>
<tr>
<td></td>
<td>Absolute Neutrophil Count (ANC) is less than 1. An ANC less than .5 is profound neutropenia. (Normal ANC is 1.5 – 7.5 x 10^9/L)</td>
<td>Fever greater than or equal to 38°C is often the only sign of infections in neutropenic patients</td>
</tr>
<tr>
<td></td>
<td>differentiation from immature cell to neutrophil takes 7-14 days</td>
<td>Common sites of infection are:</td>
</tr>
<tr>
<td></td>
<td>WBC lifespan = 7-12 hours – 3 days</td>
<td>GI tract – mucositis</td>
</tr>
<tr>
<td></td>
<td>Neutrophil lifespan = 7-12 hours</td>
<td>Resp. tract – fever, cough, dyspnea on exertion &amp; adventitious breath sounds</td>
</tr>
<tr>
<td></td>
<td>example to calculate ANC: WBC = 1.6; Polys = 48; Bands = 5</td>
<td>Urinary tract – fever, dysuria, frequency, hematuria &amp; cloudy urine</td>
</tr>
<tr>
<td></td>
<td>1. polys + bands 48 + 5 = 53</td>
<td>Indwelling devices (CVCs) – fever erythema, pain or tenderness edema, drainage &amp; induration at the site</td>
</tr>
<tr>
<td></td>
<td>2. convert to percentage, 53 + 100 = .53 or 53%</td>
<td>Skin &amp; mucous membranes – erythema, tenderness, hot skin &amp; edema</td>
</tr>
<tr>
<td></td>
<td>3. multiply WBC count by percentage</td>
<td>Septic shock associated with neutropenia has a high mortality rate</td>
</tr>
<tr>
<td></td>
<td>1.6 x 0.53 = 0.848</td>
<td></td>
</tr>
</tbody>
</table>

| ANEMIA | abnormally low RBC and hemoglobin (Hgb). Normal Hgb is 110 – 160 g/L | fatigue, exercise intolerance | identify the underlying cause |
| | a typical RBC survives 90-120 days | dizziness, headaches, irritability | treat hypoxia – erythropoietin injections, oxygen administration, encourage rest |
| | anemia occurs later after chemotherapy than neutropenia or thrombocytopenia | difficulty sleeping and concentrating | RBC transfusions with decreased HCT and/or Hgb, or with cardiopulmonary symptoms. If patient is immunocompromised, may need to administer irradiated packed red cells. |
### Thrombocytopenia

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Risks/Manifestations</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effects of chemotherapy decreases platelet production and it usually occurs with neutropenia</td>
<td>Myelosuppressive chemotherapy, radiation therapy or combination of the two, disease of bone marrow, DIC, elevated temperature leading to platelet destruction, concomitant disease (ie liver cirrhosis, diabetes mellitus, infection, sepsis, scleroderma, lupus, aplastic anemia), nutrition deficiencies (ie vitamin B12, folate), drug therapy known to affect platelet function, petechiae, overt bleeding (gums, epistaxis, GI, urinary tract), hematomegaly, splenomegaly, hypotension or tachycardia in adults, platelet count less than 50 indicates a moderate risk of bleeding and less than 15, severe risk for spontaneous hemorrhage</td>
<td>Bleeding precautions when platelet count ≤ 50, decrease activity to prevent injury and maintain a safe environment, maintain the integrity of the skin (use electric razors, do not use tourniquets, minimize invasive procedures, no IM or SC injections), maintain the integrity of mucous membranes and discourage dental care and flossing, maintain the integrity of the genitourinary tract (increase hydration and avoid catherization), maintain the integrity of the GI tract (take medications with food, especially those irritating to the GI tract, prophylactic stool softeners and stimulants, avoid enemas, suppositories and harsh laxatives), maintain optimal nutritional status (increasing protein and encourage a soft diet), avoid all medications that can cause bleeding, when patient is febrile, administer platelets when count is less than 20, otherwise administer them when count is less than 10 or when patient is symptomatic as ordered</td>
</tr>
</tbody>
</table>

### Gastrointestinal Toxicities

- Chemotherapy drugs affect the GI mucosa which could lead to nausea and vomiting, anorexia, diarrhea or constipation

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Risks/Manifestations</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nausea &amp; vomiting</td>
<td>Discomfort, delay in treatment, decreased quality of life, metabolic disturbances, anorexia or weight loss, physical debilitation</td>
<td>Administer antiemetics prophylactically or as required to manage symptoms, replace fluid and electrolytes, music therapy, exercise, acupuncture, behavioural interventions such as self-hypnosis and progressive muscle relaxation</td>
</tr>
</tbody>
</table>
### Cutaneous and Mucosal Toxicities

<table>
<thead>
<tr>
<th>Condition</th>
<th>Symptoms</th>
<th>Risks/Manifestations</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mucositis/ Stomatitis</td>
<td>changes in taste and ability to swallow</td>
<td>can be life threatening</td>
<td>encourage the use of oral agents to promote cleansing, prevent infection, moisturize the oral cavity, maintain mucosal integrity and promote healing</td>
</tr>
<tr>
<td>Mucositis – inflammation of the mucosa</td>
<td>pain when swallowing or talking</td>
<td>can be exacerbated by leucopenia and thrombocytopenia</td>
<td>administer systemic pain medications</td>
</tr>
<tr>
<td></td>
<td>hoarseness or decreased</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Condition: Stomatitis – inflammation of the oral cavity

### Symptoms
- voice strength
  - erythema, white patches, ulcerations, edema
  - changes in oral moisture

### Risks/Manifestations
- can cause delay in treatment

### Management
- culture lesions so appropriate antimicrobial agents are prescribed
- use soft toothbrush or toothette
- encourage meticulous oral hygiene
- avoid irritating agents like commercial mouthwashes, spicy foods, alcohol, tobacco, poorly fitting dentures and lemon-glycerin swabs

## Condition: Alopecia - hair loss due to damage to hair shaft or root

### Symptoms
- loss of scalp hair, male beard, hair of the eyebrows, axilla, pubis, eyelashes and fine hair
- not all chemotherapy drugs cause alopecia

### Risks/Manifestations
- can be traumatic for patients that they might consider refusing therapy

### Management
- education about time frame of hair loss and regrowth
- need to protect scalp from cold and sun
- gentle hair care
- local resource for support (wig/scarf salons, support services)

## Condition: Cutaneous Reactions

### Symptoms
- erythema, urticaria, itching, hyperpigmentation, tingling, pain, photosensitivity, telangiectasis (veins appear as eruptions under the skin)
- hand-foot syndrome - painful burning and tenderness of palms and soles with ulceration a possibility. May be dose-limiting

### Risks/Manifestations
- ulceration, infection

### Management
- if reaction severe, treatment with that agent may need to be stopped
- skin care
- pain management
- adequate hydration
- cold compress
- proper protection from sun

### Causes
- biochemical – changes in the production and balance of muscle proteins, glucose, electrolytes and hormones
- deconditioning – decreased daily energy expenditure and bed rest
- stress – physiologic, psychological, or situational factors influence an individual’s resistance and

### Risks/Manifestations
- poor nutrition
- immobility
- insomnia
- stress
- emotional distress, i.e. depression, anxiety

### Management/Patient Education
- evaluate the ability to perform activities of daily living and encourage patients to balance exercise, rest and energy – enhancing activities
- correct the causes (dehydration, anemia, electrolyte imbalances, oxygenation, hypothyroidism)
- encourage patients or family to re-organize activities and work schedules to decrease low priority activities

---

**2.8.4 FATIGUE** – a persistent, subjective sense of tiredness related to cancer or cancer treatment that interferes with usual functioning.
### CAUSES
- response to stress
  - anemia
- treatment related surgery, chemotherapy, radiation and biotherapy
  - anorexia, cachexia, poor nutrition intake and weight loss
- quality of sleep and rest
- chronic or uncontrolled comorbid conditions such as pain or nausea and vomiting
- psychological factors: depression, anxiety, lack of motivation and social support, financial concerns, cultural beliefs and altered coping mechanisms
- loss or decline in the capacity to direct attention
- biological – age, gender, genetics, allergies
- environmental – noise, temperature, lighting

### RISKS/MANIFESTATIONS
- anemia
- comorbidities
- hypoxia
- infection and/or fever
- pain
- cancer therapy

### MANAGEMENT/PATIENT EDUCATION
- evaluate medications that may be contributing to fatigue
- nutritional, rehabilitation or physiotherapy consult
- psychiatric consult
- collaborate with health team to reduce demands, especially on pediatrics
- encourage patients/families to set goals based on realistic abilities and limitations
- an activity-fatigue journal can determine patterns
- aerobic exercises regularly if not contraindicated
- regular sleep schedule including rest periods
- energy-enhancing activities (i.e. relaxation, visualization)
- maintain dietary intake
- maintain a comfortable home temperature
- patients should report changes in energy levels to their health care provider

## 2.8.5 SEXUAL & REPRODUCTIVE FUNCTION

### SYMPTOMS
- chemotherapy affects gonadal tissue and presents a risk of infertility
  - includes ovarian failure and symptoms of menopause in women and azoospermia (absence of sperm) in men
  - in children, also seen is delayed or arrested puberty and primary or secondary amenorrhea
- type of malignancy and its effect on reproductive organs and other body systems
  - specific cytotoxic drugs
  - concurrent medication with sedatives, antihypertensives, antidepressants and opioids
  - other treatment modalities (i.e. surgery or radiation to testes or cranium)
  - age and developmental stage
  - prior surgeries
  - prior radiation to the pelvis
  - hormonal therapy
  - fatigue, chronic diseases, pain
  - depression and/or psychosocial stressors
  - manifests as sexual and reproductive dysfunction in women and men

### RISKS /MANIFESTATIONS
- hormonal and non-hormonal agents as intervention for managing symptoms associated with estrogen deficiency
- monitoring hormone levels especially in men treated for Hodgkin’s disease as children. Testosterone levels and bone mineral density can decrease over time.
- semen analysis to evaluate fertility
- monitor thyroid function and chronic illnesses as they can affect reproductive function
- many medications may interfere with men’s sexual functioning
- provide information regarding contraception to prevent pregnancy and peer support groups
- explore fertility options prior to the initiation of cancer treatment
- reinforce the importance of having regular follow-up visits with their physician
### 2.9 ONCOLOGIC EMERGENCIES

- Oncologic complications occur frequently in patients with cancer.
- May be a direct result of the disease or as a result of treatment.
- Acute and life threatening and often requires critical care intervention.
- Divided into metabolic and structural complications.
- Treated aggressively in cases when the potential exists for a cure or prolonged survival.
- Palliative treatment to reduce symptoms and restore functional status may be given in advanced disease.
- Overall goal is to prevent, reverse or minimize life-threatening oncologic complications through prophylaxis, early detection and effective management.
- Key concepts include ongoing assessment, the identification of patients at risk of developing an oncologic complication and involvement of the family and significant others.
### 2.9.1 ONCOLOGIC EMERGENCIES – Structural

<table>
<thead>
<tr>
<th>CONDITION/DEFINITION</th>
<th>SIGNS/SYMPTOMS</th>
<th>MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Increased Intracranial Pressure</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Intracranial hypertension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- the volume of any of the 3 components within the skull and meninges is increased</td>
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<td></td>
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<tr>
<td>- includes the brain, CSF, and cerebral blood tissue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- headache</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- nausea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- vomiting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- change in LOC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- dysphagia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- ataxia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- seizures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- hemiparesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- corticosteroids can decrease peritumoral edema</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- osmotic diuretics (mannitol) may decrease cerebral edema</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- anticonvulsants are given to manage seizures when appropriate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- surgery is needed for the patient with life threatening increased intracranial pressure. A shunt can provide drainage of CSF and relief of symptoms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- craniotomy may be necessary for resection of tumor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- radiation and chemotherapy used to treat brain metastases and primary tumors that can cause increased intracranial pressure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **Superior Vena Cava (SVC) Obstruction** | | |
| - obstruction of the venous flow through this vessel results in impaired venous drainage, with engorgement of the vessels from the head and upper body torso |
| - as pressure rises, blood is shunted to collateral venous pathways. |
| - commonly caused by lung cancer, lymphomas or metastatic disease of breast cancer. |
| - dyspnea, tachypnea, cough, orthopnea |
| - feeling of fullness in the head with facial swelling and periorbital edema |
| - headache, visual disturbances |
| - chest pain, dizziness, hoarseness |
| - engorgement of veins across upper torso, swelling of trunk and upper extremities |
| - tachycardia |
| - radiation therapy |
| - chemotherapy is effective primary treatment for small cell lung cancer, lymphoma or a germ cell tumor |
| - stent placement |
| - surgical bypass of the SVC |
| - oxygen therapy |
| - anticoagulant prophylaxis |
| - steroids to reduce inflammation |
| - diuretics may be used to reduce edema of the head and neck but cautiously because venous return to heart is already low |
| - elevate and support upper body and extremities |

| **Cardiac Tamponade** | | |
| - the compression of the cardiac muscle by pathologic fluid accumulation under pressure within the pericardial sac. |
| - compression of the myocardium interferes with dilation of the heart chambers, which prevents adequate cardiac filling during |
| - apprehension, anxiety |
| - ECG changes |
| - tachycardia |
| - decreased systolic blood pressure and increased diastolic pressures |
| - thready, diminished pulse pressure |
| - cool, clammy extremities |
| - CXR |
| - ECG |
| - echocardiogram |
| - bloodwork, arterial blood gases |
| - oxygen therapy |
| - supportive drug therapy (i.e. lasix, prednisone, aldactazide) |
| - IV therapy (i.e. volume expansion, blood products) |
| - hemodynamic support |
| - pericardiocentesis |
## 2.9.2 ONCOLOGIC EMERGENCIES – Metabolic

<table>
<thead>
<tr>
<th>CONDITION/DEFINITION</th>
<th>SIGNS/SYMPTOMS</th>
<th>MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tumor Lysis Syndrome (TLS)</td>
<td>Early Signs:</td>
<td>identify patients at risk for TLS</td>
</tr>
<tr>
<td>• occurs with rapid lysis of malignant</td>
<td>• nausea</td>
<td>initiate hydration prior to initiating chemotherapy drugs</td>
</tr>
<tr>
<td>cells which can quickly lead to fatal</td>
<td>• vomiting</td>
<td>administer sodium bicarbonate before and during chemotherapy drugs to</td>
</tr>
<tr>
<td>renal, cardiac and neurologic</td>
<td>• anorexia</td>
<td>maintain alkaline urine</td>
</tr>
<tr>
<td>complications</td>
<td>• diarrhea</td>
<td></td>
</tr>
<tr>
<td>• leads to altered tissue perfusion</td>
<td>Later Signs:</td>
<td></td>
</tr>
<tr>
<td>• causes hyperkalemia, hyperphos-</td>
<td>• muscle weakness</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### CENTER/DEFINITION
- diastole.
  - reduces blood flow to the ventricles and reduces stroke volume resulting in decreased cardiac output.

### SIGNS/SYMPTOMS
- increased central venous pressure
- changes in heart or lung sounds
- jugular venous distension
- chest pain
- diaphoresis
- dyspnea/tachypnea
- cough
- nausea, vomiting

### MANAGEMENT
- pericardiectomy
- radiation therapy
- chemotherapy
<table>
<thead>
<tr>
<th>CONDITION/DEFINITION</th>
<th>SIGNS/SYMPTOMS</th>
<th>MANAGEMENT</th>
</tr>
</thead>
</table>
| phatemia, hypocalcemia and hyperuricemia | - muscle cramping  
- tetany  
- paresthesia  
- convulsions  
- anuria  
- cardiac arrest | hyperuricemia  
- diuretics may be ordered to prevent volume overload  
- monitor lab values  
- renal dialysis when these measures are not successful |
| **Malignant pleural effusion**  
- abnormal accumulation of fluid in the pleural cavity resulting from an altered balance between secretion and re-absorption.  
- debilitating and life-threatening, affecting respiratory function by restricting lung expansion, decreasing lung volume and altering gas exchange. | - dyspnea, tachypnea, dry-non productive cough  
- chest pain or heaviness  
- anxiety, fear of suffocation  
- malaise, weight loss  
- diminished or absent breath sounds over affected area  
- pleuritic rub over affected area on auscultation | oxygen therapy  
- chemotherapy is effective for effusions from small cell lung cancer, lymphoma, breast and ovarian cancer  
- radiation therapy is effective for lymphoma or mediastinal lymphadenopathy from lung cancer  
- chest tube drainage of effusion fluid  
- thoracentesis  
- pleurodesis – chemical sclerosing of the two pleural membranes with agents such as doxycycline, bleomycin, and t alc  
- a pleurectomy is the surgical removal of the parietal pleura with concomitant abrasion of the visceral pleura  
- pleuroperitoneal shunt involves shunting the fluid from the pleural cavity into the abdominal cavity  
- long term thoracotomy access and drainage |
| **Septic Shock**  
- sepsis is an inflammatory systemic response to infection, manifested by two or more of the following conditions:  
- temperature greater than 38° C or less than 36° C  
- heart rate greater than 90 beats per minute  
- respiratory rate greater than 20 breaths per minute or PaCO₂ less than 32 mm Hg | - changes in body temperature (greater than 38°C or less than 30°C)  
- increased heart rate  
- hypotension  
- decreased peripheral pulses  
- cool, clammy skin  
- decreased urine output  
- anxiety  
- increased respiratory rate (greater than 20/minute)  
- confusion leading to coma | continual assessment and monitoring  
- frequent vital signs, assess tissue perfusion, watch signs and symptoms of bleeding, check mental status, assess function of heart, lungs, kidneys, CNS.  
- blood culture (peripheral and central line if applicable)  
- broad spectrum antibiotics should be initiated immediately after blood culture obtained  
- bloodwork (ie CBC, coagulation panel, blood gases)  
- culture sputum, urine, stools, central line exit sites |
<table>
<thead>
<tr>
<th>CONDITION/DEFINITION</th>
<th>SIGNS/SYMPTOMS</th>
<th>MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Septic Shock</td>
<td>- metabolic acidosis&lt;br&gt;- capillary fluid leaking causes third spacing, decreased cardiac output, increased peripheral resistance&lt;br&gt;- peripheral vasoconstriction leads to ischemia and decreased blood flow to vital organs&lt;br&gt;- DIC</td>
<td>- CXR&lt;br&gt;- IV access – very important&lt;br&gt;- fluid replacement with crystalloids (i.e. normal saline) and colloids (i.e. albumin or pentaspan) to correct hypovolemia&lt;br&gt;- blood products&lt;br&gt;- oxygen therapy&lt;br&gt;- meticulous handwashing&lt;br&gt;- hemodynamic monitoring, inotropic support and ventilatory assistance in a critical care setting if needed&lt;br&gt;- correct electrolyte imbalances&lt;br&gt;- maintain adequate urine output&lt;br&gt;- aggressive nutritional support</td>
</tr>
</tbody>
</table>

Severe Hypersensitivity/Anaphylaxis
- a life threatening immunological response to a foreign substance or antigen.
- the introduction of cytotoxic agents (like other medications) may initiate a type I reaction characterized by the

<table>
<thead>
<tr>
<th>CONDITIONS</th>
<th>SIGNS/SYMPTOMS</th>
<th>MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyspnea</td>
<td>signs and symptoms typically occur within minutes of initiating the agent IV and peak within 15 to 30 minutes. Reactions to oral agents may take 2 hours.</td>
<td>Stop administration of chemotherapy drug immediately&lt;br&gt;- call for help (stat or code blue upon assessment)&lt;br&gt;- emergency equipment and medications must be readily available&lt;br&gt;- continually assess for a patent airway</td>
</tr>
<tr>
<td>Agitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONDITION/DEFINITION</td>
<td>SIGNS/SYMPTOMS</td>
<td>MANAGEMENT</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>release of histamine and other inflammatory mediators that induce symptoms such as</td>
<td>• hypotension</td>
<td>• oxygen therapy</td>
</tr>
<tr>
<td>respiratory distress or cardiovascular failure.</td>
<td>• feeling of heat, flushing</td>
<td>• monitor blood pressure, pulse, oxygenation, respirations</td>
</tr>
<tr>
<td></td>
<td>• chest or back pain</td>
<td>• IV access – very important. Administer isotonic solutions to maintain blood pressure</td>
</tr>
<tr>
<td></td>
<td>• respiratory distress (i.e. wheezing, upper airway edema)</td>
<td>• administer medications as ordered (i.e. diphenhydramine, Solu-Medrol, Epinephrine)</td>
</tr>
<tr>
<td></td>
<td>• headache, dizziness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• urticaria</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• nausea and vomiting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• seizure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• metallic taste</td>
<td></td>
</tr>
<tr>
<td>Disseminated Intravascular Coagulation (DIC)</td>
<td>• spontaneous bleeding from nose, gums, GI &amp; GU tracts, surgical sites,</td>
<td>• primary goal of therapy is to eliminate or alter the triggering event (i.e. antibiotics for sepsis)</td>
</tr>
<tr>
<td></td>
<td>injection sites, intravenous access sites</td>
<td>• supportive therapy directed at stopping intravascular clotting process and control the bleeding</td>
</tr>
<tr>
<td></td>
<td>• bleeding can range from oozing to frank bleeding to hemorrhage</td>
<td>• administration of blood components such as platelets, fresh frozen plasma, packed red blood cells,</td>
</tr>
<tr>
<td></td>
<td>• hypotension, shock symptoms</td>
<td>• Antithrombin III</td>
</tr>
<tr>
<td></td>
<td>• change in mental status (restlessness, confusion, stupor, coma)</td>
<td>• heparin therapy (inhibits thrombin formation), however, this therapy is controversial</td>
</tr>
<tr>
<td></td>
<td>• headaches</td>
<td>• monitor bleeding</td>
</tr>
<tr>
<td></td>
<td>• tachycardia, tachypnea</td>
<td>• IV therapy</td>
</tr>
<tr>
<td></td>
<td>• hematuria, oliguria</td>
<td>• oxygen therapy</td>
</tr>
<tr>
<td></td>
<td>• petechial rashies</td>
<td>• frequent vital signs</td>
</tr>
<tr>
<td></td>
<td>• hematomas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• possibility of irreversible end organ damage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• prolonged bleeding time – PTT, INR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• decreased platelet count and fibrinogen levels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• increased D-dimer level</td>
<td></td>
</tr>
<tr>
<td>Hypercalcemia</td>
<td>• lethargy, fatigue and weakness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• change in mental status (restlessness, confusion, stupor, coma)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• vomiting, nausea</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• dysrhythmias, ECG changes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• polyuria</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• treatment based on reduction of bone resorption of calcium and promotion of</td>
<td></td>
</tr>
<tr>
<td></td>
<td>urinary excretion of calcium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• adequate hydration/rehydration is the primary treatment followed by diuresis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• loop diuretics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• monitor electrolyte levels</td>
<td></td>
</tr>
</tbody>
</table>

Release of histamine and other inflammatory mediators that induce symptoms such as respiratory distress or cardiovascular failure.
<table>
<thead>
<tr>
<th>CONDITION/DEFINITION</th>
<th>SIGNS/SYMPTOMS</th>
<th>MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• lack of intervention leads to renal failure, coma and cardiac arrest</td>
<td>• renal calculi and failure</td>
<td>• drug therapy with bisphosphonates (i.e. pamidronate) to inhibit action of osteoclasts</td>
</tr>
<tr>
<td>• one of the most common oncologic emergencies</td>
<td>• anxiety</td>
<td>• glucocorticoids (i.e. prednisone) block bone resorption, increase calcium excretion and decrease GI absorption</td>
</tr>
<tr>
<td></td>
<td>• anorexia</td>
<td>• non-steroidal anti-inflammatory drugs (NSAIDS) (i.e. indomethacin, aspirin) mediate bone resorption</td>
</tr>
<tr>
<td></td>
<td>• polydipsia</td>
<td>• some drugs can lower serum calcium levels (i.e. calcitrol)</td>
</tr>
<tr>
<td></td>
<td>• constipation</td>
<td>• mobilization increases osteoblastic activity and thus decreases serum calcium levels</td>
</tr>
</tbody>
</table>

**Syndrome of Inappropriate Antidiuretic Hormone Secretion (SIADH)**

- an endocrine paraneoplastic syndrome that causes a disorder of water balance
- characterized by elevated serum blood levels of ADH, excessive water retention, hypo-osmolality and hyponatremia
- most commonly seen with lung cancer
- some chemotherapy drugs can cause SIADH

<table>
<thead>
<tr>
<th>CONDITION/DEFINITION</th>
<th>SIGNS/SYMPTOMS</th>
<th>MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• hyponatremia</td>
<td>• treat or eliminate underlying cause</td>
</tr>
<tr>
<td></td>
<td>• decreased osmolality of serum and extracellular fluid</td>
<td>• fluid restriction</td>
</tr>
<tr>
<td></td>
<td>• excessive water retention</td>
<td>• for severe cases, hypertonic saline infusions (administered in critical care) and lasix diuresis are used to slowly correct the hyponatremia</td>
</tr>
<tr>
<td></td>
<td>• elevated urine osmolality and less dilute urine (high urine specific gravity)</td>
<td>• correct potassium levels prior to or at the same time</td>
</tr>
<tr>
<td></td>
<td>• anorexia, impaired taste</td>
<td>• treatment of the malignancy with chemotherapy drugs requires hydration so may have to be delayed until hyponatremia is resolved</td>
</tr>
<tr>
<td></td>
<td>• difficulty concentrating, decreased deep tendon reflexes, hallucinations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• fatigue, headache, lethargy, inappropriate behaviour</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• incontinence, oliguria, thirst</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• muscle cramps, tremors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• peripheral edema, weight gain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• nausea, vomiting, diarrhea</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• coma, seizure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• inability to protect airway and mobilize secretions</td>
<td></td>
</tr>
</tbody>
</table>
3.0 REFERENCES


British Columbia Cancer Agency, 2003. Chemotherapy Standards, Vancouver Health Department, Vancouver Hospital & Health Sciences Center

British Columbia Cancer Agency, August 2007. Policy #111-10 Chemotherapy Process


Saskatoon Cancer Center, Stem Cell Transplant Program, January 10, 2005. Body Weight Calculations and Recommendations for Dosing


See also References attached to Policies.
4.0 POLICY AND PROCEDURES

<table>
<thead>
<tr>
<th>Policies &amp; Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title:</strong> CHEMOTHERAPY DRUGS (ORAL) FOR CANCER AND NON-CANCER TREATMENT: ADMINISTRATION &amp; PRECAUTIONS</td>
</tr>
<tr>
<td><strong>I.D. Number:</strong> 1059</td>
</tr>
</tbody>
</table>

Authorization

[x] SHR Nursing Practice Committee

Source: Nursing
Cross Index: SHR Region-Wide Policies & Procedures Manual - # 7311-60-020 High Alert Medications - Identification, Double Check and Labeling; Occupational Health & Safety Policies & Procedures Manual - #5.2.3 Chemical Hazard: Cytotoxic Drug Exposure; Infection Prevention & Control Manual - #20-150 Personal Protective Equipment (PPE) – Donning and Removing. Date Effective: June 2011 Date Revised: Scope: Royal University Hospital Saskatoon City Hospital St. Paul’s Hospital

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* For brevity’s sake in this document, the words “registered or licensed nurse” will be used for references to Registered Nurse(RN), Registered Psychiatric Nurse(RPN), Graduate Nurse(GN), and Licensed Practical Nurse(LPN) and Graduate Practical Nurse(GPN) who have successfully completed the Medication Administration Course.

DEFINITIONS:

NOTE: In this policy, ‘chemotherapy’ refers to drugs identified by pharmacy as requiring Chemotherapy Drug Precautions, based on the level of risk they present. Hormonal therapies are not included in this definition.

**Chemotherapy** – a chemical agent used to treat diseases. The term usually refers to a drug used to treat cancer. Most chemotherapy drugs are highly toxic and considered to be carcinogenic, mutagenic &/or teratogenic. Most chemotherapy drugs are also cytotoxic meaning they are detrimental or destructive to cells within the body.

**Cytotoxic Drugs** – known to be highly toxic and considered to be carcinogenic, mutagenic, or teratogenic. They are known as chemotherapy or antineoplastics and are therapeutic agents, used primarily for the treatment of malignant disease.

**Mutagenic** – able to produce a permanent change in the genetic material of a cell. Also referred to as genotoxic.

**Carcinogenic** – able to cause the development of cancer.

**Teratogenic** – able to cause abnormalities in an embryo or fetus that may lead to birth defects.
1. PURPOSE

1.1 To safely administer chemotherapy drugs to patients for cancer treatment.

1.2 To provide a safe environment for staff working with chemotherapy drugs.

2. POLICY

2.1 Registered or licensed nurses identified by their manager, will be certified in this Special Nursing Procedure/Added Skill to administer oral chemotherapy drugs for cancer and non-cancer treatment in accordance with the policy of the nursing unit.

2.2 Employees who have potential for exposure to chemotherapy drugs at least weekly should arrange to have a general health review and blood work drawn twice a year by their family physician or medical centre. Tests include blood work for CBC and reticulocyte count and urine test for blood.

2.3 All orders for chemotherapy drugs must be written by a physician. Registered or licensed nurses will not accept verbal/telephone orders for chemotherapy drugs or adjustments to chemotherapy drug doses, except to hold or stop chemotherapy administration. Faxed orders are accepted as written orders.

2.4 Pharmacy will identify all chemotherapy drugs as such on the drug packaging and the Medication Administration Record will identify them as requiring Chemotherapy Drug Precautions.

2.5 Pharmacy will prepare oral chemotherapy drugs that must be compounded in a biological safety cabinet.

2.6 When the physician’s order is received, 2 registered or licensed nurses and/or pharmacist will independently verify the chemotherapy drug dose is correct. Refer to 3.1.

2.7 Chemotherapy Drug Precautions

2.7.1 Chemotherapy Drug Precautions for body waste will be followed for 7 days post administration of last chemotherapy dose.

2.7.2 A Chemotherapy/Hazardous Drug Spill Kit must be readily available on the unit.

2.7.3 Only nursing staff certified in chemotherapy administration may clean up drug spills.

3. PROCEDURE

3.1 Processing Chemotherapy Orders

3.1.1 When the physician order is received, 2 registered or licensed nurses and/or pharmacist complete an independent double check of the drug dose. Pre-printed orders are preferred when available.

3.1.1.1 If applicable, complete the mathematical calculation of the dose which may include body surface area (BSA) and dose modifications according to lab results. Refer to Appendix D.

3.1.1.2 If there is more than a 5% variance from the prescribed dose, notify the pharmacist and the ordering physician. Document clarifications and rationale in physician’s orders. If changes are required, the physician must write a new order. Refer to 1.4.
3.1.1.3 Verify that the prescribed dose is within the recommended range for the patient, disease indication and treatment plan by referring to the CPS, medication product monograph or other approved reference that describes the chemotherapy drug regimen.

3.1.1.4 Assess chemotherapy orders for completeness including pre and post supportive therapies (e.g. pre-medications, antiemetics).

3.1.1.5 Both nurses document their initials beside each medication on the physician’s orders to indicate that the dose has been independently double-checked.

3.2 Pre-Administration

3.2.1 Gather equipment and supplies.

<table>
<thead>
<tr>
<th>Chemotherapy Drug Administration Equipment and Supplies</th>
<th>Oral Tablet/Capsule</th>
<th>Oral Liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nitrile Gloves (DOUBLED: 1 pair under gown cuff; 1 pair over gown cuff)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small SPD SKU # 61428</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Medium SPD SKU # 61429</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Large SPD SKU # 61430</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Eye/Face Protection</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye Shield/ Mask SPD SKU # 83128</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Full Face Shield SPD SKU # 46899</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Impervious Gown with white cuffs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main Stores SKU # 123011</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Chemotherapy/Hazardous Drug Spill Kit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPD SKU # 201903</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Chemotherapy Drug Precaution Labels</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPD SKU # 207153</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Chemotherapy Precautions Sign</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Printing # 103008</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Chemotherapy Sharps &amp; Fluid Resistant Waste Container</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 gallon Cart (Unit Purchase)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>18 gallon red container Main Stores SKU # 201905</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sign for Cart Printing # 103168</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Sign Alerting Staff to Use the Chemotherapy Sharps &amp; Fluid Resistant Waste Container</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Printing # 103169</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Chemotherapy Soft-Sided Waste Container</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linen Hamper (Unit Purchase)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Red Liner Bags Main Stores SKU # 202734</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sign for Hamper Printing # 103170</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Transport Waste Container</strong> (for soft-sided waste) with cytotoxic sticker affixed on lid.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue Biohazard Rubbermaid Bin, zip-ties, &amp; stickers located in Soiled Holding</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Medicine Cup</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Dissolve-A-Dose</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPD SKU # 210269</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Plastic-backed Absorbent Liner</strong></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>2x2 Gauze</strong></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
3.2.2 Review the following patient information:
  - applicable lab results
  - previous treatment for cancer
  - experienced side effects and interventions
  - adequacy of past symptom management
  - previous dose adjustments
  - concurrent medical conditions
  - weight changes > 10%
  - willingness to proceed

3.2.3 Provide information to the patient and family regarding:
  - indication of chemotherapy
  - method of administration
  - potential side effects and complications, and the importance of informing nurses of the same
  - safe handling of drug and body waste

3.2.4 Ensure that a Chemotherapy/Hazardous Drug Spill Kit is available on the unit.

3.2.5 Ensure that the patient’s room is set up with Chemotherapy Drug Precautions:
  3.2.5.1 Post a Chemotherapy Drug Precautions sign above the patient bed or on the room door. Refer to Appendix A.
  3.2.5.2 Affix Chemotherapy Drug Precaution labels on the chart, all tubing’s exiting patient, specimens and requisitions for specimens, tests and procedures. Refer to Appendix B.
  3.2.5.3 Place a Chemotherapy Sharps & Fluid Resistant Waste Container and/or Chemotherapy Soft-Sided Waste Container in the patients room. Refer to Appendix C.

3.2.6 Perform hand hygiene.

3.2.7 Don PPE required for route of administration.

3.2.8 Immediately before administration, 2 registered or licensed nurses will verify:
  - the order and dosages have been independently double checked & initialled
  - drug names
  - dosages
  - expiration dates on packaging
  - 2 different patient identifiers (e.g. name, date of birth, hospitalization number) on the medication label and the original physician’s order

3.3 **Oral Administration**

3.3.1 If an anti emetic is required administer it at least 30 minutes prior to the administration of oral chemotherapy unless instructed otherwise in the protocol.

3.3.2 Tip tablets and capsules from their container /blister pack directly into a disposable medicine cup. Use a 2 x 2 to absorb any drops when disconnecting an oral syringe from a feeding tube.

3.3.3 Observe patient consume the drug.

3.3.4 Do **NOT CUT OR CRUSH** chemotherapy tablets or capsules. Tablets/capsules must be swallowed whole.
3.3.5 If patient is unable to swallow or when administering via a PEG or a nasogastric tube, contact the pharmacist for advice on alternative liquid dose formulations and the physician for a new medication order if required. In the rare instance that Pharmacy is unable to make an oral formulation (stability issues, no recipe for formulation, etc.) refer to one of the following notes.

Note: To dissolve a tablet or capsule, place the medication in a capped “Dissolve-a-Dose” tube and add diluent (sterile water or saline). Securely attach cap and mix gently until medication is dissolved. Open the small outer cap and attach an oral syringe and withdraw the entire contents of the tube. For enteric coated tablets, contact pharmacy as above.

Note: To crush a dose that can’t be dissolved (ie. coated tablet), place the tablet(s) into an oral syringe and replace the plunger. Draw 0.5-1 ml of water into the syringe to “wet” the tablet. Place a cap on the syringe and turn the plunger with a grinding motion to create a course powder. Draw several mls of water into the syringe and let the medication dissolve for several minutes. Shake periodically. Administer.

3.3.6 If the patient vomits immediately after ingestion and the tablet or capsule cannot be seen, do not re-administer the dose. Inform the physician for further guidance. Treat vomit as a chemotherapy drug spill. Refer to 3.5.1.

3.3.7 Dispose of drug packaging and medicine cup in the Chemotherapy Soft Sided Waste Container.

3.3.8 Wash hands with soap & water after removal of PPE.

3.3.9 Report To The Physician:
- Toxicities experienced by the patient
- Adverse reactions

3.3.10 Documentation:
- Nursing Care Plan: Record start and end times of Chemotherapy Drug Precautions
- MAR: Drug administration time
- Nurses Notes/Flow sheet: Patient education and patient response to treatment

3.4 Chemotherapy Drug Precautions For Body Waste And Supplies

3.4.1 Follow chemotherapy Drug Precautions for body waste for 7 days post administration of last chemotherapy dose.

3.4.2 When handling blood or body waste, wear a disposable, low-permeable long-sleeved gown and doubled non-sterile nitrile gloves (1 pair under gown cuff; 1 pair over gown cuff). Wear eye/face protection if there is a risk of splashing or aerosolization.

3.4.3 Place Chemotherapy Drug Precautions label on the front of the patient’s chart, drainage tubes (e.g. urinary drainage catheter bag and catheter, chest tube drainage unit) and specimens and their requisitions.

3.4.4 Use disposable diapers on incontinent children and adults. Dispose in a Chemotherapy Soft-Sided Waste Container, or if saturated, in a Chemotherapy Sharps & Fluid Resistant Waste Container. Clean the patient’s
skin well and apply a barrier cream/ointment to the skin in contact with the diaper to decrease skin irritation.

3.4.5 When disposing of excreta, cover toilet/hopper with a plastic backed absorbent pad with absorbent side down prior to flushing to prevent backsplash. Dispose of the plastic-backed absorbent pad after every use in the Chemotherapy Soft-Sided Waste Container.

Note: Patient does not require a private bathroom.

3.4.6 Place soiled linens into a plastic laundry bag. No special handling is required.

Note: In areas who launder patient’s personal laundry, the laundry bag needs to be labelled as chemotherapy contaminated and staff handling that laundry will need to wear PPE as per the table in 3.2.1 or follow their facility protocol.

3.4.7 Items being returned to SPD for cleaning should be handled in the usual manner.

3.5 Precautions For Drug Spills And Drug Exposure

3.5.1 Drug Spill

3.5.1.1 Do NOT leave the area of the spill. Have a co-worker bring the Chemotherapy/Hazardous Drug Spill Kit.

3.5.1.2 Alert persons in immediate area.

3.5.1.3 Put on personal protective equipment (PPE) from the spill kit.

3.5.1.4 Attend to anyone who has been splashed with the drug. Refer to 3.5.2.

3.5.1.5 Contain the spill from the outer edges to the center by placing absorbent towels over the contaminated area.

3.5.1.6 Wash area three times, first with the detergent (supplied in kit) followed by water. Dry well with absorbent towel. Follow these same guidelines to clean contaminated equipment.

3.5.1.7 Dispose of linen, supplies and waste. Refer to 3.4.

3.5.1.8 Remove PPE. Refer to the Infection Prevention & Control Manual 20-150 Personal Protective Equipment (PPE) – Donning and Removing.

3.5.1.9 Wash hands with soap and water.

3.5.1.10 Complete the online safety report in AEMS on the SHR Infonet and notify the Manager of Nursing or designate.

3.5.2 Drug Exposure

3.5.2.1 Splash to eyes:

3.5.2.1.1 Flush eyes immediately at eyewash station for at least 15 minutes. If eyewash station unavailable, flush with copious amounts of water or normal saline for at least 15 minutes.

3.5.2.1.2 Immediately notify the Manager of Nursing or designate AND contact the SHR Incident Reporting
3.5.2.1.3 Complete the AEMS online safety report, if applicable.
3.5.2.1.4 Follow-up with the Occupational Health and Safety/Health Office for post exposure blood work (baseline and 2 weeks).

3.5.2.2 **Splash to skin:**

3.5.2.2.1 Remove contaminated clothing immediately.
3.5.2.2.2 Flush area with copious amounts of water for at least five minutes.
3.5.2.2.3 Follow with soap and water.
3.5.2.2.4 Launder contaminated clothing at home separately once, then re-wash with regular wash, or arrange for laundry services to launder your uniform for you. If a replacement uniform is not available on your unit, call SPD to arrange pick-up of a decontamination uniform.
3.5.2.2.5 Immediately notify the Manager of Nursing or designate AND contact the SHR Incident Reporting Telephone Line in Saskatoon (655-0820) or Rural (1-866-966-0820) and follow the recommendations.
3.5.2.2.6 Complete the AEMS online safety report, if applicable.
3.5.2.2.7 Follow-up with the Occupational Health and Safety/Health Office for post exposure blood work (baseline and 2 weeks).
4. REFERENCES

British Columbia Cancer Agency, 2003. Chemotherapy Standards. Vancouver Health Department, Vancouver Hospital & Health Sciences Center

British Columbia Cancer Agency, August 2007. Policy #111-10 Chemotherapy Process


Saskatoon Cancer Center, Stem Cell Transplant Program, January 10, 2005. Body Weight Calculations and Recommendations for Dosing


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Note: In this policy, 'chemotherapy' refers to drugs identified by pharmacy as requiring Chemotherapy Drug Precautions, based on the level of risk they present. Hormonal therapies are not included in this definition.

DEFINITIONS:

**Antineoplastic** - A chemotherapeutic agent that controls or kills cancer cells. Drugs used in the treatment of cancer that may be cytotoxic but are generally more damaging to dividing cells than to resting cells. However, not all antineoplastic drugs are cytotoxic.

**Biotherapy** - Agents derived from biological sources or agents that affect biologic responses.

**Chemotherapy** - A chemical agent used to treat diseases. The term usually refers to a drug used to treat cancer. However, also prescribed for non-cancer treatment.

**Cytotoxic** - A pharmacologic compound that is detrimental or destructive to cells within the body.

**Hazardous** - Drugs that exhibit one or more of the following six characteristics in humans or animals: carcinogenicity, teratogenicity or other developmental toxicity, reproductive toxicity, organ toxicity at low doses, genotoxicity, structure and toxicity profiles of new drugs that mimic existing drugs determined hazardous by the above criteria. There are various levels of risk within the hazardous drug definition.

1. PURPOSE

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1.1 To safely administer chemotherapy drugs to patients for non-cancer treatment.

1.2 To provide a safe environment for staff working with chemotherapy drugs.

2. POLICY

2.1 Registered and Graduate Nurses, and Registered Psychiatric Nurses (RNs, GNs & RPNs) identified by their manager, will be certified in this Special Nursing Procedure to administer oral, topical, subcutaneous, intramuscular and intravenous chemotherapy drugs for non-cancer treatment in accordance with the policy of the nursing unit.

2.2 Employees who are pregnant, attempting to conceive or breastfeeding may refrain from administering chemotherapy drugs upon request. This must be communicated in writing as soon as possible to the Manager of the unit prior to commencement of their shifts.

2.3 Employees who have potential for exposure to chemotherapy drugs at least weekly should arrange to have a general health review and blood work drawn twice a year by their family physician or medical centre. Tests include blood work for CBC and reticulocyte count and urine test for blood.

2.4 All orders for chemotherapy drugs must be written by a physician. RNs/GNs will not accept verbal/telephone orders for chemotherapy drugs or adjustments to chemotherapy drug doses, except to hold or stop chemotherapy administration. Faxed orders are accepted as written orders.

2.5 Pharmacy will identify chemotherapy drugs and some biotherapy drugs on the Medication Administration Record and drug packaging as requiring Chemotherapy Drug Precautions.

2.6 Pharmacy will prepare all chemotherapy drugs, including oral drugs that must be compounded or crushed, in a biological safety cabinet. The IV bag containing chemotherapy will be spiked and the tubing primed with neutral solution by pharmacy. Injectable chemotherapy will be delivered in a sealed transport bag.

2.7 When the physician’s order is received, 2 RNs, 1 RN/1 GN, or 1 RN/1 pharmacist will verify the chemotherapy drug dose is correct. Refer to 3.1.

2.8 Intravenous Drug Administration

2.8.1 2 RNs or 1 RN/1GN who are competent and certified in chemotherapy administration will independently calculate the infusion rate, and check the settings on the infusion pump at initial set-up, change of bag and/or change in infusion rate. The initials of both nurses, and time of the double check will be documented on the Medication Administration record (MAR).

2.8.2 A closed system for intravenous chemotherapy drug administration will be maintained with a closed male connector. Refer to Appendix A.

2.8.3 All chemotherapy infusions will be administered via designated IV tubing.
2.8.4 All intravenous chemotherapy drugs must be infused via an infusion pump with the exception of vesicants administered peripherally and drugs ordered IV push. 

**Note:** Administration of IV vesicants peripherally and IV Push are separate special nursing procedures and require additional education and certification.

2.8.5 All chemotherapy infusions will be administered via the secondary port.

2.8.6 The primary line will be flushed with a minimum of 25mls of compatible IV solution prior to disconnection and 10 mls between drugs, unless otherwise required for a clinical trial. (PEDIATRICS: Flush Volume 10-20 mls).

2.8.7 Blood return must be confirmed prior to administration of a chemotherapy drug. If blood return is absent from a central venous catheter, placement must be confirmed in medical imaging, and confirmation received from the radiologist that the catheter is correctly placed.

2.9 **Chemotherapy Drug Precautions**

2.9.1 Chemotherapy Drug Precautions for body waste will be followed for 7 days post administration of last chemotherapy dose, regardless of route.

2.9.2 A Chemotherapy/Hazardous Drug Spill Kit must be readily available on the unit.

2.9.3 Only nursing staff certified in chemotherapy administration may clean up drug spills.

3. **PROCEDURE**

3.1 **Processing Chemotherapy Orders**

3.1.1 When the physician order is received, 2 RNs, 1 RN/1 GN, or 1 RN/1 pharmacist complete an independent double check of the drug dose. Pre-printed orders are preferred when available.

3.1.2 If applicable, complete the mathematical calculation of the dose which may include body surface area (BSA) and dose modifications according to lab results. Refer to Appendix F.

3.1.3 If there is more than a 5% variance from the prescribed dose, notify the pharmacist and the ordering physician. Document clarifications and rationale in physician’s orders. If changes are required, the physician must write a new order. Refer to 1.4.

3.1.4 Verify that the prescribed dose is within the recommended range for the patient, disease indication and treatment plan by referring to the SHR IV Medication Reference Manual, CPS, medication product monograph or other approved reference that describes the chemotherapy drug regimen.

3.1.5 Assess chemotherapy orders for completeness including pre and post supportive therapies (e.g. pre-medications, hydration, antiemetics).
3.1.6 Both nurses document their initials beside each medication on the physician’s orders to indicate that the dose has been verified.

3.2 Pre-Administration

3.2.1 Review the following patient information:
- applicable lab results
- experienced side effects and interventions
- previous dose adjustments
- concurrent medical conditions
- weight changes > 10%

3.2.2 Assess the patient’s prior experience with chemotherapy (e.g. reactions, delayed side effects, adequacy of symptom management, willingness to proceed). Report to the physician any patient/guardian hesitancy or refusal for treatment.

3.2.3 Provide information to the patient and family regarding:
- indication of chemotherapy
- method of administration
- potential side effects and complications, and the importance of informing nurses of the same
- safe handling of drug and body waste

3.2.4 Gather supplies and equipment:

<table>
<thead>
<tr>
<th>Chemotherapy Drug Administration Equipment and Supplies</th>
<th>Oral Tablet/ Capsule</th>
<th>Oral Liquid</th>
<th>Topical</th>
<th>IM or SC</th>
<th>IV</th>
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</tr>
</tbody>
</table>
3.2.5 Ensure that a Chemotherapy/Hazardous Spill Kit is available on the unit.

3.2.6 Ensure that the patient’s room is set up with Chemotherapy Drug Precautions:
   - Post a Chemotherapy Drug Precautions sign above the patient bed or on the room door. Refer to Appendix B.
   - Affix Chemotherapy Drug Precaution labels on the chart, all tubing’s exiting patient, specimens and requisitions for specimens, tests and procedures. Refer to Appendix C.
   - Place a Chemotherapy Sharps & Fluid Resistant Waste Container and the Chemotherapy Soft-Sided Waste Container in the patients room. Refer to Appendix D.
   - Tape the sharps container in the patients room closed and affix the sign alerting staff to dispose of sharps in the Chemotherapy Sharps & Fluid Resistant Waste Container. Refer to Appendix E.

3.2.7 Administer pre-medications as ordered.

3.2.8 Perform hand hygiene.

3.2.9 Don PPP required for route of administration.

3.2.10 Immediately before administration, 2 RNs, 1 RN/1GN, 1 RN/1 pharmacist, or 1 RN/1 physician (competent and certified in chemotherapy administration) will verify:
   - the order and dosages have been independently double checked and initiated
   - drug names
   - dosages
   - rates

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3.3 Oral Administration

3.3.1 If an anti-emetic is required then this should be administered not less than 30 minutes prior to the administration of oral chemotherapy unless instructed otherwise in the protocol.

3.3.2 Tablets and capsules should be tipped from their container/blisterr pack directly into a disposable medicine cup.

3.3.3 Do NOT CUT OR CRUSH chemotherapy tablets or capsules. Tablets/capsules must be swallowed whole. Observe patient consume the drug.

3.3.4 If patient is unable to swallow or when administering via a PEG or a nasogastric tube, contact the pharmacist for advice on alternative dose formulations and the physician for a new medical order.

Note: A recommended method for dissolving and administering a capsule by syringe is to remove the plunger from the oral syringe and place the capsule inside. Replace the plunger, draw warm fluid into the syringe, and allow the capsule to dissolve. The suspension can be administered orally or via feeding tube.

3.3.5 If the patient vomits immediately after ingestion and the tablet or capsule cannot be seen, do not re-administer the dose. Inform the physician for further guidance. Treat vomit as a chemotherapy spill. Refer to 5.1.

3.3.6 Dispose of drug packaging and medicine cup in the Chemotherapy Soft Sided Waste Container.

3.3.7 Wash hands with soap and water.

3.4 Topical Administration

3.4.1 Prepare the area to be treated as ordered.

3.4.2 Apply the drug with a sterile tongue blade or cotton tipped applicator to the area to be treated.

3.4.3 Ensure the patient understands that the drug is only applied to the specific area to be treated and should avoid contact with eyes, nose, mouth or areas close to mucous membranes unless this is the area to be treated.

3.4.4 Ensure you remove immediately all drug from areas not to be treated.
3.4.5 Unless contraindicated, consider covering the treated area with a gauze pad to prevent exposure to other areas of the body, clothing, or other people, if the drug is being applied to exposed skin.

3.4.6 If applicable, ensure you remove completely the drug on completion of the required contact time.

3.4.7 Immediately after the application of the drug, remove PPE and thoroughly wash your hands with soap and water.

3.5 **Subcutaneous/Intramuscular Administration**

3.5.1 Do NOT expel air out of syringe. Tap air to the plunger end of the syringe before administering medication.

3.5.2 Dispose of needle/syringe in the Chemotherapy Sharps & Fluid Resistant Waste Container.

3.5.3 Wash hands with soap and water.

3.5.4 Document site of injection on MAR and patient’s tolerance of procedure on the nursing flow sheet.

3.6 **Intermittent Intravenous Administration (Piggy-back)**

3.6.1 Refer to the SHR IV Reference Manual to determine the hypersensitivity and/or anaphylaxis potential(s) of the drug(s). If drug is known to cause a hypersensitivity or anaphylaxis reaction then:
- Obtain baseline vitals.
- Have emergency medications/equipment available in patient’s room, if indicated.
- Attach closed male connector to the end of the primary IV line; this allows for safer disconnection from the IV site in the event of an adverse drug-related reaction. Refer to Appendix A.
- Follow monitoring requirements for administration.

3.6.2 Protect work area with a plastic backed absorbent pad.

3.6.3 Prime the primary IV tubing with a compatible additive free solution.

3.6.4 Affix a Chemotherapy Drug Precaution label to IV tubing.

3.6.5 Verify blood return from peripheral IV or central line.

3.6.6 At the bedside, before opening the sealed transport bag, verify:
- The patient’s identity with patient’s armband and the label on the drug
- The secondary tubing is securely connected to the IV bag
- The secondary tubing is clamped
- There is absence of moisture within the transport bag (i.e. drug leakage)
- The red cap is on the end of the tubing
3.6.7 Swab the secondary port of the primary IV tubing with an alcohol swab; then connect the secondary tubing.

3.6.8 Open clamps on secondary tubing.

3.6.9 Program IV pump settings as per ordered rate. Complete independent double checks to verify pump settings. Administer drug.

3.6.10 Don PPE upon completion of drug administration.

3.6.11 Flush the secondary port with 10mls neutral solution if administering additional drugs.

3.6.12 Flush the primary IV tubing with 25mls of neutral solution (PEDIATRICS:10-20 mls) prior to disconnection from patient.

3.6.13 Wipe the port(s) after disconnection with a 2x2 gauze.

3.6.14 Dispose of contaminated IV tubing/syringe in the Chemotherapy Sharps & Fluid Resistant Waste Container.

3.6.15 Wash hands with soap and water.

3.7 Report to the physician

- Toxicities experienced by the patient
- Adverse reactions
- Assessment of need for a venous access device

3.8 Documentation

- Nursing Care Plan: Record start and end times of Chemotherapy Drug Precautions
- MAR: Drug administration time and site
- Nurses Notes/Flow sheet: Patient education; patient response to treatment; and condition of intravenous/injection site

3.9 Chemotherapy Drug Precautions For Body Waste And Supplies

3.9.1 Chemotherapy Drug Precautions for body waste will be followed for 7 days post administration of last chemotherapy dose, regardless of route.

3.9.2 When handling blood or body waste, wear a disposable, low-permeable long-sleeved gown and doubled non-sterile nitrile gloves (1 pair under gown cuff; 1 pair over gown cuff). Wear eye/face protection as there is a risk of splashing or aerosolization.

3.9.3 Place Chemotherapy Drug Precautions label on the front of the patient’s chart and drainage tubes (e.g., urinary drainage catheter bag and catheter, chest tube drainage unit) and specimens and their requisitions.

3.9.4 Use disposable diapers on incontinent children and adults. Dispose in a Chemotherapy Soft-Sided Waste Container, or if saturated, in a Chemotherapy Sharps & Fluid Resistant waste container. Clean the patient’s skin well and apply a
barrier cream/ointment to the skin in contact with the diaper to decrease skin irritation.

3.9.5 When disposing of excreta, cover toilet/hopper with a plastic backed absorbent pad with absorbent side down prior to flushing to prevent backsplash. Dispose of the plastic-backed absorbent pad after every use in the Chemotherapy Soft-Sided Waste Container.

*Note:* Patient does not require a private bathroom.

3.9.6 Place soiled linens into a plastic laundry bag. No special handling is required as all laundry is washed twice.

3.9.7 Items being returned to SPD for cleaning should be handled in the usual manner (e.g. dressing trays, scissors).

3.10 Precautions For Drug Spills, Drug Exposure, And Needlestick Injury

3.10.1 Drug Spills

3.10.1.1 Do NOT leave the area of the spill. Have a co-worker bring the Chemotherapy/Hazardous Drug Spill Kit.

3.10.1.2 Alert persons in immediate area.

3.10.1.3 Put on personal protective equipment (PPE) from the spill kit.

3.10.1.4 Attend to anyone who has been splashed with the drug. See 5.2.

3.10.1.5 Contain the spill from the outer edges to the center by placing absorbent towels over the contaminated area.

3.10.1.6 Wash area three times, first with the detergent (supplied in kit) followed by water. Dry well with absorbent towel. Follow these same guidelines to clean contaminated equipment.

3.10.1.7 Dispose of linen, supplies and waste. Refer to 4.

3.10.1.8 Remove PPE. Refer to the Infection Prevention & Control Manual 20-150 Personal Protective Equipment (PPE) – Donning and Removing.

3.10.1.9 Wash hands well with soap and water.

3.10.1.10 Complete the online safety report in AEMS on the SHR Infonet and notify the Manager of Nursing or designate.

3.10.2 Drug Exposure

3.10.2.1 Splash to eyes

3.10.2.1.1 Flush eyes immediately at eyewash station for at least 15 minutes. If eyewash station unavailable, flush with copious amounts of water or normal saline for at least 15 minutes.
3.10.2.1.2 Immediately notify the manager of nursing or designate and contact the SHR incident reporting telephone line in Saskatoon (655-0820) or rural (1-866-966-0820) and follow the recommendations.

3.10.2.1.3 Complete the AEMS online safety report, if applicable.

3.10.2.1.4 Follow-up with the Occupational Health and Safety/Health Office for post exposure blood work (baseline and 2 weeks).

3.10.2.2 Splash to skin (intact or non-intact skin):

3.10.2.2.1 Remove contaminated clothing immediately.

3.10.2.2.2 Flush area with copious amounts of water for at least 15 minutes.

3.10.2.2.3 Follow with soap and water.

3.10.2.2.4 Launder contaminated clothing at home separately once, then re-wash with regular wash, or arrange for laundry services to launder your uniform for you. If a replacement uniform is not available on your unit, call SPD to arrange pick-up of a decontamination uniform.

3.10.2.2.5 Immediately notify the Manager of Nursing or designate AND contact the SHR Incident Reporting Telephone Line in Saskatoon (655-0820) or Rural (1-866-966-0820) and follow the recommendations.

3.10.2.2.6 Complete the AEMS online safety report, if applicable.

3.10.2.2.7 Follow-up with the Occupational Health and Safety/Health Office for post exposure blood work (baseline and 2 weeks).

3.10.2.3 Needle stick Injury:

3.10.2.3.1 Express blood from needle puncture site.

3.10.2.3.2 Flush puncture site with cool running water for at least 15 minutes.

3.10.2.3.3 Apply ice or heat to the injected site, as per SHR IV Reference Manual. Skin punctures with vesicant or irritant drugs will be treated as if an extravasation has occurred.

3.10.2.3.4 If needle was contaminated with blood or body fluid, follow SHR guidelines for blood and body fluid exposure. Refer to the Occupational Health & Safety Manual V-2 Bloodborne Pathogen Exposure.

3.10.2.3.5 Immediately notify the Manager of Nursing or designate AND contact the SHR Incident Reporting Telephone Line in Saskatoon (655-0820) or Rural (1-866-966-0820) and follow the recommendations.

3.10.2.3.6 Complete the AEMS online safety report, if applicable.
3.10.2.3.7 Follow-up with the Occupational Health and Safety/Health Office for post exposure blood work (baseline and 2 weeks).

4. REFERENCES

British Columbia Cancer Agency, 2003. Chemotherapy Standards. Vancouver Health Department, Vancouver Hospital & Health Sciences Center

British Columbia Cancer Agency, August 2007. Policy #111-10 Chemotherapy Process


Saskatoon Cancer Center, Stem Cell Transplant Program, January 10, 2005. *Body Weight Calculations and Recommendations for Dosing*


Appendix A:

**Closed Male Connector: SPIROS**

The Spiros™ closed male connector will be attached to all injectable chemotherapy drugs sent from pharmacy to prevent fluid leakage. The Spiros™ remains closed until it is attached to a luer activated needle free connector.

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**Chemotherapy Drug Precautions Sign**

**Drug Precautions**

TO BE FOLLOWED FOR 7 DAYS FOLLOWING LAST DOSE OF DRUG.

1. Wear **DOUBLED** non-sterile **nitrile** gloves and disposable impervious **gowns** when handling drug waste and all body waste.

2. Wear **eye/face protection** when there is a risk of **splashing** drug or body waste.

3. Wash hands well before and after patient contact.

4. Process all linen in the regular manner.

5. Affix the Chemotherapy Drug Precautions label on the front of the chart, requisitions, specimens, IV tubing containing the drug, and all tubes exiting from patient (i.e. NG, foley catheters, chest tubes, JP drains, etc.).

6. Cover toilet/hopper with a **plastic backed absorbent pad** prior to flushing and **dispose of after use**.

7. All waste contaminated with drug or body waste will be disposed of in either the Chemotherapy **Sharps & Fluid Resistant** Waste Container OR the Chemotherapy **Soft-Sided** Waste Container, as appropriate.
Chemotherapy Drug Precautions Label

CAUTION
Chemotherapy Drug Precautions.
Handle & dispose of contaminated drug/body waste appropriately.

Appendix C:

Chemotherapy Waste Containers

Chemotherapy Soft-Sided Waste Container

- Disposable impervious gowns
- Gloves, eye shield/mask, full face shield
- Drug packaging & drug transport bag
- Any items used in drug administration (i.e. absorbent pads, gauze pads, alcohol swabs, etc.)
- Disposable materials contaminated with body waste for patients on precautions (i.e. absorbent pads, diapers, dressings, etc.)
- Body fluid measuring containers

Chemotherapy Sharps & Fluid Resistant Waste Container

- IV tubing, IV bags & syringes contaminated with drug
- Needles & other sharps
- Waste blood tubes for patients on precautions
- Materials saturated with drug
- Foley bag
Appendix E:

Sign Alerting Staff to Use Chemotherapy Sharps & Fluid Resistant Waste Container

STOP!

This patient is on Chemotherapy Drug Precautions.

Please dispose of sharps in the:
“Chemotherapy Sharps & Fluid Resistant Waste Container”.

Appendix F:

Body Surface Area (BSA) Calculation

1. Obtain and document the patient’s actual, not stated, body weight and height

2. Use the formula of Mosteller to calculate the BSA

   \[ BSA \text{ (or m2)} = \sqrt{\frac{\text{height(cm)} \times \text{weight(kg)}}{3600}} \]

3. Multiply the BSA by the unit dose that is written on the original order to confirm the correct prescribed dose

Note: For pediatric patients weighing less than 10 kg., calculate the dose using mg/kg.
BSA should be recalculated to adjust dosing when the actual body weight has changed by greater than 5-10%.
### 5.0 ADMINISTRATION GUIDE FOR CHEMOTHERAPY (IV, ORAL, IM/SC)

**PROCESSING CHEMOTHERAPY ORDERS**

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<tbody>
<tr>
<td>1.</td>
<td>When the chemotherapy order is received, complete two independent double checks of the drug dose, name, route and indication. (2 RNs, 1RN/1GN, RN/Pharmacist)</td>
</tr>
<tr>
<td>2.</td>
<td>Complete the mathematical calculation of the drug dose, as applicable (i.e BSA, AUC etc). Document initials beside each drug dose.</td>
</tr>
<tr>
<td>3.</td>
<td>Notify the pharmacist and ordering physician if there is more than a 5% variance from the prescribed dose. Document clarifications in physician’s orders. Obtain a new written order if changes are required.</td>
</tr>
<tr>
<td>4.</td>
<td>Verify that the prescribed dose is within the recommended range for the patient, diagnosis and treatment plan.</td>
</tr>
<tr>
<td>5.</td>
<td>Assess orders for completeness, including pre-medications, hydration, lab work, supportive therapies.</td>
</tr>
<tr>
<td>6.</td>
<td>Transcribe orders on MAR and care-plan and fax orders to pharmacy.</td>
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**PRE-ADMINISTRATION**

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<tbody>
<tr>
<td>1.</td>
<td>Coordinate time of administration with pharmacy and others as needed.</td>
</tr>
<tr>
<td>2.</td>
<td>Review laboratory values and other pertinent patient information are within acceptable parameters and report results to physician as needed.</td>
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**IV ROUTE ONLY**

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| 3. | Refer to the SHR IV Reference Manual to determine the hypersensitivity/anaphylaxis potential(s) of the drug(s). If drug is known to cause a hypersensitivity or anaphylaxis reaction then:  
- Obtain baseline vitals.  
- Follow monitoring requirements for administration.  
- Have emergency medications/equipment available in patient’s room, if indicated.  
- Attach the closed male connector to the end of the primary IV line; this allows for safer disconnection from the IV site in the event of an adverse drug-related reaction. |
| 4. | Gather required equipment and supplies for route of administration. |
| 5. | Assess the patient’s prior experience with chemotherapy and willingness to proceed. Report any hesitancy or refusal of treatment to physician. |
| 6. | Provide information to patient and family as outlined in policy. |
| 7. | Ensure that a Chemotherapy Spill Kit is readily available on the unit. |
| 8. | Ensure that Chemotherapy Drug Precautions are set up in patient’s room. |
| 9. | Verify that pre-medication, pre-hydration and other preparations/assessments are completed. |

**ADMINISTRATION**

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<tbody>
<tr>
<td>1.</td>
<td>Perform hand hygiene.</td>
</tr>
<tr>
<td>2.</td>
<td>Don PPE.</td>
</tr>
<tr>
<td>3.</td>
<td>Immediately before administration compare the original order to the delivered drug, and expirations with another chemotherapy-competent &amp; certified RN/pharmacist/physician.</td>
</tr>
<tr>
<td>4.</td>
<td>Verify two different patient identifiers on the medication label and original order.</td>
</tr>
<tr>
<td>5.</td>
<td>Protect work area with a plastic backed absorbent pad, if applicable.</td>
</tr>
</tbody>
</table>
### IV
- Prime the primary IV tubing with a compatible additive free solution.
- Affix a Chemotherapy Drug Precaution label to IV tubing.
- At the bedside, before opening the sealed transport bag, verify:
  - The patient’s identity with patient’s armband and the label on the drug
  - The secondary tubing is securely connected to the IV bag
  - The secondary tubing is clamped
  - There is absence of moisture within the transport bag (i.e. drug leakage)
  - The red cap is on the end of the tubing
- Immediately prior to administering infusion, verify blood return. Follow policy if blood return absent.
- Swab the secondary port of the primary IV tubing with an alcohol swab before connecting the secondary tubing.
- Open clamps on secondary tubing.
- Program IV pump settings as per ordered rate. Complete independent double checks to verify pump settings.
- Don PPE when drug administration is complete.
- Flush the secondary port with 10mls neutral solution if administering additional drugs.
- Flush the primary IV tubing with 25mls of neutral solution (PEDIATRICS:10-20 mls) prior to disconnection from patient.
- Wipe the port(s) after disconnection with a 2x2 gauze.

### ORAL
- Tip capsule/tablet from the drug packaging directly into medicine cup.
- Do NOT cut or crush tablet or open capsule.
- Obtain alternative formulation if patient unable to swallow or has a feeding tube.
- Utilize the syringe method and warm fluid to dissolve tablet or capsule if pharmacy is unavailable to provide alternative formulation.
- Observe patient consume drug.
- If patient vomits immediately after drug ingestion, vomit is treated as a chemotherapy drug spill.

### IM/SC
- Do NOT expel air from the syringe. Tap air to the plunger end of the syringe before administering drug.

---

### POST-ADMINISTRATION

#### IV
- Dispose of IV tubing and IV bag in the Chemotherapy Sharps and Fluid Resistant Waste Container. Dispose of all other materials used in administration in the Chemotherapy Soft-Sided Waste Container.

#### ORAL
- Dispose of drug packaging and medication cup in the Chemotherapy Soft-Sided Waste Container.

#### IM/SC
- Dispose of needle and syringe in the Chemotherapy Sharps and Fluid Resistant Waste Container.

---

1. Wash hands with soap and water.
2. Document:
   - Nursing Care Plan: Record start and end times of Chemotherapy Drug Precautions
   - MAR: Drug administration time and site
   - Nurses Notes/Flow sheet: Patient education; patient response to treatment; condition of intravenous/injection site – IV & IM/SC only
3. Communicate post-treatment considerations to patient, family and appropriate personnel

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6.0 REVIEW QUESTIONS

Chemotherapy Drugs (Oral) For Cancer & Non-Cancer Treatment
Chemotherapy Drugs (Injectable) For Non-Cancer Treatment

Name: ___________________________ Site: ________ Unit_________________ Date: __________

1. Chemotherapy works by:
   a. damaging a cell's DNA
   b. interfering with a cell’s growth and proliferation
   c. not interfering with any healthy, normal cells
   d. suppressing the abnormal autoimmune response
   e. a, b & d
   f. all of the above

2. In which phase of the cell cycle is chemotherapy most effective?
   a. G0
   b. G1
   c. G2
   d. S
   e. all of the above

3. Match these drugs with the related descriptions:
   ____ Cyclophosphamide   a. higher risk of developing Tumor Lysis Syndrome
   ____ Mitoxantrone   b. give Leukovorin rescue & vigorous hydration
   ____ Methotrexate   c. adequate hydration to prevent hemorrhagic cystitis
   ____ Hydroxyurea   d. cardiac and malignancy screening

4. Drug Calculation:
   Mr Plasma is a 54yr old man with Multiple Myeloma who has been prescribed Melphalan 9mg/m² PO once daily x 4 days as part of his chemotherapy regimen. Mr Plasma weighs 85kg and is 180cm tall.

What is Mr Plasma’s BSA (show calculations)?

What is Mr Plasma’s Melphalan dose?

What is Mr Plasma’s actual dose being that Melphalan is supplied in 2mg capsules and is rounded to the nearest 2mg?

5. Match these side effects with the related descriptions:
   ____ Neutropenia   a. protect scalp from cold & sun
   ____ Thrombocytopenia   b. eat applesauce & bananas
   ____ Mucositis   c. avoid spicy foods & alcohol; use saline mouthwashes
   ____ Anorexia   d. increased caloric and protein supplements
   ____ Hand-Foot Syndrome  e. prophylactic antiemetics
   ____ Alopecia   f. may be treated with G-CSF
   ____ Diarrhea  g. painful burning & tenderness of palms & soles
   ____ Nausea & Vomiting h. avoid invasive treatments

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6. Match these oncologic emergencies with their symptoms or management:

_____ Septic Shock  a. pathological fractures, muscle weakness, restlessness
_____ Spinal Cord Compression  b. back pain, paralysis, diminished pain sensation
_____ Hypercalcemia  c. allopurinol & sodium bicarbonate; hydration
_____ DIC  d. colloid therapy, antibiotics & oxygen therapy
_____ Tumor Lysis Syndrome  e. spontaneous bleeding & clot formation

7. When administering a liquid chemotherapy drug and disposing of the drug waste you must wear:
   a. nitrile gloves (double)
   b. eye/face protection
   c. impervious cuffed gown
   d. all of the above

8. The liquid chemotherapy you are administering splashes on the floor. Listed are 5 things you should do. Number them in the correct order.

___ Contain the spill from the outer edges to the center with absorbent pads.
___ Complete Acute Care Safety report and notify MON or Charge Nurse.
___ Alert persons in the immediate area. Don’t leave the area unattended. Have someone else bring the spill kit.
___ Wash & rinse the area well with supplied detergent and water 3 times.
___ Don PPE and attend to anyone exposed to the spill.

9. If a chemotherapy agent in intravenous solution remains in the IV bag you should:
   a. drain the solution in the sink and dispose of the IV bag and tubing in the garbage.
   b. drain the solution in the sink and dispose of the IV bag and tubing in the appropriate biohazardous waste container.
   c. leave the solution in the bag and dispose of the IV bag and tubing in the appropriate Chemotherapy Drug Sharps & Fluid Resistant Waste Container.

10. True or False
    T  F your patient is receiving chemotherapy drugs and has soiled the linen with urine. You are sending all linen to Central laundry. You should process the linen using strict isolation precautions.

    T  F items being returned to SPD should be soaked in bleach first.

    T  F a urine soaked blue pad could be disposed of in the Chemotherapy Drug Soft Sided Waste Container or appropriate Chemotherapy Drug Sharps & Fluid Resistant Waste Container.

    T  F a chemotherapy drug has been spilled on your uniform. You should damp sponge the area with a wet facecloth.

11. Body fluid waste precautions will be followed ____ hours post infusion of last chemotherapy dose.