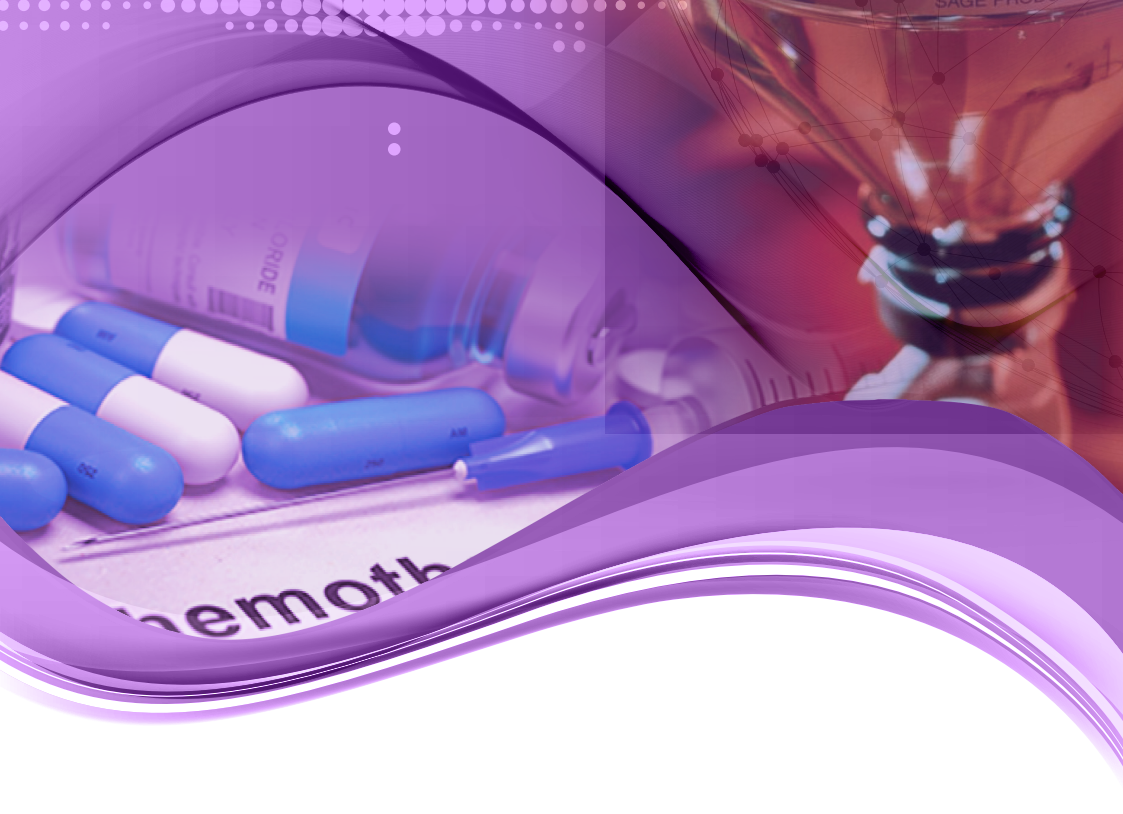




Pharmaceutical Services Division
Ministry of Health Malaysia

CANCER DRUG COUNSELLING: A GUIDE FOR PHARMACISTS



CANCER DRUG COUNSELLING

A Guide for Pharmacists

1st Edition, 2017
Pharmaceutical Services Division
Ministry of Health, Malaysia

DISCLAIMER

This guide would serve as a handy reference for **PHARMACIST ONLY** and not as a complete drug information resource. It is **NOT** intended to replicate or replace the knowledge, skills and experience of trained oncology health professionals, nor is it a substitute for clinical judgement and advice. The nature of healthcare/drug information is that it is constantly evolving with ongoing research and clinical experience and is often subject to interpretation. While best effort has been made to ensure the accuracy of the information and recommendation presented, reader is advised that the contributors, editors, reviewers and publishers cannot be responsible for the continued updates of the information, of any errors or/and of any consequences arising from its application.

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PREFACE



Providing pharmaceutical care to patients through education and counselling can contribute towards enhancing patients' adherence to cancer drug therapy as well as to reduce medication related problems. The complexity of current cancer drug therapies has resulted in changes in the role hospital pharmacists play in their provision of care towards cancer patients today. It is an established fact that provision of the right information benefits patients through shared decision making, and can lead to a better quality of life, which is the aim of patient-oriented pharmaceutical care.

The practice of hospital pharmacists may differ between facilities, but in general, oncology pharmacists are expected to be competent in both drug-oriented services and patient centred care. The move towards daycare and outpatient administration of chemotherapy has increased the necessity for accurate and thorough patient and family education to enable them to manage their medicines independently. This requires pharmacists to explain the self-care activities to ensure proper use of their medications and to be aware of possible adverse effects and remedial choices to be taken in order to minimise risks to the patients.

This Counselling Handbook serve as a quick reference for cancer drug therapy counselling points and is also intended to guide pharmacists in providing effective and accurate patient education regarding their cancer therapy. I would like to commend the Clinical Pharmacy Working Committee (Oncology Pharmacy Subspecialty) for their contributions and commitment in the development of this handbook. It is hoped that this handbook will be a useful guide for pharmacists working in the area of oncology and will help further improve the care of cancer patients in this country.

Thank you.

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ACRONYMS & ABBREVIATIONS

APML: Acute promyelocytic leukemia

ALP: Alkaline phosphatase

ALT: Alanine transaminase

AST: Aspartate aminotransferase

AUC: Area under the curve

BD: (*bis die*) Twice daily

BUN: Blood urea nitrogen

CHF: Congestive heart failure

CNS: Central Nervous System

COPD: Chronic obstructive pulmonary disease

CrCl: Creatinine clearance

DVT: Deep vein thrombosis

D5W: Dextrose 5% in water

ECG: Electrocardiogram

GI: Gastrointestinal

Gutt: Eye drop

GVHD: graft-versus-host disease

HBsAg: Surface antigen of Hepatitis B Virus

HBcAb: Hepatitis B core antibody

HSCT: Hematopoietic stem cell transplant

Ig G: Immunoglobulin G

IM: Intramuscular

INR: International normalised ratio

IV: Intravenous

IT: Intrathecal

LVEF: Left ventricular ejection fraction

LFT: Liver function test

MAOI: Monoamine oxidase inhibitor

MI: Myocardial infarction

NS: Normal saline

NSAIDs: Non-steroidal anti-inflammatory drugs

OD: (*omne in die*) Once daily

PO: (*Per os*) By mouth

RPLS: Reversible posterior leukoencephalopathy syndrome

SC: Subcutaneous

SNRI: Serotonin and norepinephrine reuptake inhibitor

SOB: Shortness of breath

SSRI: Selective serotonin reuptake inhibitor

ULN: Upper limit of normal

VTE: Venous thromboembolism

WFI: Water for injection

5FU: Fluorouracil

Table of Contents

Contents	Page
Introduction	9
CHAPTER 1-INTRODUCING CHEMOTHERAPY TO PATIENTS	10
CHAPTER 2-DRUGS USED IN CANCER TREATMENT	13
Alemtuzumab - 30mg/ml Injection	13
All Trans Retinoic Acid (ATRA) - 10mg Capsule	15
Amsacrine - 75mg/1.5ml Injection	17
Anagrelide - 0.5mg, 1mg Capsule	19
Anastrozole - 1mg Tablet	20
Aprepitant - 125mg, 80mg Capsule	21
Arsenic Trioxide - 1mg/ml Injection	22
Azacitidine - 100mg Injection	23
Bevacizumab - 25mg/ml Injection	24
Bicalutamide - 50mg Tablet	26
Bleomycin - 15mg Injection	27
Bortezomib - 3.5mg Injection	28
Busulfan - 6mg/ml Injection; 2mg Tablet	30
Capecitabine - 150mg, 500mg Tablet	32
Carboplatin - 10mg/ml Injection	33
Carmustine - 100mg Injection	34
Cetuximab - 5mg/ml Injection	35
Chlorambucil - 2mg Tablet	37
Cisplatin - 1mg/ml Injection	38
Cladribine - 10mg/ml Injection	40
Clodronate - 800mg Tablet	41
Cyclophosphamide - 200mg, 1000mg Injection; 50mg Tablet	43
Cytarabine - 100mg/ml Injection	44
Dacarbazine - 100mg Injection	46
Dactinomycin - 0.5mg Injection	47
Daunorubicin HCl - 20mg Injection	49
Decitabine - 50mg Injection	50
Docetaxel - 40mg/ml Injection	51
Doxorubicin - (Pegylated Liposomal) 20mg Injection	53
Doxorubicin - 2mg/ml Injection	55
Epirubicin - 10mg, 50mg Injection	57

Erythropoietin Human Recombinant (Epoitin Alfa) - 2,000IU/0.5ml, 3,000IU/0.3ml, 4,000IU/0.4ml, 10,000IU/ml Injection	59
Erlotinib - 100mg, 150mg Tablet	60
Etoposide - 20mg/ml Injection; 50mg Capsule	62
Everolimus - 5mg, 10mg Tablet	64
Exemestane - 25mg Tablet	66
Fentanyl Transdermal Patch - 12mcg/hr, 25mcg/hr, 50mcg/hr	67
Filgrastim - 30MU/0.5ml, 30MU/ml Injection; PegFilgrastim Pre-filled Syringe 6mg/6ml Injection	69
Fludarabine - 50mg Injection; 10mg Tablet	70
Fluorouracil - 50mg/ml Injection; 100mg Tablet	71
Flutamide - 250mg Tablet	73
Gabapentin - 100mg, 300mg, 600mg Tablet	74
Gefitinib - 250mg Tablet	76
Gemcitabine - 200mg, 1000mg Injection	78
Goserelin - 3.6mg, 10.8mg Depot Injection	79
Granisetron HCl - 1mg/ml Injection; 1mg Tablet	80
Hydroxyurea- 500mg Capsule	81
Idarubicin - 10mg, 5mg Injection	82
Ifosfamide - 1g Injection	83
Imatinib Mesylate - 100mg, 400mg Tablet	85
Interferon Alfa-2b - 18MiU, 30MiU Multidose Injection Pen	87
Irinotecan HCl Trihydrate - 20mg/ml Injection	89
Lapatinib - 250mg Tablet	91
L-asparaginase - 10,000IU Injection	93
Lenalidomide - 5mg, 10mg, 15mg, 25mg Capsule	94
Letrozole - 2.5mg Tablet	95
Leucovorin Calcium - 3mg, 50mg Injection, 15mg Tablet	96
Leuprolide - 11.25mg Injection	97
Lomustine - 40mg Tablet	98
Melphalan - 50mg Injection; 2mg Tablet	99
Mercaptopurine - 50mg Tablet	100
Mesna - 100mg/ml Injection	101
Methotrexate - 25mg/ml Injection; 2.5mg Tablet	102
Mitomycin C - 10mg Injection	104
Mitoxantrone - 2mg/ml Injection	105
Morphine Sulphate - Controlled Release: 10mg, 30mg Tablet / Immediate Release: 5mg, 10mg Tablet	107

Nilotinib - 200mg Tablet	108
Octreotide - 20mg, 30mg Injection	110
Ondansetron - 2mg/ml Injection; 2mg, 8mg Tablet	112
Oxaliplatin - 50mg Injection	113
Oxycodone HCl - Control Release: 10mg, 20mg, 40mg Capsule / Immediate Release: 5mg, 10mg, 20mg Capsule	114
Paclitaxel - 6mg/ml Injection	116
Palonosetron - 0.25mg/5ml Injection	118
Pamidronate - 30mg, 90mg Injection	119
Pazopanib HCl - 200mg, 400mg Tablet	120
Pemetrexed Disodium - 100mg, 500mg Injection	122
Procarbazine HCl - 50mg Capsule	123
Rituximab - 10mg/ml Injection	125
Sorafenib - 200mg Tablet	126
Sunitinib - 12.5mg, 25mg, 50mg Capsule	128
Tamoxifen Citrate - 20mg Tablet	130
Tegafur 100mg + Uracil 224mg Capsule	131
Temozolomide - 20mg, 100mg Capsule	132
Thalidomide - 50mg Capsule	133
Thioguanine - 40mg Tablet	134
Trastuzumab - 440mg Injection	135
Vinblastine - 10mg Injection	137
Vincristine - 1mg Injection	138
Vindesine - 5mg/5ml Injection	140
Vinorelbine - 10mg, 50mg Injection	141
Zoledronic Acid - 4mg Injection	143
CHAPTER 3 - GUIDING PATIENTS TO MANAGE COMMON SIDE EFFECTS OF CANCER DRUGS	144
Myelosuppression	144
Gastrointestinal Toxicities	145
Fatigue	148
Diet	148
Exercise	149
Neuropathy	149
Dermatological Toxicities	150
Sexuality	151
APPENDIX: Oral Chemotherapy Administration Guide	152

INTRODUCTION

Pharmacists are tasked to educate and provide drug counselling to patients in order to improve their adherence with their complicated cancer medications. This guide is intended to serve as a quick reference for pharmacists who counsel cancer patients. It is designed to guide counselling systematically with the provided chapters:

a) Chapter 1: Introducing Chemotherapy to Patients

A guide to patient need-to-know information about cancer treatment in lay language. It gives a general overview about cancer treatment including the definitions of commonly used medical terms, side effects, precautions and general counselling points for patients during chemotherapy.

b) Chapter 2: Drugs Used in Cancer Treatment

This is the drug information section of this guide. All drugs are listed alphabetically by generic names. It provides a brief summary of important drug counselling points, instructions to take medicine, storage and handling of products, precautions, interactions and side effects. This is NOT an exhaustive list of drugs used in cancer treatment and is NOT a complete drug information resource. Reference to other drug literature is advised if further details are required.

c) Chapter 3: Guiding Patients to Manage the Common Side Effects of Cancer Drugs

This chapter is dedicated to teaching patients about the common side effects of their pharmacotherapy which ranged from myelosuppression to sexuality issue. It provides advice on prevention, self-monitoring, treatment and coping with the effects.

CHAPTER 1-INTRODUCING CHEMOTHERAPY TO PATIENTS

General Counselling Points for Patients During Chemotherapy

- a) Avoid crowded areas.
- b) Wear protective mask.
- c) Go to the nearest hospital if there are signs of fever, prolonged bleeding or unexplained fatigue.
- d) Avoid smoking or alcohol consumption.
- e) Avoid uncooked food, eat a well-balanced diet and drink plenty of water.
- f) Get plenty of rest and sleep.
- g) Perform daily activities and exercise as tolerated.
- h) Consult doctor for choice of contraception measures. Discuss with doctor if plan to get pregnant.
- i) Discuss with the doctor or pharmacist before taking any other medicines, vitamins, mineral supplements, traditional or complementary medicines. Some may seriously interfere with the treatment that has been prescribed.
- j) Discuss with the healthcare provider regarding side effects encountered during chemotherapy. Consult doctor if wish to stop therapy for any reason.

Counselling Patients About Their Oral Chemotherapy

The use of oral cancer drug has significantly increased during the past years and is anticipated to continue to grow. It has gained much popularity among patients due to its convenience. Unfortunately, it is often wrongly perceived to be less toxic and more tolerable than conventional chemotherapy. The shift of treatment responsibility from healthcare facilities into patient's home raises significant concern about medication safety. Therefore, effective counselling is vital to educate and empower patients to engage in their own medication management for a safe and optimal treatment outcome.

Patients and carer need to be well-informed about the treatment and be provided with written guide for medication administration, importance of early recognition and prompt management of side effects. Emphasise on the importance of adherence in order to achieve optimal outcome without compromising patient safety.

In summary, the following points should be addressed during drug counselling sessions:

- a) 5R: The right patient, medicines, dose, route and time of administration (in regards to food intake).
- b) The name and indications of their medications, including supportive medications.
- c) Treatment schedule; when to start, stop and interval between doses as well as duration of each cycle and total number of cycle.
- d) Common and significant side effects and the treatment managements.
- e) Steps to be taken in the event of fever or other signs of infection.
- f) Any drug or food interactions.
- g) The arrangements for resupply either from the hospital, health clinic or retail pharmacy; supply adequate quantity for each cycle only, advice to return any unused or extra medication.
- h) Storage instructions and emphasise on **keeping out of children's reach**.
- i) Any handling or safety precautions; cytotoxic drugs should not be handled by pregnant women.
- j) "Do not cut/ crush / chew"
- k) Any issues on fertility.
- l) Clear advice if the patient misses a dose or vomits shortly after the dose is taken:
 - Take the medication at the same time each day.
 - If vomiting occurs within 1 hour of taking a dose, consult doctor or healthcare providers.
 - If missed a dose, take it as soon as possible and do not double the dose.
 - Once a day dosing : If it is more than 12 hours since missed dose, skip the missed dose and go back to usual dosing time.
 - Twice a day dosing : If it is more than 6 hours since missed dose, skip the missed dose and go back to usual dosing time.

General Precautions During Cancer Treatment

- a) Check with doctor or pharmacist before start taking any new drugs (including over-the counter, nutritional supplements, vitamins, and herbal drugs). Discuss with doctor before receiving any immunisation. This is to prevent drug-induced immunosuppression.
- b) Inform doctor immediately if patient or partner becomes pregnant; may cause foetal harm.
- c) Breastfeeding is not encouraged during treatment as it may harm the baby.
- d) Inform doctor or dentists if on chemotherapy.
- e) Avoid alcohol. It may interfere with the way some chemotherapy drugs work

References:

1. Sam M. (2012) *How to counsel cancer patients about their oral chemotherapy*. Clinical Pharmacist, 4(1) 171.
2. National patient Safety Agency (2008) *Risks of incorrect dosing of oral anti-cancer medicines. Rapid Response Report*. [Online] (1). Available from – www.nrls.npsa.nhs.uk/resources. [Accessed: 9th September 2015]

CHAPTER 2-DRUGS USED IN CANCER TREATMENT

Alemtuzumab - 30mg/ml Injection

Instruction

- Route of administration: IV, SC.
- Premedication: IV chlorpheniramine, PO paracetamol 30 minutes prior to infusion.
- IV: do not administer as IV push/bolus.
- SC: SC administration reduces infusion-related symptoms. Ice packs applied to the injection site 15 minutes prior to and 15 minutes post injection may decrease the severity of skin reactions. Cold compresses applied for 15-20 minutes, several times a day after treatment may also help to alleviate symptoms.

Storage

- Store the concentrate at 2-8°C.
- Diluted solution store at room temperature or in refrigerator. Use within 8 hours.
- Protect from light.

Precaution

- Single dose of alemtuzumab greater than 30 mg or cumulative doses greater than 90 mg per week increase the incidence of pancytopenia.
- Use with caution in patients with recent exposure to chicken-pox virus.
- Use with caution in patients with previous hypersensitivity reaction to other monoclonal antibodies.
- Transfusion related GVHD: eliminate risk by using irradiated blood products.
- Pregnancy Risk Factor : C
- Adequate contraception should be used by both sexes while on therapy and for 6 months following discontinuation of therapy
- Discontinue breastfeeding during treatment and for at least 3 months following the last dose of alemtuzumab as human Ig G is excreted in breast milk.

Drug-Disease Interaction

- Hepatitis B reactivation: Test for HBsAg and HBcAb. If positive, treat with Lamivudine 100 mg/day orally, for the entire duration of chemotherapy and for six months afterwards.

Drug-Herb Interaction

- Echinacea: May diminish therapeutic effect of alemtuzumab.

Side Effects

- Haematologic toxicities (lymphopenia, neutropenia, thrombocytopenia).
- Infusion related reaction (fever, rigors, hypotension, SOB, rash).
- Infection: High risk of opportunistic bacterial or viral infections. Administer prophylactic medication against PCP and herpes viral infection.
- GI toxicities (nausea & vomiting, diarrhoea).
- Pulmonary toxicities (dyspnoea, cough).
- Incidences of side effects are less with SC use.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.

All Trans Retinoic Acid (ATRA) - 10mg Capsule

Instruction

- Route of administration: PO
- Take with food and a glass of water or juice.

Storage

- Store in a refrigerator and protect from light.

Precaution

- May influence activities requiring alertness or coordination (such as driving) due to its central nervous system side effects.
- Pregnancy Risk Factor: D
- Adequate contraception (2 reliable birth control) should be used while on therapy and for 1 month following discontinuation of therapy.

Drug-Disease Interaction

- Venous thrombosis, arterial thrombosis. Risk during first month of therapy. May involve any organ system.
- Hypercholesterolaemia, hypertriglyceridemia (reversible upon completion of treatment).

Drug-Drug Interaction

- Vitamin A: May increase ATRA toxicity (symptom of hypervitaminosis A such as dry mouth, rash, nausea and vomiting).
- Antifibrinolytic agents: May increase thrombogenic effect.
- Tetracycline derivatives: May increase pseudotumour cerebri (also known as intracranial hypertension: symptoms include severe headache, nausea and vomiting, visual changes) .
- Contraceptives pills (progesterone): May decrease effect of contraceptives pills.

Drug-Herb

- St John's Wort: May decrease ATRA effect.
- Dong quai, St John's Wort: May increase photosensitisation.

Side Effects

- Haematologic toxicity (APML differentiation syndrome characterised by fever, dyspnoea, acute respiratory distress, weight gain, radiographic pulmonary infiltrates, pleural or pericardial effusions, oedema, hepatic, renal, and/or multiorgan failure). May need temporary interruption of therapy.
- Skin toxicities (mucosal and skin dryness, rash).
- Cardiotoxicities (oedema, peripheral oedema, flushing).
- GI toxicities (minimal to low: nausea and vomiting, mucositis, constipation, diarrhoea, dry lips and mouth).
- CNS toxicity (headache). Occurs several hours after ATRA ingestion. May develop tolerance with continued therapy.
- Renal toxicity (increased serum creatinine).
- Ocular toxicity (visual disturbances, photophobia).
- Ototoxicity (otalgia).
- General (weight gain, fatigue, fever).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.

Amsacrine - 75mg/1.5ml Injection

Instruction

- Route of administration: IV
- Do not administer IT, IM or SC
- Compatible with D5W only. Precipitation will occur in the presence of chloride or sulphate ions.

Storage

- Store at room temperature.
- Protect from light.
- Concentrated amsacrine should not remain in plastic syringe for more than 15 minutes.

Precaution

- Use with caution in renal and hepatic impairment. May need dose modification.
- Pregnancy Risk Factor: Clinical data not available. Women of childbearing potential should avoid becoming pregnant while receiving treatment.
- Extravasation injury: May cause severe tissue necrosis. Inform doctor immediately when extravasation occurs.

Drug-Disease Interaction

- Cardiac disease: May increase cardiotoxicity.
- Hypokalaemia: May increase risk of arrhythmia.

Drug-Herb Interaction

- Echinacea: May decrease effects of amsacrine.

Side Effects

- Haematologic toxicities (anaemia, neutropenia, leucopenia, thrombocytopenia).
- GI toxicities (mucositis, low: nausea & vomiting, diarrhoea, perirectal abscess).
- Cardiotoxicities (arrhythmia, cardiomyopathy).
- CNS toxicities (seizures or loss of consciousness, headache, dizziness).
- Skin toxicities (alopecia, rash, urticaria).
- Renal toxicities (renal failure, urine discolouration: orange-red).
- Hepatotoxicities (hepatic insufficiency, hepatitis).
- Vascular toxicity (phlebitis: concentration related - reduced by infusing over at least 60 min).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.
3. Loughran C. (2014) *Macmillan Cancer Support* [Online] Available from - <http://www.macmillan.org.uk/Cancerinformation/Cancertreatment/Treatmenttypes/Chemotherapy/Individualdrugs/Amsacrine.aspx>. [Accessed: 9th September 2015]
4. Allwood M., Stanley A., Wright P. (eds.)(1997) *The cytotoxics handbook*. 3rd edition. Washington DC: American Pharmaceutical Association.

Anagrelide - 0.5mg, 1mg Capsule

Instruction

- Route of administration: PO
- Take with food (if it causes stomach upset) or on an empty stomach.

Storage

- Store at room temperature and protect from light.

Precaution

- Use with caution in hepatic impairment. May need dose modification.
- May cause sterility in men. Discuss with doctor if plan to have children.
- Pregnancy Risk Factor: C

Drug-Disease Interaction

- Cardiac Disease: May increase heart rate.

Drug-Drug Interaction

- Aspirin, NSAIDs (especially non-selective), anticoagulants: May increase risk of bleeding.
- Sucralfate: May decrease anagrelide effect.

Drug-Food/Herb Interaction

- Glucosamine, omega-3, alfalfa, anise, bilberry, bromelain, cat's claw, celery, chamomile, cordyceps, dong quai, evening primrose oil, fenugreek, feverfew, garlic, ginger, ginkgo biloba, ginseng, grape seed, green tea, horse chestnut seed, liquorice, red clover, reishi, sweet clover, turmeric, white willow: may increase risk of bleeding.

Side Effects

- Haematologic toxicities (thrombocytopenia, anaemia).
- Cardiotoxicities (peripheral oedema, tachycardia, angina, arrhythmia, heart failure, hypertension, postural hypotension, syncope, thrombosis, vasodilatation).
- CNS toxicities (dizziness, amnesia, confusion, depression, insomnia, migraine, nervousness, somnolence).
- GI toxicities (low: nausea & vomiting, diarrhoea, abdominal pain).
- Skin toxicities (photosensitivity, pruritus, alopecia, urticaria).
- Flu like symptoms (fever, fatigue, chills, headache, arthralgia).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.

Anastrozole - 1mg Tablet

Instruction

- Route of administration: PO
- Take with food or on an empty stomach with a glass of water or juice.

Storage

- Store at room temperature.
- Protect from light, heat and moisture.

Precaution

- Should not be administered to women with pre-menopausal endocrine status.
- Pregnancy Risk Factor: X
- May decrease bone mineral density. Monitor bone density.

Drug-Drug Interaction

- Oestrogen-containing therapies: May interfere with therapeutic effect of anastrozole.

Side Effects

- Endocrine (hot flushes: take tablet at bedtime).
- Musculoskeletal (arthralgia, myalgia, headache, back pain, risk of fracture).
- Cardiotoxicities (increased incidence of ischaemic events in women with pre-existing ischaemic heart disease, peripheral oedema).
- GI toxicity (nausea: take the tablet right after a meal).
- General (may elevate the cholesterol level, fatigue, weight gain).
- Sexual / reproductive dysfunction (vaginal dryness).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.

Aprepitant - 125mg, 80mg Capsule

Instruction

- Route of administration: PO
- Patient should receive a package containing 3 capsules of aprepitant. It is taken as 3 doses over 3 days.
- Day 1: Take one 125mg capsule by mouth 1 hour prior to chemotherapy.
- Day 2 and Day 3: Take one 80mg capsule by mouth, each morning for 2 days.
- Take with food or on an empty stomach with a glass of water.

Storage

- Store at room temperature.

Precaution

- Pregnancy Risk Factor: B
- Avoid pregnancy while on therapy and for 1 month following discontinuation of therapy.

Drug-Drug Interaction

- Cisapride, pimozone, terfenadine and astemizole: May cause life-threatening interactions.
- May decrease the effectiveness of warfarin, phenytoin and oral contraceptives via induction of their metabolism.

Drug-Herb Interaction

- St John's Wort : May decrease aprepitant level.

Side Effects

- CNS toxicities (headache, fatigue).
- GI toxicities (nausea, diarrhoea, constipation).
- Pulmonary toxicity (hiccups).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.
3. Electronic Medical Compendium. (2015) [Online] Available from - <http://www.medicines.org.uk/emc/medicine/13868>. [Accessed: 9th September 2015]

Arsenic Trioxide - 1mg/ml Injection

Instruction

- Route of administration: IV
- Infuse over 1-2 hours. May be extended up to 4 hours if vasomotor reactions are observed.

Storage

- Store at room temperature.

Precaution

- Administer drug in a controlled setting with careful monitoring of blood pressure & ECG.
- Correct hypokalaemia and hypomagnesaemia if present, before initiation of the treatment.
- Use with caution in heart failure, history of torsade de pointes, long QT syndrome and/ or on other medications that prolong the QT interval.
- Use with caution in renal impairment (CrCl < 30ml/min). May need dose modification.
- Pregnancy Risk Factor : D
- Avoid pregnancy while on therapy and for at least 3 months following discontinuation of therapy.
- Breastfeeding is not recommended during therapy and for 3 months following discontinuation of therapy.

Drug-Drug Interaction

- Clozapine, ivabradine and mifepristone: May increase risk of QTc prolongation. Avoid concomitant use.

Side Effects

- Abnormal heart rhythm (QT prolongation).
- Metabolism and nutrition disorders (hypokalaemia, hypomagnesaemia, hyperglycaemia).
- APML differentiation syndrome (e.g. dyspnoea, chest pain, cough, fever, oedema).
- Haematologic toxicities: Hyperleukocytosis (leukocytes $\geq 10,000\text{m}^3$), anaemia, thrombocytopenia.
- Fatigue.
- Infection.
- GI toxicities (diarrhoea, low to moderate: nausea).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.
3. Electronic Medical Compendium. (2015) [Online] Available from - <http://www.medicines.org.uk/emc/medicine/28860>. [Accessed: 9th September 2015]

Azacitidine - 100mg Injection

Instruction

- Route of administration: IV, SC
- IV: infuse over 10 - 40 minutes.
- Incompatible with D5W.
- SC: Do not filter after reconstitution. Resuspend contents of syringe by vigorously rolling between palms immediately prior to administration.
- Use air-sandwich technique to minimise risk and severity of injection site reaction.
- Administer at the upper arm, thigh or abdomen. Doses more than 4ml should be injected into two separate sites. Injection sites should be rotated. New injections should be given at least 2.5cm apart from the previous site.

Storage

- Store at room temperature.

Precaution

- Contraindicated in advance malignant hepatic tumours.
- Pregnancy Risk Factor: D
- Women of child-bearing potential should continue birth control up to 3 months and men up to 6 months following discontinuation of therapy.

Side Effects

- Haematologic toxicities (thrombocytopenia, anaemia, neutropenia).
- GI toxicities (constipation, low to moderate: nausea and vomiting).
- Fatigue.
- Pulmonary toxicity (dyspnoea).
- Injection site reaction (bruising, erythema, pain).
- CNS toxicities (dizziness, headache).
- Musculoskeletal (myalgia, arthralgia).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.
3. Electronic Medical Compendium. (2015) [Online] Available from - <http://www.medicines.org.uk/emc/medicine/21508>. [Accessed: 9th September 2015]

Bevacizumab - 25mg/ml Injection

Instruction

- Route of administration: IV
- Do not administer as an IV push/bolus.
- Infuse over 90 minutes as loading dose. If tolerated, the 2nd infusion can be given over 60 minutes. The 3rd and subsequent infusion may be shortened to 30 minutes if the 60 minutes infusion is well tolerated.
- Incompatible with D5W.

Storage

- Store in a refrigerator.
- Protect from light.
- Do not shake.

Precaution

- Stop bevacizumab 4 weeks before surgery and not restart bevacizumab until 4 weeks after surgery and only if the surgical wound is fully healed. This helps to lower the risk of bleeding and may prevent problems with wound healing after surgery.
- Use with caution in patients with coagulopathies (congenital, acquired or therapeutic).
- Use with caution if given with other antiangiogenic agents.
- Pregnancy Risk Factor: C
- Avoid pregnancy while on therapy and for 6 months following discontinuation of therapy.

Drug-Drug Interaction

- Sunitib: Increase risk of microangiopathic haemolytic anemia (MAHA).

Side Effects

- Skin toxicities (wound healing complication, rash).
- Cardiotoxicity (hypertension).
- Renal toxicity (proteinuria).
- Thromboembolic events (MI, DVT, PE).
- General (fatigue, haemorrhage).
- Infusion related reactions (SOB, rash, hypo/hypertension).
- CNS toxicities (headache, pain, RPLS).
- GI toxicities (mucositis, constipation, diarrhoea, gastrointestinal perforation, fistulas).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.
3. Electronic Medical Compendium. (2015) [Online] Available from - <http://www.medicines.org.uk/emc/medicine/15748>. [Accessed: 9th September 2015]

Bicalutamide - 50mg Tablet

Instruction

- Route of administration: PO
- Take with food or on an empty stomach at the same time each day.

Storage

- Store at room temperature.

Precaution

- Contraindicated in female.
- Use with caution in moderate to severe hepatic impairment. May delay metabolism, resulting in prolonged elimination half-life and increased risk of toxicity.
- Bicalutamide contains lactose. Use should be carefully considered in patients with hereditary galactose intolerance, severe lactase deficiency or glucose galactose malabsorption.
- Pregnancy Risk Factor: X
- Protect from light, heat and moisture.

Drug-Disease Interaction

- Diabetes: Loss of glycaemic control and reduce glucose tolerance.
- Cardiac disease: May cause fluid retention.

Drug-Drug Interaction

- Warfarin: May enhance risk of bleeding.
- Midazolam: May increase AUC of midazolam (after administration of bicalutamide for 28 days).
- Ketoconazole: May increase plasma concentration of bicalutamide.

Side Effects

- Endocrine (hot flashes, gynaecomastia, breast tenderness).
- GI toxicities (constipation, diarrhoea, low: nausea).
- Musculoskeletal (pain).
- General (fatigue).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.

Bleomycin - 15mg Injection

Instruction

- Route of administration: IV, IM, SC, intrapleural.
- IV: Infuse slowly over 10 minutes.
- IM and SC: May cause pain at injection site.
- Intrapleural: Dilute 60 units in 60-100ml NS.
- Maximum lifetime cumulative dose: Greater than 400 units increase risk of developing pulmonary toxicity. May be prevented by IV hydrocortisone as per protocol. [1 units = 1mg = 1000 iu USP]

Storage

- Store at room temperature.

Precaution

- Use with caution in renal impairment (CrCl<50ml/min). May need dose modification.
- Pregnancy Risk Factor: D

Drug-Disease Interaction

- Pulmonary dysfunction: May increase risk of pulmonary toxicity.

Drug-Drug Interaction

- May decrease digoxin & phenytoin level.

Drug-Radiotherapy Interaction

- Irradiation to the thorax: May increase the risk of interstitial pneumonia and pulmonary fibrosis.

Side Effects

- Skin toxicities (striae, rash, erythema usually developed 2-4 weeks after initiation of treatment).
- Pulmonary toxicities (pneumonitis, fibrosis).
- Febrile reaction (fever).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.
3. Electronic Medical Compendium. (2015) [Online] Available from - <http://www.medicines.org.uk/emc/medicine/26918>. [Accessed: 9th September 2015]

Bortezomib - 3.5mg Injection

Instruction

- Route of administration: IV, SC
- Do not administer IT.
- SC: Dilute to 2.5mg/ml. If injection site reaction occurs, dilution of 1mg/ml concentration may be used. Administer on abdomen or thigh. Rotate injection sites and administer at least 1 inch from previous injection area.

Storage

- Store at room temperature and protect from light.

Precaution

- May cause reactivation of hepatitis B and tuberculosis with bortezomib use.
- Use with caution in hepatic impairment. May need dose modification.
- Pregnancy Risk Factor: D
- May cause sterility in men and menopause in women. Discuss with doctor if plan to have children. Women of childbearing potential should avoid becoming pregnant while receiving treatment.

Drug-Disease Interaction

- Diabetes: May experience hypo/hyperglycaemia. Monitor blood glucose level closely.

Drug-Drug Interaction

- Ascorbic acid: May decrease effect of bortezomib. Avoid if possible.
- Ketoconazole: May decrease bortezomib AUC by 35%.
- Rifampicin: May decrease bortezomib efficacy by 45%.

Drug-Food/Herb Interaction

- Green tea, green tea products and St John's Wort: May decrease the effect of bortezomib.
- Grapefruit: May increase bortezomib level.

Side Effects

- Haematologic toxicities (thrombocytopenia, neutropaenia).
- GI toxicities (constipation, diarrhoea).
- Fatigue.
- Neurotoxicity (peripheral neuropathy).
- Cardiotoxicity (hypotension: postural and orthostatic).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.
3. Electronic Medical Compendium. (2015) [Online] Available from - <http://www.medicines.org.uk/emc/medicine/17109>. [Accessed: 9th September 2015]

Busulfan - 6mg/ml Injection; 2mg Tablet

Instruction

- Route of administration: PO, IV
- PO: Take with food (if it causes stomach upset) or on an empty stomach.
- IV: infuse within 2 hours via central line.

Storage

- Injection:
 - Store in a refrigerator.
 - Solutions diluted are stable for up to 8 hours at room temperature and 12 hours in refrigeration.
 - The infusion must be completed within that 12 hour time frame.
- Tablet: Store at room temperature.

Precaution

- Pregnancy Risk Factor : D
 - Avoid pregnancy while on therapy and for at least 4 months following discontinuation of therapy.
- Busulfan may impair fertility.
 - Sterility in men and menopause in women.
 - Discuss with doctor if plan to have children.

Drug-Disease Interaction

- Seizure: Initiate prophylactic anticonvulsant therapy prior to treatment.

Drug-Drug Interaction

- Antifungal (azole derivatives, systemic): May increase busulfan effect.
- Phenytoin: May decrease busulfan effect.

Drug-Food/Herb Interaction

- Liquorice: May increase busulfan effect.
- St. John's Wort: May decrease busulfan effect.
- Ginger, green tea, pomegranate juice, black pepper, turmeric, star fruit juice: May increase busulfan effect.

Side Effects

- Haematologic toxicities (thrombocytopenia, neutropenia, anaemia).
- GI toxicities (high: nausea and vomiting, mucositis, diarrhoea).
- Cardiotoxicities (tachycardia, hypertension, oedema, chest pain).
- CNS toxicities (insomnia, headache, dizziness, confusion, seizure).
- Hepatotoxicity (veno-occlusive disease).
- Pulmonary toxicities (SOB, hacking cough).
- Skin toxicities (rash, urticaria, alopecia, skin darkening). Mostly occur in pressure areas such as elbows, knees and skin creases, which will slowly fade when stop taking busulfan).
- Metabolism and nutrition disorders (hyperglycaemia, hypomagnesaemia, hypokalaemia, hypocalcaemia, hypophosphatemia).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.
3. Electronic Medical Compendium. (2015) [Online] Available from - <http://www.medicines.org.uk/emc/medicine/24686>. [Accessed: 9th September 2015]

Capecitabine - 150mg, 500mg Tablet

Instruction

- Route of administration: PO
- Take within 30 minutes after breakfast or dinner with a glass of water.
- Take twice a day for 2 weeks, followed by 1 week break before repeating the next cycle (regimen may differ according to protocol).

Storage

- Store at room temperature.

Precaution

- Geriatric: May be more sensitive and may need dose reduction.
- Dihydropyrimidine dehydrogenase (DPD) deficiency: Greater risk of severe capecitabine related toxicities.
- Use with caution in renal impairment and hand-foot skin reaction patients. May need dose modification.
- Pregnancy Risk Factor: D

Drug-Disease Interaction

- CAD: May increase risk of cardiotoxicity.
- History of cardiotoxicity associated with 5FU therapy.

Drug-Drug Interaction

- Warfarin: May increase anticoagulation effect.
- Phenytoin: May increase serum phenytoin level.

Drug-Food Interaction

- Reduce the rate and extent of absorption with the presence of food.

Side Effects

- Haematologic toxicities (anaemia, neutropenia, thrombocytopenia).
- Skin toxicity (hand-foot skin reaction).
- GI toxicities (low: nausea and vomiting, diarrhoea, mucositis).
- Hepatotoxicities (hyperbilirubinaemia, yellow eyes or skin, white or clay coloured stool).
- Cardiotoxicity (oedema).
- General (fatigue, fever).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.
3. Electronic Medical Compendium. (2015) [Online] Available from - <http://www.medicines.org.uk/emc/medicine/28462>. [Accessed: 9th September 2015]

Carboplatin - 10mg/ml Injection

Instruction

- Route of administration: IV
- When administered as sequential infusions, taxanes (paclitaxel, docetaxel) should be administered before platinum (cisplatin, carboplatin) to limit myelosuppression and enhance efficacy.

Storage

- Store at room temperature and protect from light.

Precaution

- The incidence and severity of nephrotoxicity may increase in patients who have impaired renal function before carboplatin treatment.
- Anaphylactic-like reactions have occurred within minutes of administration; increased risk with prior platinum therapy.
- Aluminium-containing equipment should not be used during preparation and administration of carboplatin because it may interact with aluminium to form black precipitate.
- Combination therapy with other myelosuppressive agents may require dose changes or rescheduling of doses in order to minimise the combined myelosuppressive effects.
- Pregnancy Risk Factor: D

Drug-drug Interaction

- Aminoglycosides: May increase ototoxicity.
- Phenytoin: May decrease phenytoin level.
- Warfarin: May increase anticoagulant effects of Warfarin. Monitor INR and bleeding signs.

Side Effects

- Haematologic toxicities (anaemia, thrombocytopenia, neutropenia).
- GI toxicities (moderate: nausea and vomiting).
- Hypersensitivity reaction (rash, facial oedema).
- Neurotoxicity (peripheral neuropathy).
- Hepatotoxicity (elevated ALP, AST).
- Renal toxicity (abnormal blood urea, increase in serum creatinine).
- Metabolism and nutrition disorders (hypomagnesaemia, hyponatraemia, hypokalaemia).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.

Carmustine - 100mg Injection

Instruction

- Route of administration: IV
- Infuse over 1 to 2 hours. High dose (transplant dose) should be infused over more than 2 hours (maximum infusion rate: 3mg/m²/min) to avoid excessive flushing, agitation and hypotension.
- Incompatible with NS.
- Accidental contact of reconstituted carmustine with skin may caused burning and hyperpigmentation of the affected areas. Immediately wash the area thoroughly with soap and water.

Storage

- Store in a refrigerator.

Precaution

- High dose of carmustine may be fatal if not followed by stem cell rescue.
- Use with caution in renal impairment and hepatic disease. Close monitoring is recommended.
- Pregnancy Risk Factor: D
- May impair fertility; sterility in men and menopause in women. Discuss with doctor if plan to have children.

Drug-Drug Interaction

- Phenytoin: May decrease absorption or increase metabolism of phenytoin.
- Digoxin: May decrease digoxin absorption.

Side Effects

- Pulmonary toxicity (pulmonary infiltrates and/ or fibrosis especially if cumulative dose greater than 1400mg/m²).
- Haematologic toxicity (cumulative, dose-related and delayed myelosuppression).
- Hepatotoxicity (reversible).
- GI toxicities (high to moderate: nausea and vomiting).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.

Cetuximab - 5mg/ml Injection

Instruction

- Route of administration: IV (Do not administer via IV push/ bolus).
 - Infuse over 2 hours as loading dose, next infusion to be given over 1 hour as maintenance dose.
 - Administration rate should not exceed 10mg/min.
- Initiate cetuximab one week prior to initiation of radiation therapy.
- Complete cetuximab administration 1 hour prior to platinum-based therapy or with 5-FU.
- Premedication: H₁ antagonist (chlorpheniramine) and corticosteroid prior to the initial dose to reduce severe infusion reactions.

Storage

- Store in a refrigerator.

Precaution

- Use with caution in patients with history of CAD, CHF, arrhythmias or pre-existing lung disease.
- Pregnancy Risk Factor: C
- Breastfeeding is not recommended during therapy and for 60 days following discontinuation of therapy.

Drug-Drug Interaction

- Cisplatin, carboplatin:
 - May increase risk of leucopenia and severe neutropenia
 - May lead to febrile neutropenia, pneumonia and sepsis.
- Fluorouracil: May increase risk of cardiac ischaemia (MI and CHF) and hand-foot reaction.

Side Effects

- Skin toxicities (acneiform rash, dry skin, nail changes).
 - Acneiform rash onset within the first two weeks of therapy.
 - If severe, may need dose modification, treatment with topical corticosteroids and topical antibiotics.
 - Topical retinoid or benzoyl peroxide may worsen the condition and should be avoided.
 - Limit sun exposure during treatment and for 2 months following cessation of treatment.
 - Dry skin-require moisturisation.
 - Nail changes usually delayed, developing after 4-8 weeks of therapy. Tender, erythematous and superinfection may occur.
- Severe infusion reactions (chills, rigors, dyspnoea, angioedema, hypo/hypertension, urticaria).
 - Usually occur during first infusion and with subsequent infusions.
 - Mild to moderate reaction may be managed with slower infusion rate and prophylactic antihistamines for subsequent doses.
 - Discontinue therapy for severe reaction.
- GI toxicities (constipation, diarrhoea, mucositis, abdominal pain).
- Metabolism and nutrition disorders (hypomagnesaemia, hypokalaemia, hypocalcaemia).
 - May occur days to months after initiation of treatment.
 - Manifest as severe fatigue, irritability, paraesthesia and cramps.
 - Monitor electrolytes during treatment and continue for at least 8 weeks following completion of treatment.
- General (fatigue, fever).
- CNS toxicities (headache, insomnia).
- Pulmonary toxicities (cardiopulmonary arrest, interstitial lung disease).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.
3. Electronic Medical Compendium. (2015) [Online] Available from - <http://www.medicines.org.uk/emc/medicine/19595>. [Accessed: 9th September 2015]

Chlorambucil - 2mg Tablet

Instruction

- Route of administration: PO
- Take on an empty stomach with a full glass of water at the same time each day.

Storage

- Store in a refrigerator and protect from light.

Precaution

- Use with caution in hepatic impairment and geriatrics. May need dose modification.
- Pregnancy Risk Factor: D
- May impair fertility; sterility in men and menopause in women. Discuss with doctor if plan to have children.

Drug-Disease Interaction

- Seizures or head trauma, nephrotic syndrome in children: High risk of seizure.

Side Effects

- Haematologic toxicities (neutropenia, anaemia, lymphopenia, thrombocytopenia, bone marrow failure).
- Skin toxicities (rash, Stevens-Johnson syndrome, toxic epidermal necrolysis).
- Pulmonary toxicities (interstitial pneumonia, pulmonary fibrosis).
- CNS toxicities (seizures or loss of consciousness: High pulse doses; may occur days to months after initiating treatment).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.
3. Electronic Medical Compendium. (2015) [Online] Available from - <http://www.medicines.org.uk/emc/medicine/24689>. [Accessed: 9th September 2015]

Cisplatin - 1mg/ml Injection

Instruction

- Route of administration: IV
- Incompatible with D5W. Hydration should be given according to protocol.
- When administered as sequential infusions, taxanes (paclitaxel, docetaxel) should be administered before platinum (cisplatin, carboplatin) to limit myelosuppression and enhance efficacy.

Storage

- Store at room temperature (refrigeration may cause precipitation).
- Protect from light.

Precaution

- Pre-existing renal impairment, hearing impairment or myelosuppression. May need dose modification for renal impairment. Hydration is required to minimise nephrotoxicity. Pre-treatment hydration with 1 or 2 litre of fluid prior to a cisplatin dose or hydrate as per institutional protocol.
- Inadvertent substitution of cisplatin for carboplatin can result in a potentially fatal overdose.
- Pregnancy Risk Factor: D

Drug-Drug Interaction

- Etoposide: Synergistic antineoplastic activity.
- Aminoglycosides, amphotericin: May increase the risk of nephrotoxicity.
- Aminoglycosides, loop diuretics: May increase the risk of ototoxicity.
- Phenytoin: May decrease phenytoin serum levels.
- Pyridoxine: May decrease cisplatin activity.
- May increase the serum levels of renally excreted drugs.

Side Effects

- GI toxicities (high: nausea and vomiting).
- Haematologic toxicities (anaemia, thrombocytopenia).
- Nephrotoxicity: May be minimised by adequate hydration.
- Metabolism and nutrition disorders (hypomagnesaemia, hypocalcaemia, hypokalaemia).
- Ototoxicity (tinnitus; with or without hearing loss).
- Hypersensitivity reaction (SOB, facial oedema, flushing).
- Neurotoxicities (peripheral neuropathy, paraesthesia).
- CNS toxicities (cerebral herniation, encephalopathy, seizure).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.
3. Electronic Medical Compendium. (2015) [Online] Available from - <http://www.medicines.org.uk/emc/medicine/258944> . [Accessed: 21st September 2016]

Cladribine - 10mg/ml Injection

Instruction

- Route of administration: IV, SC
- Continuous infusion or as per protocol.
- Not for IV push or bolus.
- Incompatible with D5W.

Storage

- Store in a refrigerator.
- Inadvertent freezing does not affect the solution.
- Protect from light.
- Precipitate may develop at low temperature and may be resolubilised at room temperature or by shaking the solution vigorously.

Precaution

- May cause reactivation of hepatitis B in lymphoma patient with cladribine use.
- High dose use in bone marrow transplant is associated with severe neurotoxicity (irreversible), nephrotoxicity and bone marrow suppression.
- Use with caution in renal impairment. May need dose modification.
- Pregnancy Risk Factor: D

Side Effects

- Haematologic toxicities (febrile neutropenia, anaemia, thrombocytopenia).
- CNS toxicity (headache).
- Opportunistic infection.
- Fever.
- Fatigue.
- GI toxicities (minimal: nausea and vomiting).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.

Clodronate - 800mg Tablet

Instruction

- Route of administration: PO
- Take on an empty stomach, at least 1 hour before or 1 to 2 hours after food.
- Take with copious fluids (not milk). For patients with swallowing problem, tablets can be crushed and mix with small amount of water. However, tablet content is acidic and may cause burning in the oesophagus, bioavailability of this drug through this method has not been determined.

Storage

- Store at room temperature.

Precaution

- Contraindicated in patients who have a history of hypersensitivity to other biphosphonates, severe renal impairment (ClCr < 10ml/min) and/or severe inflammation of GI tract.
- Pregnancy Risk Factor: Clinical data not available. Women of childbearing potential should avoid becoming pregnant while receiving treatment.

Drug-Drug Interaction

- Antacids (calcium, iron, magnesium or aluminium containing preparations): May decrease therapeutic effect of clodronate. Avoid concurrent administration. Take at least 2 hours apart.
- Aminoglycosides (amikacin, gentamycin, tobramycin) and calcium lowering agents (corticosteroid, phosphate, calcitonin, loop diuretics): May increase hypocalcaemic effect of clodronate.
- Vitamin D containing preparations: May decrease hypocalcaemic effect of clodronate.
- Estramustine: May increase serum concentration of estramustine.

Drug-Food Interaction

- Food (containing calcium, iron, multivalent ions) and beverages (dairy products, orange, coffee): May interfere with absorption.

Side Effects

- GI toxicities (low: nausea and vomiting, constipation, diarrhoea). Generally associated with higher oral doses and may be minimised by reducing or dividing the total daily dose, or temporarily interrupting therapy.
- Musculoskeletal (bone pain, muscle pain, osteonecrosis of jaw).
- Metabolism and nutritional disorders (hypocalcaemia).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.
3. Royal Pharmaceutical Society (2015) *British National Formulary 69*. United Kingdom: BMJ Group and Pharmaceutical Press.

Cyclophosphamide - 200mg, 1000mg Injection; 50mg Tablet

Instruction

- Route of administration: PO, IV
- PO: Take with food or on an empty stomach. Preferable morning administration to ensure adequate hydration throughout the day. Do not administer at bed time.

Storage

- Injection: Store at room temperature.
- Tablet: Store at room temperature not more than 30°C.

Precaution

- Use with caution in renal impairment. May need dose modification.
- Pregnancy Risk Factor: D
- May impair fertility; sterility in men and menopause in women. Discuss with doctor if plan to have children.

Drug-Drug Interaction

- Allopurinol: May increase cyclophosphamide effect.
- Warfarin: May increase the effect of warfarin.
- Digoxin: May decrease the effect of digoxin.

Drug-Herb Interaction

- Avoid black cohosh and dong quai in oestrogen-dependent tumours.

Side Effects

- Renal toxicity (haemorrhagic cystitis in high dose and or long term therapy). May be minimised by adequate hydration and/or with mesna).
- Haematologic toxicities (anaemia, neutropenia, thrombocytopenia).
- GI toxicities (moderate to high: nausea and vomiting, mucositis, diarrhoea).
- Skin toxicities (alopecia, hyperpigmentation of nail or skin).
- Cardiotoxicities: With high dose HSCT therapy (arrhythmias, cardiac tamponade, CHF, haemorrhagic myocarditis, myocardial necrosis).
- Pulmonary toxicity (high dose therapy: pulmonary fibrosis).
- Hepatotoxicity (high dose therapy: veno-occlusive liver disease).
- Nasal congestion due to rapid administration of cyclophosphamide.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.
3. Royal Pharmaceutical Society (2015) *British National Formulary 69*. United Kingdom: BMJ Group and Pharmaceutical Press.

Cytarabine - 100mg/ml Injection

Instruction

- Route of administration: IV, SC, IT
- IV high dose ($\geq 1000\text{mg/m}^2$): Give premedication with corticosteroid during and for 2 to 7 days after completion of cytarabine.
- IT: Solutions containing bacteriostatic agents should not be used for the preparation of IT doses.

Storage

- Store at room temperature.

Precaution

- Use with caution in renal impairment, hepatic impairment and drug induced bone marrow suppression. May need dose modification.
- Pregnancy Risk Factor: D

Drug-Drug Interaction

- Digoxin: May decrease the effect of digoxin.
- Cytarabine high dose may increase cardiomyopathy risk of cyclophosphamide.

Side Effects

- Fever, allergic reaction (rash, pruritis).
- GI toxicities (high to moderate: nausea and vomiting, mucositis).
- Haematologic toxicities (neutropenia, thrombocytopenia, anaemia, megaloblastosis, reticulocytes decreased).
- High Dose Therapy ($\geq 1\text{g}/\text{m}^2$) or IT administration:
 - Ocular toxicity (blur vision, conjunctivitis). Usually occurs 1 to 2 weeks after initiation of therapy.
 - CNS toxicities (seizures, loss of consciousness, confusion, memory loss, abnormal speech or body movements). Usually occurs 3 to 8 days after initiation of therapy.
 - GI toxicities (high to moderate: nausea and vomiting, mucositis). May be more pronounced with rapid IV injection compared to continuous IV infusion.
 - Neurotoxicity (peripheral neuropathy).
 - Pulmonary toxicities (pulmonary oedema, syndrome of sudden respiratory distress). Continuous infusions more likely than intermittent infusions to cause sudden respiratory distress. Treatment measures include supportive care, high-dose corticosteroids, and discontinuing cytarabine.
 - Cardiotoxicity (cardiomyopathy).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.

Dacarbazine - 100mg Injection

Instruction

- Route of administration: IV
- Infuse over 30-60 minutes.
- Discard if the reconstituted solution turns pink (decomposed due to exposure to light).

Storage

- Store in a refrigerator and protect from light.

Precaution

- May influence activities requiring alertness or coordination (such as driving) due to its central nervous system side effects.
- Pregnancy Risk Factor: C
- Extravasation injury: May cause severe tissue necrosis. Inform doctor immediately when extravasation occurs.

Drug-Drug Interaction

- Levodopa: May reduce response to levodopa.

Drug-Herb Interaction

- Dong quai and St John's Wort: May cause photosensitisation. Avoid concomitant use.

Side Effects

- Haematologic toxicities (thrombocytopenia, leucopenia).
- GI toxicities (high: nausea and vomiting).
- Skin toxicities (photosensitivity, alopecia).
- Flu-like syndrome (fever, myalgia, malaise). Usually occurs after single large doses 2 to 7 days after therapy.
- Hepatotoxicity (hepatovenous occlusion/ hepatic vein thrombosis). Common with combination chemotherapy.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.
3. Clark C. (2014) *Macmillan Cancer Support* [Online] Available from - <http://www.macmillan.org.uk/Cancerinformation/Cancertreatment/Treatmenttypes/Chemotherapy/Individualdrug/Dacarbazine.aspx> . [Accessed: 9th September 2015]
4. Royal Pharmaceutical Society (2015) *British National Formulary 69*. United Kingdom: BMJ Group and Pharmaceutical Press.

Dactinomycin - 0.5mg Injection

Instruction

- Route of administration: IV
- Slow push through side arm of free flowing IV (D5W or NS). May be mixed in a mini bag (NS or D5W; concentration must be at least 0.01mg/ml); Infuse over 10-15 minutes. Do not use cellulose ester membrane filters. It may filter out dactinomycin.

Storage

- Store at room temperature. Protect from light and moisture.

Precaution

- Contraindicated to patient with recent or current infection with chicken pox or Herpes Zoster. Avoid the use of live vaccines.
- Not recommended in children under 6 months of age due to increase frequency of toxic effects. Elderly patients may experience an increased risk of myelosuppression, and should initiate therapy at lower dose.
- Use with caution in hepatic impairment. May need dose modification.
- Adequate contraception should be used by both sexes during therapy and for at least 6 months following discontinuation of therapy. Pregnancy Risk Factor: D
- Extravasation injury: May cause severe tissue necrosis.

Drug-Drug Interaction

- Concomitant use with halogenated inhalation anaesthetics (enflurane, halothane): May increase hepatotoxicity.

Drug-Radiation Interaction

- Dactinomycin is a radiosensitiser. May cause GI toxicities and marrow suppression with higher doses of dactinomycin.

Side Effects

- Hepatotoxicities (ascites, hepatomegaly, hepatic veno-occlusive disease, hepatitis, LFT abnormalities). Usual doses produce hepatotoxicities when additional stressors are placed on the liver (such as concomitant radiation).
- GI toxicities (moderate: nausea and vomiting, mucositis, stomatitis, diarrhoea).
- Skin toxicity (rash may be exacerbated by radiation or sun exposure, alopecia, injection site reaction -phlebitis).
- Haematologic toxicities (thrombocytopenia, neutropenia, leucopenia).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Bragalone DL. (eds.) *Drug information handbook for oncology*. 13th edition. Lexicomp.
3. Electronic Medical Compendium. (2015) [Online] Available from - <http://www.medicines.org.uk/emc/medicine/28812>. [Accessed: 9th September 2015]

Daunorubicin HCl - 20mg Injection

Instruction

- Route of administration: IV
- Do not administer IT, IM or SC.
- Reconstituted solution colour changes from red to blue purple indicate decomposition.

Storage

- Store in a refrigerator and protect from light.

Precaution

- Renal and hepatic impairment. May need dose modification.
- Pregnancy Risk Factor: D
- May cause sterility in men and menopause in women. Discuss with doctor if plan to have children
- Extravasation injury: May cause severe tissue necrosis. Inform doctor immediately when extravasation occurs.

Drug-Drug Interaction

- Calcium channel blocker (verapamil, nifedipine): May increase cardiotoxicity of daunorubicin.
- Barbiturates (phenobarbital): May decrease effect of daunorubicin.
- Cyclosporin: May increase pharmacological effect of daunorubicin.
- Quinolone (ciprofloxacin): May decrease quinolone absorption.
- Stavudine: May decrease the active form of stavudine.

Drug-Food Interaction

- Turmeric: May decrease daunorubicin effects.

Side Effects

- Cardiotoxicity (arrhythmias, CHF).
- Haematologic toxicity.
- GI toxicities (high to moderate: nausea and vomiting, mucositis).
- Skin toxicities (alopecia, nail changes, flare).
- General (urine discolouration: urine may be pink or reddish for 1-2 days after treatment).
- Metabolism and nutrition disorders (hyperuricaemia).

References:

1. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/26175>. [Accessed: 29th August 2016]
2. *Drug information handbook*. 24th edition. Lexicomp.

Decitabine - 50mg Injection

Instruction

- Route of administration: IV
- Infuse over 1-3 hours. Recommended to prepare with cold infusion solution.

Storage

- Store at room temperature.

Precaution

- Pregnancy Risk Factor: D
 - Avoid pregnancy while on therapy and for 1 month following discontinuation of therapy.
 - Men should avoid fathering a child while on therapy and for 2 months following discontinuation of therapy.

Side Effects

- Haematologic toxicities (leucopenia, thrombocytopenia, anaemia).
- Cardiotoxicity (peripheral oedema, oedema, heart murmur).
- GI toxicities (nausea, constipation, diarrhoea).
- General (fatigue, fever).
- Skin toxicities (petechiae, rash, erythema).
- Metabolism and nutritional disorders (hyperglycaemia, hypoalbuminaemia, hyponatraemia).

References:

1. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/27127>. [Accessed: 21st September 2016]
2. *Drug information handbook*. 24th edition. Lexicomp.
3. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/fda-decitabine> [Accessed: 21st September 2016]

Docetaxel - 40mg/ml Injection

Instruction

- Route of administration: IV
- Final infusion concentration shall be less than 0.74mg/ml.
- Premedication: PO dexamethasone for 3 days (the day before, during and the day after docetaxel administration). Premedication helps to reduce the frequency and severity of fluid retention and hypersensitivity reactions.

Storage

- Store in a refrigerator and protect from light.
- Dispense in non-PVC container. After dilution, use within 8 hours (bolus: in refrigerator) or 4 hours (infusion: in room temperature).

Precaution:

- Use with caution in hepatic impairment. May need dose modification.
- Pregnancy Risk Factor: D

Drug-Drug Interaction

- Ketoconazole: May decrease metabolism of docetaxel.
- Ritonavir: May increase haematological toxicity.
- Sorafenib: May increase docetaxel toxicity.

Drug-Herb

- Echinacea: May diminish therapeutic effect of docetaxel.
- St. John's Wort: May increase metabolism of docetaxel.

Side Effects

- Haematologic toxicities (neutropenia, anaemia, thrombocytopenia).
- Cardiotoxicity (fluid retention).
- Skin toxicities (alopecia, cutaneous reaction, nail changes - usually transient and disappear with treatment withdrawal).
- GI toxicities (mucositis, diarrhoea, low: nausea and vomiting).
- Hypersensitivity reaction (hypotension, bronchospasm, generalised rash).
- Neurotoxicity (peripheral neuropathy: related to cumulative dose).
- Ocular toxicity (lacrimation of eyes: transient, reversible, visual disturbances). Treat with antibiotic and steroid.
- Pulmonary toxicities (dyspnoea, epistaxis), hepatotoxicity (elevated LFT).
- General (fatigue, fever, infection).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/32013>. [Accessed: 29th September 2016]
3. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/docetaxel> [Accessed: 29th September 2016]

Doxorubicin - (Pegylated Liposomal) 20mg Injection

Instruction

- Route of administration: IV
- Compatible with D5W only.
- Pegylated liposomal doxorubicin formulations are not interchangeable with conventional doxorubicin.
- Maximum lifetime cumulative dose: 550mg/m². Cumulative doses of 400mg/m² in patients who have received prior mediastinal irradiation or are receiving concurrent cyclophosphamide treatment.

Storage

- Store in a refrigerator.

Precaution

- Hepatic impairment, Palmar-Plantar Erythrodysesthesia (PPE) and stomatitis patients. May need dose modification.
- Patients who have received other anthracyclines and contraindicated in patients with history of cardiovascular disease. May cause cardiac toxicity.
- Adequate contraception should be used by both sexes while on therapy and for 6 months following discontinuation of therapy. Pregnancy Risk Factor: D
- Extravasation injury: May cause severe tissue necrosis.

Drug -Drug Interaction

- Bevacizumab: May increase cardiotoxic effect of pegylated liposomal doxorubicin.
- Stavudine: May decrease therapeutic effect of stavudine.

Drug-Herb

- St. John's Wort: May increase metabolism of pegylated liposomal doxorubicin.

Side Effects

- Haematologic toxicities (neutropenia, anaemia, thrombocytopenia).
- Skin toxicities (rashes, hand-foot syndrome), CNS toxicities (headache, general pain), cardiotoxicities (peripheral oedema, hypotension, tachycardia).
- GI toxicities (low: nausea and vomiting, mucositis, constipation, diarrhoea).
- Infusion related reaction (SOB, dizziness, sweating). Infuse at a reduced rate (not greater than 1mg/min at initial dose).
- General (weakness, fever).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/32013>. [Accessed: 29th September 2016]
3. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/doxorubicinhydrochloride> [Accessed: 29th September 2016]

Doxorubicin - 2mg/ml Injection

Instruction

- Route of administration: IV
- Do not administer IT, IM or SC.
- To avoid doxorubicin flare, IV bolus should be infused over 3-10 minutes.
- Maximum lifetime cumulative dose: 300-550mg/m².

Storage

- Store in a refrigerator and protect from light.
- Storage of vials of solution under refrigeration may result in formation of a gelled product. If gelling occurs, place vials at room temperature for 2 to 4 hours to return the product to a slightly viscous, mobile solution.

Precaution

- Hepatic impairment (contraindicated in Child-Pugh class C or bilirubin >5 mg/dL).
- Patients who have received other anthracyclines and contraindicated in patients with history of cardiovascular disease (may cause cardiac toxicity).
- Avoid pregnancy while on therapy and for at least 6 months following discontinuation of therapy. Pregnancy Risk Factor: D
- Use non-hormonal contraception in breast cancer patient.
- May cause sterility in men and menopause in women. Discuss with doctor if plan to have children.
- Extravasation injury: May cause severe tissue necrosis.

Drug-Drug Interaction

- Calcium channel blocker (verapamil, nifedipine) : May increase cardiotoxicity of doxorubicin.
- Barbiturates (phenobarbital): May decrease the effect of doxorubicin.
- Bevacizumab: May increase doxorubicin induced cardiotoxicity.
- Cyclosporin: May increase pharmacological effect of doxorubicin.
- Quinolone (ciprofloxacin): May decrease quinolone absorption.
- Stavudine: May decrease the active form of stavudine.
- Trastuzumab: May increase cardiotoxicity.

Drug-Food/Herb

- Curcumin: May decrease doxorubicin effect.
- Avoid foods or products containing turmeric (curcumin).

Side Effects

- Cardiotoxicity (ECG changes, cardiomyopathy, arrhythmia). Cardiac assessment should be done at baseline and throughout therapy.
- Haematologic toxicity (leucopenia).
- GI toxicities (high to moderate: nausea and vomiting, mucositis, diarrhoea).
- Skin toxicities (alopecia, hyperpigmentation of nail beds).
- General (urine discoloration: urine maybe pink or reddish for 1-2 days after therapy).
- Metabolism and nutrition disorders (hyperuricaemia).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/32013>. [Accessed: 29th September 2016]
3. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/doxorubicinhydrochloride> [Accessed: 29th September 2016]

Epirubicin - 10mg, 50mg Injection

Instruction

- Route of administration: IV (Do not administer IT, IM or SC).
- Maximum lifetime cumulative dose: 600-900mg/m²

Storage

- Solution: Store in a refrigerator. If gelling occurs, place vials at room temperature for 2 to 4 hours to return the product to a slightly viscous, mobile solution.
- Lyophilised powder: Store at room temperature.
- Protect from light.

Precaution

- Hepatic impairment (may need dose modification).
- Patients who have received other anthracyclines and contraindicated in patients with history of cardiovascular disease (may cause cardiac toxicity).
- May cause sterility in men and menopause in women. Discuss with doctor if plan to have children. Pregnancy Risk Factor: D
- Extravasation injury: May cause severe tissue necrosis.

Drug-Drug Interaction

- Cardiotoxic antitumour drugs (5-fluorouracil, cyclophosphamide, cisplatin, taxanes, trastuzumab) and cardioactive compounds (calcium channel blockers) requires a close monitoring of cardiac function throughout therapy.
- Cimetidine: may increase the AUC of epirubicin by 50% and should be stopped during treatment with epirubicin.
- Verapamil: may increase risk of heart failure.
- Propanolol: additive cardiotoxic effect.

Side Effects

- Cardiotoxicity (tachycardia, ECG changes, CHF). Cardiac assessment should be done at baseline and throughout therapy.
- Haematologic toxicities (leucopenia, anaemia, thrombocytopenia, and rarely secondary acute myelogenous leukemia).
- GI toxicities (moderate-high: nausea and vomiting, mucositis, diarrhoea, loss of appetite), Skin toxicities (alopecia, injection site reaction), Endocrine (hot flashes), Hepatotoxicity (may increase transaminases),
- General (fatigue, urine discolouration pink or reddish for 1-2 days after administration), Metabolism and nutritional disorders (hyperuricaemia).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Cancer Research UK.(2016) [Online] Available from - [http://www.nhs.uk/ipgmedia/National/Cancer%20Research%20UK/assets/Epirubicin\(CRUK4pages\).pdf](http://www.nhs.uk/ipgmedia/National/Cancer%20Research%20UK/assets/Epirubicin(CRUK4pages).pdf) [Accessed: 30th September 2016]
3. Medicines & Health Products Regulatory Agency UK (MHRA). (2016) [Online] Available from - <http://www.mhra.gov.uk/home/groups/par/documents/websiteresources/con2023491.pdf> [Accessed: 30th September 2016]

Erythropoietin Human Recombinant (Epoitin Alfa) - 2,000IU/0.5ml, 3,000IU/0.3ml, 4,000IU/0.4ml, 10,000IU/ml Injection

Instruction

- Route of administration: IV, SC
- SC: Recommended injection sites are thigh and abdomen area (vary the site from day to day). Refer to drug information leaflet for detail instructions of administration.

Storage

- Store in a refrigerator and protect from light. Temperature should be closely maintained until administration.
- A syringe left at temperature of up to 25°C must be used within 7 days.
- Do not freeze or shake (vigorous shaking may damage the product).

Precaution:

- Use with caution in pre-existing hypertension, ischaemic vascular disease, or suspected allergy to any component of the product, porphyria or gout (increase serum uric acid) and chronic hepatic failure.
- Pregnancy Risk Factor: B

Side Effects

- Cardiotoxicities (hypertension, oedema).
- GI toxicities (diarrhoea, nausea and vomiting).
- CNS toxicities (fever, headache, seizure).
- Flu-like symptoms (fever, fatigue, chills, headache, arthralgia) at the beginning of therapy.
- Thromboembolic event (thrombotic vascular events).
- Haematologic toxicity (pure red cell aplasia: late onset).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/29446>. [Accessed: 30th September 2016]
3. Ng, T., Marx, G., Littlewood, T., & Macdougall, I. (2003). Recombinant erythropoietin in clinical practice. *Postgraduate Medical Journal*, 79(933), 367–376. <http://doi.org/10.1136/pmj.79.933.367>

Erlotinib - 100mg, 150mg Tablet

Instruction

- Route of administration: PO
- Take on an empty stomach, at least 1 hour before or 2 hours after food. Food may increase bioavailability but highly variable.

Storage

- Store at room temperature, protect from heat, light and moisture.

Precaution

- Use with caution in hepatic impairment, idiopathic pulmonary fibrosis, and those at risk for QT interval prolongation.
- Pregnancy Risk Factor: D

Drug-Drug Interaction

- Antacids, H₂-antagonist, proton pump inhibitors and other drugs which increase gastric pH: May decrease efficacy of erlotinib. Do not take erlotinib within 2 hours after taking an antacid.
- May increase anticoagulant effects of warfarin. Monitor INR & bleeding signs.
- Phenytoin, rifampicin: May decrease level of erlotinib.
- Itraconazole, clarithromycin: May increase erlotinib effect.

Drug-Food Interaction

- Grapefruit and grapefruit juice: May increase plasma level of erlotinib.

Side Effects

- Skin toxicities (rash, dryness, itchiness or acne). May be managed with a brief interruption of therapy (up to 14 days). Avoid prolonged sun exposure.
- GI toxicities (diarrhoea, anorexia, minimal to low: nausea and vomiting). Severe diarrhoea may require interruption of therapy and dose modification.
- Pulmonary toxicities (dyspnoea, cough, interstitial lung disease: rare but potentially fatal).
- Infection.
- CNS toxicities (anxiety, headache, depression, insomnia, fatigue).
- Hepatotoxicity (elevated bilirubin, transaminases). Interrupt or discontinue if total bilirubin is greater than 3 times upper limit of normal (ULN) and/or transaminase are greater than 5 times ULN.
- Ocular toxicity (conjunctivitis, dry eyes, corneal ulcer/perforation). May require interruption or discontinuation of therapy.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/16781>. [Accessed: 30th September 2016]
3. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/fda-erlotinib-hydrochloride> [Accessed: 29th September 2016]

Etoposide - 20mg/ml Injection; 50mg Capsule

Instruction

- Route of administration: PO, IV
- PO: Take on an empty stomach. Doses 200mg/day and less should be given as OD dosing; doses more than 200mg/day should be given in 2 to 4 divided doses.
- IV: Final infusion concentration shall be within 0.2-0.4mg/ml.

Storage

- Store at room temperature and protect from light.
- Recommended to dispense in non-PVC container.

Precaution

- Renal and hepatic impairment. May need dose modification.
- Pregnancy Risk Factor: D
- Extravasation injury: May cause severe tissue necrosis. Inform doctor immediately when extravasation occurs.

Drug-Disease Interaction

- Hypoalbuminaemia: Increase risk of adverse events.

Drug-Drug Interaction

- May increase anticoagulant effects of warfarin. Monitor INR & bleeding signs.
- Aprepitant: May elevate etoposide plasma level.
- Cyclosporine: High dose of cyclosporine may increase plasma level of etoposide.
- Glucosamine: May cause resistance to etoposide.

Drug-Food/Herb Interaction

- St. John's Wort, grapefruit: May decrease the effectiveness of etoposide.

Side Effects

- GI toxicities (low: nausea and vomiting, diarrhoea, mucositis, taste alteration).
- Haematologic toxicities (leucopenia, thrombocytopenia).
- Hypotension due to rapid infusion. Infuse at least over 30 - 60 minutes.
- Hypersensitivity reaction (dyspnoea, bronchospasm, flushing).
- Skin toxicity (alopecia).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/7051> [Accessed: 30th September 2016]
3. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/29330> [Accessed: 30th September 2016]
4. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/etoposide> [Accessed: 29th September 2016]

Everolimus - 5mg, 10mg Tablet

Instruction

- Route of administration: PO
- Take on an empty stomach or after a small fat-free meal at the same time each day (preferably in the morning). Swallow whole, do not break, chew or crush the tablet. High fat meals may reduce C_{max} and AUC.
- If difficult to swallow tablet, place tablet in a 30ml water, stir until tablet dissolves and drink straight away, rinse glass with 30ml and drink remaining residual drug.
- If missed a dose (more than 6 hours), take the next dose as scheduled.

Storage

- Store at room temperature, protect from light and moisture.

Precaution

- May impair wound healing. Caution during the peri-surgical period.
- Mild to moderate hepatic impairment. May need dose modification.
- Adequate contraception should be used by both sexes while on therapy and for 8 weeks following discontinuation of therapy. Pregnancy Risk Factor: D

Drug- Drug Interaction

- Erythromycin, ketoconazole, verapamil, cyclosporine: May increase AUC level of everolimus.
- Rifampicin: May decrease AUC level of everolimus.

Drug-Food/Herb Interaction

- St. John's Wort: May decrease plasma level of everolimus.
- Grapefruit and grapefruit juice: May increase plasma level of everolimus.

Side Effects

- Haematologic toxicities (anaemia, thrombocytopenia, neutropenia), GI toxicities (mucositis, diarrhoea), Renal toxicity (increase in serum creatinine), Hepatotoxicity (elevated liver enzyme), CNS toxicity (headache).
- Pulmonary toxicities (infection, cough, dyspnoea): Non-infectious pneumonitis: Moderate to severe symptoms; consider treatment interruption until symptoms improve with reduced dose. Corticosteroids may be indicated
- General (fatigue, fever), Metabolism and nutrition disorders (hypercholesterolaemia, hypertriglyceridemia, hyperglycaemia, hypophosphataemia).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/22281> [Accessed: 10th October 2016]
3. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/everolimus> [Accessed: 10th October 2016]

Exemestane - 25mg Tablet

Instruction

- Route of administration: PO
- Take with food or on an empty stomach with a glass of water. Take after food at night to reduce the risk of nausea.

Storage

- Store at room temperature, protect from light, heat and moisture.

Precaution

- Should not be administered to women with pre-menopausal endocrine status.
- Pregnancy Risk Factor: X
- Avoid pregnancy while on therapy. May cause birth defects or miscarriage.

Drug-Drug Interaction

- Oestrogen-containing therapies: May interfere with therapeutic effect of exemestane.

Side Effects

- Endocrine (hot flushes).
- Musculoskeletal (arthralgia, myalgia, osteoporosis, risk for fracture). Bone mineral density may decrease.
- GI toxicity (nausea).
- Ocular toxicity: Increased incidence compared to tamoxifen.
- Sexual/ reproductive dysfunction (vaginal dryness/ discharge/ itchy).
- General (fatigue, increased sweating, hoarseness, headache).
- Cardiotoxicity (peripheral oedema, hypertension).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/27781> [Accessed: 10th October 2016]
3. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/exemestane> [Accessed: 10th October 2016]
4. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a607006.html> [Accessed: 10th October 2016]

Fentanyl Transdermal Patch - 12mcg/hr, 25mcg/hr, 50mcg/hr

Instruction

- Route of administration: Transdermal
- Do not use damaged patch (increased risk of rapid release and absorption causing fatal overdose). Avoid exposure to direct external heat and use in caution in febrile patients. Heat may increase permeability of fentanyl.
- Apply patch on non-irritated and non-irradiated skin. Clean site with water and let it dry completely, then firmly press in place and hold for 30 seconds. Change patch every 72 hours. Apply subsequent patch to a different skin site.
- Do not use soap, alcohol or other solvents when removing patch but use copious water.

Storage

- Do not store above 25°C.

Precaution

- Use with caution in patients with head injury, myasthenia gravis, hypothyroidism, hypercapnia, renal or hepatic impairment. May need dose modification in renal or hepatic impairment.
- Avoid use in patients with circulatory shock and in patients who have taken MAO inhibitors in last 14 days.
- Pregnancy Risk Factor: C

Drug-Drug Interaction

- Erythromycin, ranitidine, amlodipine: May increase toxicity of fentanyl.
- Nifedipine: May cause severe hypotension.
- CNS depressants: May increase risk of CNS depression.

Drug-Food/Herb Interaction

- Herbs (valerian, St John's Wort, kava kava, gotu kola), alcohol: May increase CNS depression.
- Grapefruit juice: May increase toxicity of fentanyl.

Side Effects

- GI toxicities (nausea and vomiting, constipation).
- CNS toxicities (somnolence, dizziness, insomnia).
- Skin toxicities (hyperhydrosis, pruritis).
- Pulmonary toxicity (dyspnoea, respiratory depression).
- Ocular toxicity (miosis).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] [Accessed: 10th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a601202.html> [Accessed: 10th October 2016]
4. Grissinger M. Fentanyl Transdermal Patches: More Protection Needed for Patients and Their Families. *Pharmacy and Therapeutics*. 2009;34(7):343-390.

Filgrastim - 30MU/0.5ml, 30MU/ml Injection; PegFilgrastim Pre-filled Syringe 6mg/6ml Injection

Instruction

- Route of administration: SC
- Filgrastim: Do not use within the period of 24 hours before to 24 hours after administration of cytotoxic chemotherapy, unless been instructed.
- Pegfilgrastim: Do not use within the period of 14 days before to 24 hours after administration of cytotoxic chemotherapy, unless been instructed.

Storage

- Store in a refrigerator and protect from light. Discard syringes stored at room temperature for more than 48 hours.
- Do not freeze. If frozen, thaw in the refrigerator before administration. Discard if frozen more than once.
- Do not shake.

Precaution:

- Pregnancy Risk Factor: C
- The effect of filgrastim on sperm or the baby if used during pregnancy is not known. It is best to avoid pregnancy during therapy.

Drug-Disease Interaction

- Sickle cell disorder: May be fatal.

Side Effects

- Splenic rupture (pain at left upper abdominal and shoulder tip area).
- Pulmonary toxicity (acute respiratory distress syndrome).
- Hypersensitivity reaction (skin rash, urticaria, tachycardia). Usually occur more frequently with IV administration.
- General (fever).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/29329> [Accessed: 10th October 2016]
3. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/filgrastim> [Accessed: 10th October 2016]

Fludarabine - 50mg Injection; 10mg Tablet

Instruction

- Route of administration: PO, IV
- PO: Take with food or on an empty stomach with a glass of water at the same time each day. Swallow whole. Do not open blister packaging until ready to be taken. Drink plenty of fluid (about 2L/day).
- IV: Infuse over 30 minutes or as per protocol.

Storage

- IV: Store intact vials under refrigeration or at room temperature, as specified according to each manufacturer's labelling.
- Tablet: Store at room temperature.

Precaution

- Use with caution in patient with history of opportunistic infections, renal impairment.
- May cause reactivation of hepatitis B with fludarabine use.
- Pregnancy Risk Factor: D
- Avoid pregnancy while on therapy and for 6 months following discontinuation of therapy.

Drug-Drug Interaction

- Corticosteroid: May increase risk of infection with opportunistic pathogens such as pneumocystis, listeria, cytomegalovirus.
- Dipyridamole and other inhibitors of adenosine uptake: May decrease the therapeutic efficacy of fludarabine.
- Pentostatin: May cause severe or fatal pulmonary toxicity.

Side Effects

- CNS toxicities (headache, agitation, confusion, seizure, paraesthesia, visual changes).
- Opportunistic infection.
- Pulmonary toxicities (cough, dyspnoea, pulmonary hypersensitivity reaction: pneumonitis, pulmonary infiltrates).
- Haematologic toxicities (neutropenia, anaemia, leucopenia).
- Metabolism and nutrition disorders (hyperuricaemia).
- General (fatigue).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/1819> [Accessed: 10th October 2016]
3. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/4240> [Accessed: 10th October 2016]
4. NICE National Institute for Health and Care Excellent.(2016) [Online] Available from - <https://www.nice.org.uk/Guidance/ta119> [Accessed: 10th October 2016]

Fluorouracil - 50mg/ml Injection; 100mg Tablet

Instruction

- Route of administration: IV

Storage

- Store at room temperature and protect from light.
- Slight discolouration may occur during storage; does not usually denote decomposition.

Precaution

- Contraindicated with Tegafur and in patients with known hypersensitivity to capecitabine.
- Dihydropyrimidine dehydrogenase (DPD) deficiency may result in life-threatening or fatal toxicity in patients receiving fluorouracil via parenteral or topical administration.
- Elderly patients are at increased risk for developing toxicities, due to decreased bone marrow reserve.
- Female patients are at increased risk of developing toxicities.
- Patients who are receiving radiation or who have received high-dose pelvic radiation, previously treated with alkylating agents or wide spread of bone marrow metastases. These may increase risk of severe toxicity.
- Avoid pregnancy while on therapy and for at least 1 month following discontinuation of therapy. Pregnancy Risk Factor: D

Drug-Drug Interaction

- May increase the efficacy and toxicity of phenytoin & warfarin (monitor INR and bleeding signs).
- Thiazides: Prolong fluorouracil-induced leucopenia.
- Metronidazole, Gemcitabine: May increase the efficacy and toxicity of fluorouracil.

Side Effects

- GI toxicities (low: nausea and vomiting, mucositis, diarrhoea, heart burn).
- Skin toxicities (alopecia, dermatitis, dry skin, low: hand-foot skin reaction)
- Haematologic toxicities (thrombocytopenia, anaemia).
- Cardiotoxicity (arrhythmias, chest pain).
- Ocular toxicities (excessive lacrimation, blurred vision, photophobia, eye irritation).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/636> [Accessed: 10th October 2016]
3. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/fluorouracil> [Accessed: 10th October 2016]
4. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a605010.html> [Accessed: 10th October 2016]

Flutamide - 250mg Tablet

Instruction

- Route of administration: PO
- Take with food (to reduce the risk of nausea) or on an empty stomach at the same time each day.

Storage

- Store at room temperature, protect from moisture and heat.

Precaution

- Contraindicated in female and children.
- Severe hepatic impairment and in patients with cardiac disease.
- Patients with glucose-6-phosphate dehydrogenase deficiency, haemoglobin M disease and smokers are at risk of toxicities.
- Flutamide contains lactose; Use should be carefully considered in patients with hereditary galactose intolerance, severe lactase deficiency or glucose-galactose malabsorption.
- Pregnancy Risk Factor: D

Drug-Drug Interaction

- May increase anticoagulant effects of Warfarin. Monitor INR and bleeding signs.

Side Effects

- Sexual/ reproductive dysfunction (may decrease libido, impotence).
- Endocrine (hot flashes, gynaecomastia, galactorrhoea). These effects usually disappear upon dose reduction or drug discontinuation.
- GI toxicities (diarrhoea, low: nausea and vomiting).
- Hepatotoxicity (elevated transaminases, jaundice, hepatic encephalopathy). Discontinue therapy if severe hepatic impairment or transaminases levels are more than 2 times ULN.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. BC Cancer Agency Cancer Drug Manual. (2014) [Online] Available from - http://www.bccancer.bc.ca/drug-database-site/Drug%20Index/Flutamide_monograph_1April2014.pdf [Accessed: 10th October 2016]

Gabapentin - 100mg, 300mg, 600mg Tablet

Instruction

- Route of administration: PO
- Take with food or on an empty stomach.
- If there is a need for dose reduction, discontinuation, or substitution with an alternative medication, this should be done gradually over a minimum of one week.
- Therapy may be initiated by administering 300mg nocte on Day 1, 300mg bd on Day 2, 300mg tds, thereafter, increase by 300 mg/day every 1 to 7 days.
- Maximum dose: 2400 mg/day.

Storage

- Store at room temperature.

Precaution

- Use with caution in renal impairment. May need dose modification.
- If a patient develops acute pancreatitis under treatment with gabapentin, discontinuation should be considered.
- Patients should be carefully observed for signs of CNS depression, such as somnolence, and the dose of gabapentin or morphine should be reduced appropriately when gabapentin is co-administered with morphine.
- Co-administration with antacids containing aluminium and magnesium reduces gabapentin bioavailability. It is recommended that gabapentin to be taken at the earliest of two hours following antacid administration.
- Pregnancy Risk Factor: D

Drug-Drug Interaction

- Naproxen: Appears to increase the amount of gabapentin.
- Hydrocodone, morphine: May increase gabapentin level.
- Antacid: May decrease the bioavailability of gabapentin by about 20%.

Side Effects

- CNS toxicities (dizziness, somnolence, nystagmus, coma and seizure, hostile behaviour and suicidal thoughts).
- Cardiotoxicity (peripheral oedema).
- GI toxicities (low: nausea and vomiting, diarrhoea, dry mouth, constipation).
- Drug hypersensitivity syndrome.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/26529> [Accessed: 11th October 2016]

Gefitinib - 250mg Tablet

Instruction

- Route of administration: PO
- Take with food or on an empty stomach with a glass of water.
- Oral suspension may be prepared by placing one tablet (whole, do not crush) in half a glass of non-carbonated drinking water. Stir until tablet is dispersed (about 10 minutes), then administer immediately. Rinse with another half glass of water and drink the residue.

Storage

- Store at room temperature, protect from heat, light and moisture.

Precaution:

- Patients with hepatic impairment, idiopathic pulmonary fibrosis and those at risk of QT interval prolongation.
- Avoid prolonged sun exposure, tanning booths and sunlamps.
- Sunlight may worsen any skin reactions that may occur while on this therapy.
- Pregnancy Risk Factor: D

Drug-Drug Interaction

- Warfarin: May increase the anticoagulant effects of Warfarin. Monitor INR and bleeding signs.
- Concurrent use with antacids, H₂-antagonist, proton pump inhibitors and other drugs which increase gastric pH: Decrease the efficacy of gefitinib.
- Phenytoin, rifampicin: May decrease the level of gefitinib.
- Metoprolol: May increase the level of metoprolol.
- Itraconazole: May increase the level of gefitinib.

Drug-Food/Herb Interaction

- Grapefruit and grapefruit juice: May increase plasma level of gefitinib.
- St. John's Wort: May decrease plasma concentration of gefitinib.

Side Effects

- GI toxicities (diarrhoea, minimal to low: nausea and vomiting), Skin toxicities (rash, dryness, itchiness or acne): May be managed with a brief interruption of therapy (up to 14 days), Hepatotoxicity (elevated transaminases): Discontinue therapy if severe hepatic impairment, Pulmonary toxicity (interstitial lung disease: rare but potentially fatal), Ocular toxicity (aberrant eyelash growth, conjunctivitis, dry eyes, corneal eruption): May need interruption or discontinuation of therapy.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/22104> [Accessed: 11th October 2016]
3. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/gefitinib> [Accessed: 11th October 2016]

Gemcitabine - 200mg, 1000mg Injection

Instruction

- Route of administration: IV
- Infuse over 30-60 minutes. Infusion beyond 60 minutes associated with increased toxicity.

Storage

- Store at room temperature.
- Refrigeration may form crystals.

Precaution

- Myelosuppression, hypotension, asthenia and severe flu like symptoms have been reported at an increased incidence with infusion time greater than 60 minutes.
- Pregnancy Risk Factor: D

Drug-Drug Interaction

- Warfarin: May increase the anticoagulant effects of Warfarin. Monitor INR and bleeding signs.

Side Effects

- Haematologic toxicities (anaemia, neutropenia, thrombocytopenia, haemolytic uremic syndrome: Microangiopathic haemolytic anaemia, thrombocytopenia and renal impairment).
- Flu like symptoms (fever, fatigue, chills, headache, arthralgia).
- Hepatotoxicity (elevated bilirubin, transaminases).
- Skin toxicities (alopecia, erythematous pruritic maculopapular rashes on the neck and extremities).
- GI toxicities (low to moderate: nausea and vomiting, diarrhoea).
- Renal toxicities (haematuria, proteinuria).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/27754> [Accessed: 12th October 2016]
3. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/gemcitabinehydrochloride> [Accessed: 12th October 2016]

Goserelin - 3.6mg, 10.8mg Depot Injection

Instruction

- Route of administration: SC
- Goserelin comes as an implant.

Storage

- Store at room temperature, protect from light.

Precaution

- Contraindicated in undiagnosed abnormal vaginal bleeding.
- Pregnancy Risk Factor:
 - X for endometriosis.
 - D for breast cancer.
- Avoid pregnancy with non-hormonal contraceptives during therapy and following discontinuation, until return of menses (or for at least 12 weeks).

Drug-Disease Interaction

- Heart disease: Worsen heart disease.
- Diabetes: Worsen glycaemic control.

Side Effects

- Sexual / reproductive dysfunction (amenorrhoea, impotence, decrease libido).
 - Sexual ability may return when stop taking Goserelin. Menses resumed within 8 weeks completion of therapy. Vaginal bleeding may occur during start of therapy.
- Endocrine (hot flushes, diabetes).
- Musculoskeletal (decrease in bone mineral density: increase fracture risk).
- Haematologic toxicity (anaemia).
- Drug induced disease flare (bone pain, cord compression, urethral obstruction in men and bone pain, skin erythema in women. Occurs at initial weeks of therapy).
- CNS toxicity (headache).
- Cardiotoxicities (hypertension, arrhythmia, peripheral oedema).
- General (fatigue, weight gain)

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/7855> [Accessed: 12th October 2016]
3. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/8146> [Accessed: 12th October 2016]
4. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/goserelinacetate> [Accessed: 12th October 2016]

Granisetron HCl - 1mg/ml Injection; 1mg Tablet

Instruction

- Route of administration: PO, IV
- PO: Give 1 hour prior to chemotherapy/ radiotherapy.
- Take with food or on an empty stomach. Take with food if it causes stomach upset.
- IV: Give 30 minutes prior to chemotherapy/ radiotherapy.

Storage

- Store at room temperature and protect from light

Precaution:

- Pregnancy Risk Factor: B

Drug-Disease Interaction

- Congenital QT syndrome: Increased risk with cardiac disease and concomitant electrolyte abnormalities.
- Ileus or gastric distention: Does not stimulate gastric or intestinal peristalsis; may mask progressive ileus and/or gastric distension.
- Injection contains benzyl alcohol which has been associated with 'gaspingsyndrome' in neonates.

Drug-Drug Interaction

- Alfuzocin, ciprofloxacin, chloroquine, quinine, nilotinib, quetiapine: May increase QT prolongation effect of granisetron.

Side Effects

- CNS toxicities (headache, insomnia).
- GI toxicities (constipation, diarrhoea, dyspepsia).
- Musculoskeletal (asthenia, abdominal pain).
- Cardiotoxicities (hypertension, QT prolongation).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/21349> [Accessed: 12th October 2016]
3. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/6060> [Accessed: 12th October 2016]
4. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a601211.html> [Accessed: 12th October 2016]

Hydroxyurea- 500mg Capsule

Instruction

- Route of administration: PO
- Take with food or on an empty stomach.

Storage

- Store at room temperature.

Precaution

- Use with caution in renal impairment. May need dose modification.
- Pregnancy Risk Factor: D
 - Avoid pregnancy while on therapy and for 6 months in female and 1 year in male following discontinuation of therapy.
- May cause sterility in men and menopause in women. Discuss with doctor if plan to have children.

Drug-Disease Interaction

- Sickle cell anaemia: Increase deformability of sickle cells (increase in haemoglobin level, decrease in neutrophil level and altering adhesion of red blood cells to endothelium).

Drug-Drug Interaction

- Didanosine, stavudine: May increase risk of hepatotoxicity, pancreatitis and neuropathy.

Drug-Radiation Interaction

- Risk for exacerbation of post irradiation erythema.

Side Effects

- Haematologic toxicities (anaemia, leucopenia, thrombocytopenia).
- Skin toxicities (cutaneous vasculitic toxicities, dermatomyositis-like skin changes, facial erythema, gangrene, hyperpigmentation, maculopapular rash, nail atrophy, nail discolouration, peripheral erythema, vasculitis ulcerations, violet papules).
- Hepatotoxicity.
- GI toxicities (constipation, diarrhoea, mucositis, pancreatitis).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/19081> [Accessed: 12th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a682004.html> [Accessed: 12th October 2016]
4. Creary S.E. and Strouse JJ. (2014) Hydroxyurea and transfusion therapy for the treatment of sickle cell disease. A pocket guide for the clinician. American Society of Haematology.

Idarubicin - 10mg, 5mg Injection

Instruction

- Route of administration: IV
- Do not administer IT, IM or SC.
- Maximum lifetime cumulative dose: 150mg/m²

Storage

- Store in a refrigerator and protect from light.

Precaution

- Use with caution in renal hepatic impairment. May need dose modification. Avoid use if bilirubin >5 mg/dL.
- May cause sterility in men and menopause in women. Discuss with doctor if plan to have children. Pregnancy Risk Factor: D
- Extravasation injury: May cause severe tissue necrosis. Inform doctor immediately when extravasation occurs.

Drug-Disease Interaction

- Existing or prior cardiovascular disease: May increase cardiac toxicity.

Drug-Drug Interaction

- Clozapine: May increase the level of Clozapine.

Drug-Radiation Interaction

- Concomitant or prior radiation within 2-3 weeks before idarubicin: Predispose to increased myelosuppression.

Side Effects

- Haematologic toxicities (neutropenia, anaemia, thrombocytopenia).
- Infection.
- GI toxicities (low to moderate: nausea and vomiting, diarrhoea, mucositis).
- Skin toxicity (alopecia, rash, urticaria).
- Cardiotoxicity (CHF, decrease LVEF, ECG changes).
- Renal toxicity (urine discolouration: darker yellow).
- CNS toxicities (seizures, headache).
- Hepatotoxicity (elevated ALP, hyperbilirubinaemia).
- Peripheral neuropathy (hand-foot skin reaction).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/27149> [Accessed: 12th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a691004.html> [Accessed: 12th October 2016]

Ifosfamide - 1g Injection

Instruction

- Route of administration: IV
- Provide hydration and MESNA as per protocol.

Storage

- Store at room temperature.

Precaution

- Use with caution in unilateral nephrectomy, renal and hepatic impairment. May need dose modification.
- Correct any electrolyte imbalances, obstruction or infection of the urinary tract before initiating therapy.
- Do not initiate therapy for 10-14 days after surgery. May impair wound healing.
- Pregnancy Risk Factor: D
 - Adequate contraception should be used by both sexes while on therapy and for 6 months following discontinuation of therapy.
- May cause sterility in men and temporary menopause in women.

Drug-Drug Interaction

- May increase anticoagulant effects of Warfarin. Monitor INR & bleeding signs.

Drug-Herb Interaction

- St. John's Wort: May decrease the effect of Ifosfamide.

Side Effects

- CNS toxicities (encephalopathy, hallucination, seizure). Methylene blue may be used to treat encephalopathy.
- GI toxicities (moderate: nausea and vomiting, mucositis, diarrhoea).
- Haematologic toxicities (leucopenia, neutropenia, thrombocytopenia, anaemia).
- Renal toxicities (haemorrhagic cystitis, haematuria). Adequate hydration, fluid balance and Mesna may decrease the incidence of bladder toxicity. Discontinue or reduce dose in patients who develop haematuria despite concurrent use of Mesna.
- Cardiotoxicity (arrhythmia, heart failure).
- Skin toxicity (alopecia).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/30183> [Accessed: 12th October 2016]
3. BC Cancer Agency Cancer Drug Manual. (2014) [Online] Available from - http://www.bccancer.bc.ca/drug-database-site/Drug%20Index/Ifosfamide_monograph_1June2010_formatted.pdf [Accessed: 10th October 2016]

Imatinib Mesylate - 100mg, 400mg Tablet

Instruction

- Route of administration: PO
- Take with food and a glass of water.
- May put tablet in half cup of water or apple juice. Let it dissolve for a few minutes, mix, and drink. Rinse cup with more water or juice and drink.
- Dosage 800mg should be administered as 400mg BD, and the 400mg tablet should be used in order to reduce iron exposure.
- Doses less than or equivalent to 600mg/day should be administered once daily.

Storage

- Store at room temperature.
- Protect from heat, light and moisture.

Precaution

- Use with caution in severe fluid retention, renal and hepatic impairment. May need dose modification.
- Pregnancy Risk Factor: D
- May cause sterility in men and menopause in women. Discuss with doctor if plan to have children.

Drug-Disease Interaction

- Pre-existing or risk factors for cardiac disease: May cause CHF, left ventricular dysfunction.
- Hypereosinophilic syndrome: Cardiac involvement (cardiogenic shock).
- Hypothyroidism (thyroidectomy patients): Decrease levothyroxine effectiveness and worsening of hypothyroidism.

Drug-Drug Interaction

- Antifungal agents (azole derivatives): May increase imatinib effect.
- Rifampicin: May decrease imatinib effect.
- Lovastatin, simvastatin, colchicine, alfuzocin, tamsulosin, corticosteroids (included: orally inhaled, nasal, systemic; excluded: beclomethasone, triamcinolone), fentanyl, prasugrel, saxagliptin, sildenafil, tadalafil, warfarin:
- Digoxin, codeine, tramadol: Their effect may be decreased by imatinib.
- Proton pump inhibitor (lansoprazole, pantoprazole): May increase dermatologic toxic effect of imatinib.

Drug-Herb Interaction

- Grapefruit and grapefruit juice, black cohosh, cat's claw, kava kava, milk thistle, valerian root: May increase imatinib effect.
- St John's Wort: May decrease imatinib effect.
- The exact interaction has yet to be fully determined: Dong quai, garlic, genistein, ginkgo, ginkgo biloba, ginseng, glucosamine chondroitin, saw palmetto, all types of teas (green tea, dandelion, peppermint, chamomile). Avoid use.

Side Effects

- Cardiotoxicity (oedema, fluid retention).
- Haematologic toxicities (thrombocytopenia, neutropenia, anaemia).
- Skin toxicities (photosensitivity, rash).
- GI toxicities (diarrhoea, constipation, low: nausea and vomiting).
- Pulmonary toxicities (cough, dyspnoea, pleural effusion, pulmonary oedema).
- Musculoskeletal (muscle cramps, arthralgia, joint pain, myalgia).
- Hepatotoxicity (elevated bilirubin, transaminases).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/15014> [Accessed: 12th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a606018.html> [Accessed: 12th October 2016]
4. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/imatinibmesylate> [Accessed: 12th October 2016]

Interferon Alfa-2b - 18MiU, 30MiU Multidose Injection Pen

Instruction

- Route of administration: SC
- The instructions for using the multi-dose pen are as below:
 - Pull the cap off the pen and wipe the rubber membrane with an alcohol swab.
 - Remove the paper backing from the needle by pulling the paper tab.
 - Keep the needle in its outer clear needle cap and gently push the needle straight into the pen's rubber membrane. Screw the needle onto the pen by turning it clockwise.
 - With the needle facing up, pull off the outer clear needle. Next, pull off the white inner needle cap to expose the needle.
 - Keep the needle facing up and remove any air bubbles by tapping the reservoir with finger.
 - Hold the pen by the barrel and turn the reservoir clockwise until you feel the click.
 - Keep the needle facing up and press the push button all the way up. A solution will come out of the tip of needle.
 - Place the cap back. Make sure the black triangle is lined up with dosage indicator on the pen barrel. The dose is ready to be set.
 - Hold the pen horizontally in the middle of the pen barrel. With the other hand, hold the pen cap.
 - Set the dose by turning the cap clockwise. The push button will start to rise and the push button scale will be exposed.
 - Remove the pen cap and insert the needle to the subcutaneous area like thigh and tummy. Leave the needle in place for a few seconds to allow the drug to distribute under the skin.
 - Carefully replace the outer cap. Completely unscrew the needle assembly anti-clockwise. Then carefully lift the pen and discard the capped needle.

Storage

- Store in a refrigerator.
- The needles provided in the packaging should be used for Interferon alfa 2b only. A new needle is used each time the pen delivers a dose. After each use, discard the needle and return the pen to refrigerator.
- The multi-dose pen should be stored at 15-25 °C before administering each dose. The pen should be removed from refrigerator approximately 30 minutes before administration. Each pen is intended for a maximum of 4 weeks period and then must be discarded afterwards. In case the product is left at temperatures of 15-25°C, a maximum of 48 hours (2 days) of exposure is permitted.

- **Precaution**
- Renal and hepatic impairment. May need dose modification.
- Pregnancy Risk Factor: C
- May cause sterility in men and menopause in women. Discuss with doctor if plan to have children.

Drug-Disease Interaction

- Autoimmune disease (thrombocytopenia, vasculitis, Raynaud's disease, rheumatoid arthritis, lupus erythematosus, rhabdomyolysis, psoriasis and sarcoidosis): May induce or aggravate autoimmune disease.
- Cardiovascular disease: Arrhythmia may be reversible upon discontinuation of therapy.
- Chronic hepatitis: Patients being treated for chronic hepatitis B or C with a history of autoimmune disease, who are immunosuppressed transplant recipients should not receive interferon alfa-2b.
- Coagulation disorders.
- Diabetes: May induce or aggravate diabetes.
- Thyroid disorders: May induce or aggravate thyroid disorder.
- Hypertriglyceridemia: May or aggravate hypertriglyceridemia.

Drug-Drug Interaction

- Theophylline: May increase the effect of theophylline.
- Warfarin: May increase anticoagulant effects of Warfarin. Monitor INR and bleeding signs.

Side Effects

- Flu-like syndrome (fever, fatigue, headache, myalgia). May occur shortly after therapy. Symptoms usually disappear on their own.
- Haematologic toxicities (neutropenia, anaemia, thrombocytopenia).
- GI toxicities (low to minimal: nausea and vomiting, diarrhoea, taste alteration).
- CNS toxicities (depression, somnolence, confusion, insomnia, dizziness, vertigo).
- Hepatotoxicity (elevated ALP, ALT).
- Pulmonary toxicities (dyspnoea, cough, fibrosis).
- Cardiotoxicities (arrhythmia, hypertension, hypotension). Maintain adequate hydration throughout therapy to prevent hypotension due to dehydration.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/12194> [Accessed: 12th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a690006.html> [Accessed: 12th October 2016]

Irinotecan HCl Trihydrate - 20mg/ml Injection

Instruction

- Route of administration: IV
- Infuse over 90 minutes.

Storage

- Store at room temperature, protect from light and do not freeze.

Precaution

- Use with caution in renal or hepatic impairment. Not recommended for dialysis patients.
- Risk of having severe diarrhoea, both early in treatment and 24 hours or more after receiving this drug. May need dose modification.
- May impair activities requiring alertness or coordination (such as driving) due to its central nervous system side effects.
- Pregnancy Risk Factor: D

Drug-Disease Interaction

- Gilbert syndrome: May increase the toxicity of irinotecan.
- Pulmonary disease: May increase the risk of interstitial pulmonary disease.

Drug- Drug Interaction

- Ketoconazole: May increase the level of irinotecan.
- Carbamazepine, phenobarbital, phenytoin, rifampicin: May decrease the level of irinotecan.

Drug-Herb Interaction

- St. John's Wort: May decrease the level of irinotecan.

Side Effects

- GI toxicities (acute and delayed diarrhoea, moderate: nausea and vomiting). Severe early onset diarrhoea may be treated with IV or SC atropine.
- Haematologic toxicities (leucopenia, anaemia, neutropenia).
- Pulmonary toxicities (dyspnoea, cough).
- CNS toxicities (dizziness, insomnia, headache).
- Hepatotoxicity (elevated bilirubin, transaminases).
- General (fatigue, fever, abdominal pain/cramping, sweating).
- Ocular toxicity (visual disturbances).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/12194> [Accessed: 12th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a690006.html> [Accessed: 12th October 2016]

Lapatinib - 250mg Tablet

Instruction

- Route of administration: PO
- Take on an empty stomach at the same time each day, at least 1 hour before or 1 hour after food to achieve consistent systemic exposure and reduce potential toxicity.
- Presence of food significantly alters the bioavailability of lapatinib, with 3-5 fold increases in AUC with low and high fat meals relative to fasting.

Storage

- Store at room temperature, protect from light, heat and moisture.

Precaution

- Use with caution in hepatic impairment. May need dose modification.
- Monitor patients who are at risk for developing *torsade de pointes* (an atypical ventricular tachycardia with changes in QT interval) include those with cardiac disease, history of arrhythmias, electrolyte imbalances, nutritional deficits, and those receiving cumulative anthracycline or trastuzumab therapy.
- Monitor LVEF before therapy initiation and periodically throughout therapy.
- Pregnancy Risk Factor: D

Drug-Drug Interaction

- H₂-blockers, proton pump inhibitor and antacid: May decrease efficacy of lapatinib due to decreased absorption when gastric acid secretion suppressed. Advisable to take 1 hour pre or post administration.
- Ketoconazole: May increase lapatinib plasma concentration.
- Carbamazepine: May decrease lapatinib plasma concentration.

Drug-Herb Interaction

- Grapefruit and grapefruit juice: May increase plasma level of lapatinib.

Side Effects

- GI toxicities (diarrhoea, minimal to low: nausea and vomiting)
- Cardiotoxicities (decrease LVEF: discontinue if grade 2 or greater, QT prolongation)
- Pulmonary toxicities (dyspnoea, interstitial lung disease, pneumonitis),
- General (fatigue, back pain).
- Skin toxicities (rash, pruritis mainly on the trunk/face, hand-foot skin reaction). Treatment should be permanently discontinued for intolerable rash grade 3 or 4 reactions or recur after treatment interruption and rechallenge.
- Hepatotoxicity. Consider dose reduction for moderate and severe transaminase elevation and therapy discontinuation if severe hepatotoxicity develops.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/20929> [Accessed: 12th October 2016]
3. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/fda-lapatinib> [Accessed: 12th October 2016]

L-asparaginase - 10,000IU Injection

Instruction

- Route of administration: IV, IM, SC
- IM: Volume not more than 2ml per injection. Use multiple injection sites for volume more than 2ml.
- Observe patient for 1 hour after administration for hypersensitivity reaction.

Storage

- Store in a refrigerator.

Precaution

- Contraindicated in patient with past or present pancreatitis.
- Significant hypersensitivity reaction may occur.
- Pregnancy Risk Factor: C

Drug-Drug Interaction

- Dexamethasone: May increase level /effects of dexamethasone.

Side Effects

- Hypersensitivity reaction (rash, urticarial, hypotension, respiratory distress, anaphylaxis).
- Haematologic toxicities (anaemia, leucopenia, thrombocytopenia).
- Coagulation abnormality (haemorrhagic or thrombotic event).
- Hepatobiliary toxicity (pancreatitis).
- Hepatotoxicity (elevated bilirubin, transaminases).
- Metabolism and nutrition disorders (hyperglycaemia, hyperuricaemia).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/31063> [Accessed: 12th October 2016]

Lenalidomide - 5mg, 10mg, 15mg, 25mg Capsule

Instruction

- Route of administration: PO
- Take with food or on an empty stomach.
- Take at night before bed.

Storage

- Store at room temperature.

Precaution

- Use with caution in renal impairment. May need dose modification.
- Pregnancy Risk Factor: X
- Avoid pregnancy while on therapy. Use 2 methods of contraceptives. Negative pregnancy test must be obtained before initiation of treatment. Men should use condom during therapy and at least 4 weeks following discontinuation of therapy.

Drug-Disease Interaction

- Pre-existing viral liver disease or elevated baseline liver enzymes: Increased risk of hepatic failure. May need dose reduction or interruption.
- Prior thrombosis, hyperlipidaemia, hypertension: Increase risk of venous and arterial thromboembolism.

Drug-Drug Interaction

- Erythrocyte stimulating agents, oestrogen containing agents: Increase risk of thrombosis.
- Digoxin: May increase digoxin plasma concentration.

Side Effects

- Thromboembolic events (DVT, PE, MI).
- Haematologic toxicities (thrombocytopenia, neutropenia).
- GI toxicities (diarrhoea, constipation).
- CNS toxicity (asthenia, somnolence, dizziness, tremor).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/29492> [Accessed: 18th October 2016]
3. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/29491> [Accessed: 18th October 2016]
4. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/29479> [Accessed: 18th October 2016]
5. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/29490> [Accessed: 18th October 2016]

Letrozole - 2.5mg Tablet

Instruction

- Route of administration: PO
- Take with food or on an empty stomach at same time each day.

Storage

- Store at room temperature.

Precaution

- Bone mineral density may decrease.
- Use with caution in hepatic impairment. May need dose modification.
- Pregnancy Risk Factor: X

Drug-Drug Interaction

- Oestrogen: May interfere with therapeutic effect of letrozole.
- Tamoxifen: May decrease plasma letrozole level by 38%.

Side Effects

- Endocrine (hot flushes: take tablet at bedtime).
- General (fatigue, sweating, weight gain).
- CNS toxicities (dizziness, headache, insomnia).
- Musculoskeletal (arthralgia, osteoporosis, bone pain, fracture).
- Cardiotoxicity (peripheral oedema).
- GI toxicities (nausea, diarrhoea, constipation).
- Pulmonary toxicities (dyspnoea, cough).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/31659> [Accessed: 18th October 2016]
3. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/letrozole> [Accessed: 18th October 2016]

Leucovorin Calcium - 3mg, 50mg Injection, 15mg Tablet

Instruction

- Route of administration: PO, IV, IM
- PO: Take with food or on an empty stomach.
- IV: Infusion rate should not be more than 160mg/min due to calcium content.

Storage

- Injection:
 - Store in a refrigerator.
 - Protect from light.
- Tablet: Store at room temperature.

Precaution

- Patients with renal impairment, inadequate hydration or third space fluid accumulation experience delay in methotrexate clearance; higher doses or prolonged administration of leucovorin may be required.
- Pregnancy Risk Factor: C

Drug-Drug Interaction

- Capecitabine, fluorouracil: May increase the effect of capecitabine and fluorouracil.
- Methotrexate: May decrease toxicity of methotrexate.
- Phenytoin: May decrease effect of phenytoin.
- Sodium bicarbonate: May precipitate sodium bicarbonate when given concurrently.
- Trimethoprim: May decrease the therapeutic effect of trimethoprim.

Side Effects

- GI toxicities (diarrhoea, mucositis, nausea and vomiting).
- Allergic reaction (rash, pruritus, urticaria).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a682336.html> [Accessed: 18th October 2016]

Leuprolide Acetate - 11.25mg Injection

Instruction

- Route of administration: IM, SC
- IM only: Leuprolide injection (Lupron Depot®).
- IM or SC: Leuprolide injection (Lucrin Depot®).

Storage

- Store at room temperature and protect from light.

Precaution

- Contraindicated in undiagnosed abnormal vaginal bleeding.
- Use with caution in heart disease and diabetes.
- Transient hypercalcaemia may develop after initiation of leuprolide in patients with bone metastasis.
- Pregnancy Risk Factor: X
- Non-hormonal methods of contraceptive should be used during therapy.

Drug-Disease Interaction

- Heart disease: Worsen heart disease.
- Diabetes: Worsen glycaemic control.

Side Effects

- Sexual/ reproductive dysfunction (amenorrhoea, impotence, decrease libido).
 - Sexual ability may return when stop taking leuprolide. Menses resumed within 8 weeks completion of therapy. Vaginal bleeding may occur during start of therapy.
- Endocrine (hot flushes).
- Musculoskeletal (arthralgia, myalgia, decrease in bone mineral density: increase fracture risk).
- Haematologic toxicity (anaemia).
- Drug induced disease flare (bone pain, cord compression, urethral obstruction. Occurs at initial weeks of treatment).
- Cardiotoxicities (oedema, hypertension, CHF).
- General (fatigue, weight gain).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a685040.html> [Accessed: 18th October 2016]

Lomustine - 40mg Tablet

Instruction

- Route of administration: PO
- Take on an empty stomach with a glass of water at the same time each day. Do not break the capsule.
- Avoid food or drink for 2 hours after administration to reduce the incidence of nausea and vomiting.
- Take at night before bed.

Storage

- Store at room temperature.

Precaution

- Pregnancy Risk Factor: D
- Avoid pregnancy while on therapy and for 2 weeks in female and 3.5 months in male following discontinuation of therapy.
- May cause sterility in men and menopause in women. Discuss with doctor if plan to have children.

Side Effects

- Haematologic toxicities (cumulative and delayed suppression particularly thrombocytopenia and leucopenia).
- GI toxicities (high to moderate: nausea and vomiting).
- Pulmonary toxicity (infiltrates and/or fibrosis). Usually with cumulative doses more than 1100mg/m².
- Hepatotoxicity (elevated bilirubin, transaminases).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/6252> [Accessed: 18th October 2016]
3. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/lomustine> [Accessed: 18th October 2016]

Melphalan - 50mg Injection; 2mg Tablet

Instruction

- Route of administration: PO, IV
- PO: Take on an empty stomach with a full glass of water, at least 1 hour before or 2 hours after food. Take with food if it causes stomach upset.
- IV: Infuse within 60 minutes of reconstitution.

Storage

- Injection
 - Store at room temperature and protect from light.
 - A 5mg/ml concentration is stable for less than 90 minutes at room temperature. Precipitation occurs if solutions are being refrigerated.
- Tablet: Store in a refrigerator.

Precaution

- Use with caution in renal impairment. May need dose modification.
- Pregnancy Risk Factor: D
- May cause sterility in men and menopause in women. Discuss with doctor if plan to have children.

Drug-Drug Interaction

- Digoxin: May decrease the effect of digoxin.

Side Effects

- GI toxicities (high: nausea and vomiting, diarrhoea, mucositis).
- Haematologic toxicities (neutropenia, thrombocytopenia, anaemia).
- Hepatotoxicity (hepatic sinusoidal obstruction syndrome: associated with high dose IV melphalan use only).
- CNS toxicities (seizures, loss of consciousness).
- Cardiotoxicity (hypotension).
- Pulmonary toxicity (interstitial pneumonitis, fibrosis).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/2605> [Accessed: 19th October 2016]
3. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/703> [Accessed: 19th October 2016]
4. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/melphalan> [Accessed: 19th October 2016]

Mercaptopurine - 50mg Tablet

Instruction

- Route of administration: PO
- Take on an empty stomach, at least 1 hour before or 2 hours after food. Administration in the evening has demonstrated superior outcome.
- Do not take with milk or milk based products. There is an enzyme in cow's milk that can break down mercaptopurine.

Storage

- Store at room temperature.

Precaution

- Use with caution in renal and hepatic impairment. May need dose modification.
- Pregnancy Risk Factor: D

Drug-Disease Interaction

- Thiopurinomethyltransferase (TPMT) deficiency: Increased myelosuppression, secondary malignancy).

Drug-Drug Interaction

- Allopurinol, azathioprine: May increase mercaptopurine effect.
- Warfarin: May decrease the effect of warfarin.

Side Effects

- Haematologic toxicities (neutropenia, thrombocytopenia, anaemia).
- Hepatotoxicity (intrahepatic cholestasis and focal centralobular necrosis: more common at doses more than 2.5 mg/kg/day. Usually occurs within 2 months of therapy but may occur within 1 week, or be delayed up to 8 years).
- Skin toxicities (hyperpigmentation of hands, elbows and knees, rash).
- GI toxicities (mucositis, diarrhoea, loss of appetite, low: nausea and vomiting).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/24688> [Accessed: 19th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a682653.html> [Accessed: 19th October 2016]

Mesna - 100mg/ml Injection

Instruction

- Route of administration: PO, IV
- IV form can be taken orally. Freshly prepared by mixing in water, juice, milk or carbonated beverages. If vomit within 2 hours, repeat the dose or give IV mesna.

Storage

- Store at room temperature.

Precaution

- May get a false positive result during ketone test for diabetic patient.
- Pregnancy Risk Factor: B

Drug-Disease Interaction

- Rheumatoid arthritis, systemic lupus erythematosus, nephritis: Increased risk of developing hypersensitivity reaction to Mesna.

Side Effects

- GI toxicities (diarrhoea in high doses, nausea and vomiting).
- CNS toxicities (headache, transient hypotension with high doses).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/30187> [Accessed: 19th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a695034.html> [Accessed: 19th October 2016]

Methotrexate - 25mg/ml Injection; 2.5mg Tablet

Instruction

- Route of administration: PO, IV, IM, SC, IT
- PO: Take on an empty stomach with a full glass of water at the same time each day (as per protocol). Drink plenty of liquids (2L/day).
- IV: Administer leucovorin and monitor level as per protocol. Alkalise urine using IV or PO sodium bicarbonate to maintain urine pH >7.

Storage

- Store at room temperature and protect from light.

Precaution

- Use with caution in renal failure and hepatic impairment. May need dose modification. Avoid use if bilirubin >5mg/dl.
- Pleural effusion or ascites: Accumulated fluid should be removed prior to therapy to avoid toxicity.
- May influence activities requiring alertness or coordination (such as driving) due to its central nervous system side effects.
- Pregnancy Risk Factor: X
 - Avoid pregnancy while on therapy and for at least one ovulatory cycle in female or minimum 3 months in male following discontinuation of therapy.
 - May cause sterility in men and menopause in women.

Drug-Drug Interaction

- NSAIDs: May increase toxicity of methotrexate.
- Sulfonamides: May increase level of methotrexate. Monitor methotrexate level.
- Proton pump inhibitor: May increase level of methotrexate. Consider H₂-antagonist as alternative.
- Thiazides: May increase methotrexate level and risk of myelosuppression.

Drug-Food/Herb Interaction

- Avoid Echinacea.
- Food and milk: may decrease absorption of oral methotrexate.

Side Effects

- Haematologic toxicities (neutropaenia, thrombocytopaenia).
- GI toxicities (mucositis, high to moderate: nausea and vomiting).
- Hepatotoxicity (increase in bilirubin, serum aminotransferases).
- Nephrotoxicity (acute renal failure).
- Pulmonary toxicity (dyspnoea, crackles, fibrosis, pleural effusion). Toxicity may be caused by inflammation, infection or neoplasm.
- Skin toxicities (photosensitivity, pigment changes).
- CNS toxicities (headache, dizziness, seizure, leukoencephalopathy). Occur with IT administration or high dose methotrexate.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/6278> [Accessed: 19th October 2016]
3. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/6003> [Accessed: 19th October 2016]
4. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a682019.html> [Accessed: 19th October 2016]

Mitomycin C - 10mg Injection

Instruction

- Route of administration: IV, Intravesicular, Ophthalmic
- Intravesicular: Instill into bladder and retain for up to 2 hours. Rotate patient every 15-30 minutes.

Storage

- Store at room temperature.

Precaution

- Use with caution in renal impairment. May need dose modification.
- Pregnancy Risk Factor: D
- Extravasation injury: May cause severe tissue necrosis. Inform doctor immediately when extravasation occurs.

Drug-Drug Interaction

- Vincristine, vinblastine, vindesine: May lead to bronchospasm, SOB.

Side Effects

- Haematologic toxicities (leucopenia, thrombocytopenia, anaemia).
- Renal toxicities (intravesicallly administration: local irritation, cystitis, dysuria, haematuria).
- GI toxicities (low: nausea and vomiting, mucositis).
- Pulmonary toxicities (cough, SOB).
- Skin toxicities (local irritation, nail changes).
- Fever.
- Haemolytic Uremic Syndrome (rare).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/26917> [Accessed: 19th October 2016]
3. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/mitomycin> [Accessed: 19th October 2016]

Mitoxantrone - 2mg/ml Injection

Instruction

- Route of administration: IV
- Do not administer IT, IM or SC.
- Maximum lifetime cumulative dose: 140mg/m².

Storage

- Store at room temperature.

Precaution

- Use with caution in hepatic impairment. May need dose modification.
- Pregnancy Risk Factor: D
- May cause sterility in men and menopause in women. Discuss with doctor if plan to have children.
- Extravasation injury: May cause severe tissue necrosis. Inform doctor immediately when extravasation occurs.

Drug-Disease Interaction

- Existing or prior cardiovascular disease: Increased risk of cardiotoxicity.

Drug-Drug Inteaction

- Aripiprazole, clozapine: May increase the level of aripiprazole, clozapine.
- Quinolones (ciprofloxacin): May decrease anti-microbial effect.

Side Effects

- Haematologic toxicities (leucopenia, anaemia, thrombocytopenia).
- Cardiotoxicities (arrhythmia, cardiomyopathy, CHF).
- GI toxicities (low to minimal: nausea and vomiting, diarrhoea, constipation, mucositis).
- Infection.
- Skin toxicities (alopecia, nail bed changes).
- Metabolism and nutrition disorders (hyperglycaemia, increased BUN).
- CNS toxicities (seizures or loss of consciousness, headache, pain).
- Pulmonary toxicities (cough, SOB).
- Renal toxicities (urine discoloration: blue-green, haematuria).
- Hepatotoxicity.
- Ocular toxicities (conjunctivitis, blurred vision).
- Musculoskeletal (myalgia, arthralgia).
- General (fever, fatigue).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/10050> [Accessed: 19th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a608019.html> [Accessed: 19th October 2016]

Morphine Sulphate - Controlled Release: 10mg, 30mg Tablet / Immediate Release: 5mg, 10mg Tablet

Instruction

- Route of administration: PO
- Take with food or on an empty stomach.

Storage

- Store at room temperature and protect from light and moisture.

Precaution

- Use with caution in renal and hepatic impairment. May need dose modification.
- Abrupt withdrawal may result in severe withdrawal symptoms and should be avoided.
- May impair activities requiring alertness or coordination (such as driving) due to its central nervous system side effects.
- Pregnancy Risk Factor: C

Drug-Disease Interaction

- Adrenocortical insufficiency (Addison's disease), hypothyroidism, myxedema: Increased risk of toxicity. May need dose reduction.

Drug-Drug Interaction

- Monoamine oxidase inhibitor (MAOI) (selegiline, moclobemide): Possible CNS excitation or depression. Avoid concomitant use and for 2 weeks after stopping MAOIs.

Drug-Food Interaction

- Alcohol: Enhanced hypotensive and sedative effects.

Side Effects

- GI toxicities (constipation, nausea, vomiting, abdominal pain).
- CNS toxicities (drowsiness, dizziness, confusion, somnolence).
- Pulmonary toxicities (respiratory depression, apnoea).
- Skin toxicities (rash, pruritis).
- Cardiotoxicities (bradycardia, hypotension).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/24808> [Accessed: 19th October 2016]
3. US Food & Drug Administration. (2016) [Online] Available from - <http://www.fda.gov/downloads/drugs/drugsafety/ucm199333.pdf> [Accessed: 19th October 2016]

Nilotinib - 200mg Tablet

Instruction

- Route of administration: PO
- Take on an empty stomach, at least 1 hour before or 2 hours after food. If unable to swallow whole, may empty contents into 5ml applesauce and administer within 15 minutes (do not save for later use).

Storage

- Store at room temperature.
- Protect from heat, light and moisture.

Precaution

- Use with caution in hepatic impairment. May need dose modification.
- Pregnancy Risk Factor: D

Drug-Disease Interaction

- Long QT syndrome: May need dose modification.
- Cardiac disease (MI, unstable angina): May need dose modification.
- Pancreatitis: Monitor serum lipase. May need dose modification.
- Electrolyte imbalance (hypokalaemia, hypomagnesaemia): Increased risk of QT prolongation. To correct prior to therapy.
- Capsules contain lactose. Do not use with galactose intolerance, severe lactase deficiency, or glucose-galactose malabsorption syndromes.
- Gastrectomy patients

Drug-Drug Interaction

- Alfuzocin, ciprofloxacin, chloroquine, quinine, quetiapine: May increase QT prolongation effect of nilotinib.
- Colchicine, dabigatran, rivaroxaban: May increase the effects of colchicine, dabigatran, rivaroxaban.
- Codeine, tramadol: May decrease the effects of codeine, tramadol.
- Rifampicin: May decrease nilotinib effect.
- Ketoconazole: May increase nilotinib effect.

Drug-Food/Herb Interaction

- Grapefruit and grapefruit juice, black cohosh, cat's claw, kava kava, milk thistle, valerian root: May increase the effect of nilotinib.
- The exact interaction has yet to be fully determined: Dong quai, garlic, genistein, ginkgo, ginkgo biloba, ginseng, glucosamine chondroitin, saw palmetto, all types of teas (such as green tea, dandelion, peppermint, chamomile). Avoid use.

Side Effects

- Haematologic toxicities (neutropenia, thrombocytopenia, anaemia).
- GI toxicities (constipation, diarrhoea, low: nausea and vomiting, abdominal pain).
- Skin reactions (rash, pruritus).
- Musculoskeletal: (arthralgia, myalgia, pain).
- Pulmonary toxicities (cough, dyspnoea).
- CNS toxicities (headache, fatigue, dizziness).
- Metabolism and nutrition disorders (hyperglycaemia, hyper/hypophosphataemia, hyper/hypokalaemia, hyper/hypocalcaemia, hyponatraemia, hypomagnesaemia, lipase increased, amylase increased).
- Cardiotoxicities (peripheral oedema, pericardial effusion, QT prolongation).
- Hepatotoxicity (elevated LFT, hypercholesterolaemia, hyperlipidaemia).
- General (fatigue, fever).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/20827> [Accessed: 19th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a608002.html> [Accessed: 19th October 2016]

Octreotide - 20mg, 30mg Injection

Instruction

- Route of administration: IM intragluteal
- Do not administer IV or SC.
- Avoid deltoid administration. Alternate gluteal injection sites to avoid irritation.
- Must be administered immediately after mixing.

Storage

- Store in a refrigerator and protect from light.

Precaution

- Renal (requiring dialysis), hepatic impairment. May need dose modification.
- Suppresses secretion of thyroid stimulating hormone, which may result in hypothyroidism.
- Reduce glucose tolerance due to imbalance between insulin, glucagon and growth hormone, which may result in hypoglycaemia or hyperglycaemia.
- Cardiac conduction abnormalities have occurred during therapy. The incidence of these adverse events during long-term therapy was determined only in acromegaly patients who, due to their underlying disease/ the subsequent treatment they receive, are at an increased risk for the development of diabetes mellitus, hypothyroidism, and cardiovascular disease.
- Pregnancy Risk Factor: B

Drug-Disease Interaction

- Acromegaly/ carcinoid syndrome: Bradycardia, arrhythmia, conduction abnormalities (QT prolongation).

Drug-Drug Interaction

- May decrease blood level of cyclosporine and result in transplant rejection.
- Bromocriptine: May increase the bioavailability of bromocriptine.

Side Effects

- Cardiotoxicities (bradyarrhythmia, hypertension).
- GI toxicities (abdominal discomfort, biliary tract abnormalities, diarrhoea, flatulence, nausea, pancreatitis).
- CNS toxicities (headache, dizziness).
- Metabolism and nutrition disorders (hyperglycaemia: transient and mild).
- Skin toxicity (injection site reaction).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. US Food & Drug Administration. (2016) [Online] Available from - http://www.accessdata.fda.gov/drugsatfda_docs/nda/2014/021008Orig1s028.pdf [Accessed: 19th October 2016]

Ondansetron - 2mg/ml Injection; 2mg, 8mg Tablet

Instruction

- Route of administration: PO, IV
- PO: Give 30 minutes prior to chemotherapy; 1-2 hours prior to radiotherapy.
- IV: Infuse over 15 minutes. Give 30 minutes before chemotherapy for the first dose then 4 hours and 8 hours post chemotherapy for subsequent doses.

Storage

- Store at room temperature and protect from light.

Precaution

- Use with caution in severe hepatic impairment. May need dose modification. Total daily dose of 8mg should not be exceeded.
- Avoid in patient with congenital long QT syndrome or medication that cause QT prolongation.
- Ondansetron may mask progressive ileus and gastric distension.
- Pregnancy Risk Factor: B

Drug-Drug Interaction

- Tramadol: Pain relieving effect may be reduced.
- Phenytoin, carbamazepine, rifampicin: May decrease the effect of ondansetron.

Side Effects

- GI toxicities (diarrhoea, constipation).
- CNS toxicity (headache).
- Cardiotoxicity (abnormal heart rhythm).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/21510> [Accessed: 19th October 2016]
3. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/27756> [Accessed: 19th October 2016]
4. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a601209.html> [Accessed: 19th October 2016]

Oxaliplatin - 50mg Injection

Instruction

- Route of administration: IV
- Compatible with D5W only.

Storage

- Store in room temperature and protect from light.

Precaution

- Use with caution in renal impairment and neurotoxicity. May need dose modification.
- Elderly patients: May be at higher risk of severe diarrhoea.
- Women are at higher risk of neutropenia.
- Pregnancy Risk Factor: D
- Extravasation injury: May cause severe tissue necrosis. Inform doctor immediately when extravasation occurs.

Drug-Drug Interaction

- Warfarin: May increase anticoagulant effects of Warfarin. Monitor INR and bleeding signs.

Drug-Herb Interaction

- Echinacea may diminish therapeutic effect of oxaliplatin.

Side Effects

- Neurotoxicity (peripheral neuropathy: sensory ataxia and dysesthesia of the limbs, mouth, throat and larynx, may be exacerbated by exposure to cold). Cumulative, dose-related and usually reversible a few months after stopping treatment.
- Haematologic toxicities (thrombocytopenia, neutropenia, anaemia).
- GI toxicities (moderate: nausea and vomiting, diarrhoea).
- Hepatotoxicity (abnormal transaminases).
- Infection.
- Anaphylaxis reaction.
- Pharyngolaryngeal dysesthesia; prevent recurrence by extending infusion duration.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/27556> [Accessed: 19th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a607035.html> [Accessed: 19th October 2016]

Oxycodone HCl - Control Release: 10mg, 20mg, 40mg Capsule / Immediate Release: 5mg, 10mg, 20mg Capsule

Instruction

- Route of administration : PO
- Should be swallowed whole and are not to be broken, chewed or crushed.

Storage

- Store at room temperature and protect from light.

Precaution

- Use with caution in renal and hepatic impairment. May need dose modification.
- Respiratory depression, leading to respiratory arrest and death, has been reported with the highest risk during treatment initiation or following a dose increase.
- Severe hypotension (orthostatic hypotension, syncope) in ambulatory patients may occur; especially in patients with compromised ability to maintain blood pressure. Patient may rise slowly from a sitting or supine position.
- Abrupt withdrawal may result in severe withdrawal symptoms and should be avoided.
- May influence activities requiring alertness or coordination (such as driving) due to its central nervous system side effects.
- Pregnancy Risk Factor: C

Drug-Disease Interaction

- Endocrine metabolic: Adrenocortical insufficiency and hypothyroidism.
- Gastrointestinal: Acute abdominal conditions and gastrointestinal obstruction.
- Hepatic: Sphincter of Oddi spasm may occur and hepatic impairment.
- Neurologic: Intracranial pressure elevations, opioid-intolerant patients, seizure disorders, coma or impaired consciousness.
- Psychiatric: Toxic psychosis.
- Respiratory: Cor-pulmonale, COPD, or decreased respiratory reserve (severe kyphoscoliosis), hypoxia, hypercapnia, or pre-existing respiratory depression; increased risk for further respiratory depression, particularly during treatment initiation and titration; consider alternative non-opioid analgesics.

Drug-Drug Interaction

- CYP3A4 inhibitors (macrolide antibiotics, azole-antifungals, protease inhibitors): May increase oxycodone plasma concentration.
- CYP450 inducer (rifampin, carbamazepine, phenytoin): May decrease oxycodone plasma concentration.
- CNS depressants (sedatives, tranquilisers): May increase respiratory depression, hypotension.
- Anti-hypertensive agents: May increase risk of orthostatic hypotension.
- Anti-cholinergic agents (tricyclic anti-depressant, anti-histamine, anti-psychotic, muscle relaxant): May increase risk of constipation, urinary retention.

Side Effects

- GI toxicities (constipation, nausea and vomiting, dry mouth).
- CNS toxicities (headache, confusion, somnolence, dizziness).
- Pulmonary toxicities (respiratory depression, dyspnoea).
- Skin toxicities (rash, pruritis).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/30252> [Accessed: 19th October 2016]

Paclitaxel - 6mg/ml Injection

Instruction

- Route of administration : IV
- Final infusion concentration shall be within 0.3-1.2mg/ml.
- Premedication: PO dexamethasone 12 hours and 6 hours prior to the dose or IV dexamethasone 30 minutes prior to dose, IV chlorpheniramine and IV ranitidine 30 minutes prior to dose.

Storage

- Store at room temperature and protect from light.
- Dispense in non-DEHP container and administer through tubing with in-line filter.

Precaution

- Use with caution in hepatic impairment. May need dose modification.
- Elderly patients: May increase risk of adverse events.
- Pregnancy Risk Factor: D
- Extravasation injury: May cause severe tissue necrosis.

Drug-Disease Interaction

- AIDS related Kaposi's Sarcoma: May have more haematologic toxicities, infections and febrile neutropenia.

Drug-Drug Interaction

- Cisplatin: May increase neutropenia when paclitaxel given after cisplatin.
- Doxorubicin: May increase cardiotoxicity.
- May increase anticoagulant effects of Warfarin. Monitor INR & bleeding signs.

Drug-Herb Interaction

- Dong quai, St. John's Wort: May increase metabolism of paclitaxel.

Side Effects

- Haematologic toxicities (neutropenia, anaemia, thrombocytopenia), Skin toxicities (alopecia, rash), Neurotoxicity (peripheral neuropathy),
- Musculoskeletal (muscle and joint pain: usually resolves within days), GI toxicities (low: nausea and vomiting, mucositis, diarrhoea), Hepatotoxicities (elevated ALP, AST, bilirubin), Cardiotoxicities (bradycardia, hypotension, ECG changes: usually occurs during first 3 hours of infusion).
- Hypersensitivity reaction / infusion related reaction (dyspnoea, hypotension, tachycardia). May be avoided when infused at a reduced rate.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/25881> [Accessed: 19th October 2016]
3. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/paclitaxel> [Accessed: 19th October 2016]

Palonosetron - 0.25mg/5ml Injection

Instruction

- Route of administration: IV
- Given 30 minutes prior to chemotherapy.
- Adults: Infuse over 30 seconds.
- Paediatrics: infuse over 15 minutes.
- Flush the infusion line with NS before and after administration of palonosetron. It should not be mixed with other drugs.

Storage

- Store at room temperature and protect from light.

Precaution

- Patients on treatment with SSRI and SNRI should be informed of increased serotonin syndrome.
- Pregnancy Risk Factor: B

Drug-Drug Interaction

- SSRI (escitalopram, fluoxetine, fluvoxamine) and SNRI (duloxetine, venlafaxine): Serotonin syndrome such as mental status changes, autonomic instability and neuromuscular symptoms (tremor, rigidity).

Side Effects

- CNS toxicities (headache, dizziness, fatigue).
- GI toxicities (constipation, diarrhoea).
- Cardiotoxicity (bradycardia).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a610002.html> [Accessed: 19th October 2016]

Pamidronate - 30mg, 90mg Injection

Instruction

- Route of administration: IV
- Final infusion concentration shall be less than 0.36mg/ml.
- Patients must be adequately hydrated before and during therapy.
- Retreatment: Recommended minimum 7 days elapse before retreatment, to allow for full response to the initial dose.

Storage

- Store at room temperature.

Precaution

- Renal impairment. Longer infusion (more than 2 hours) may reduce renal toxicity particularly in pre-existing renal insufficiency.
- Must be adequately hydrated with intravenous normal saline before and during pamidronate therapy to increase renal calcium clearance.
- Pregnancy Risk Factor: D

Drug-Drug Interaction

- Calcium or vitamin D containing preparation: May antagonise the effect of pamidronate.

Side Effects

- GI toxicities (nausea and vomiting, constipation, diarrhoea, abdominal pain).
- Musculoskeletal (bone pain, muscle pain, bone fracture, osteonecrosis of jaw: avoid invasive dental procedures).
- Pulmonary toxicities (dyspnoea, coughing).
- Haematologic toxicities (anaemia, neutropenia, thrombocytopenia).
- Metabolism and nutrition disorders (hypocalcaemia, hypophosphataemia, hypomagnesaemia).
- Infection (urinary tract infection, upper respiratory tract infection).
- Fever.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/pamidronatedisodium> [Accessed: 19th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a601163.html> [Accessed: 19th October 2016]

Pazopanib HCl - 200mg, 400mg Tablet

Instruction

- Route of administration: PO
- Take on an empty stomach, at least 1 hour before or 2 hours after food.
- Increase exposure (toxicity) when administered as crushed/ broken tablets or given with food.
- Maximum recommended daily dose: 800mg

Storage

- Store at room temperature.

Precaution

- Contraindicated in patients who have these conditions within the past 6 months:
 - Uncontrolled hypertension.
 - History of arterial thromboembolism.
 - Severe renal or liver impairment.
 - History of haemoptysis, cerebral or significant GI bleeding.
- Hold for at least 7 days pre-surgery and resume 4 weeks after surgery and if surgical wound healed adequately.
- Not recommended for use in patients with severe renal impairment (< 30 mL/min) or moderate to severe hepatic impairment (ALT/AST >3.0 x ULN with bilirubin >2.0 x ULN).
- Pregnancy Risk Factor: D
 - Avoid pregnancy while on therapy and for at least 8 weeks following discontinuation of therapy.

Drug-Disease Interaction

- Hypothyroidism, torsade de pointes: Increased risk for adverse event.

Drug-Drug Interaction

- Avoid H₂ blockers, proton pump inhibitor and antacid 1 hour pre and post administration (reduced efficacy of pazopanib due to decreased absorption when gastric acid secretion suppressed).
- Simvastatin: May increase risk of ALT elevation and hepatotoxicity.
- Ketoconazole, itraconazole, ritonavir, erythromycin, clarithromycin, lapatinib: May increase pazopanib plasma concentration.
- Rifampicin: May decrease plasma concentration.

Drug-Food Interaction

- Grapefruit and grapefruit juice: May increase plasma concentration of pazopanib.

Side Effects

- Cardiotoxicity (hypertension; reduce dose if persistent hypertension despite antihypertensive therapy, bradycardia, QT prolongation, thromboembolic events, decrease in LVEF: Withhold and reduce pazopanib dose if decreased LVEF (grade 3 or greater), or if LVEF drops 20% or greater relative to baseline or below the lower limit of normal. Discontinue if symptomatic decline in LVEF).
- GI toxicities (diarrhoea, anorexia, low: nausea and vomiting).
- Hepatotoxicities (elevated LFT and lipase). Dose modification or therapy interruption/ cessation may be required.
- Metabolism and nutrition disorders (hyperglycaemia, hyperkalaemia, hypothyroidism, anorexia).
- Haematologic toxicities (haemorrhage, leucopenia, neutropenia, thrombocytopenia).
- Skin toxicities (change in hair colour, rash, hand-foot skin reaction).
- CNS toxicity (headache, fatigue).
- Renal toxicity (proteinuria).
- Pulmonary toxicities (cough, dyspnoea, interstitial lung disease).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a610013.html> [Accessed: 19th October 2016]
3. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/23148> [Accessed: 19th October 2016]

Pemetrexed Disodium - 100mg, 500mg Injection

Instruction

- Route of administration: IV
- Infuse over 10 minutes
- Premedication:
 - PO folic acid from 5-7 days before the therapy until day 21 after the last therapy.
 - IM vitamin B₁₂ during the week prior to the first dose and then administer every 9 weeks thereafter.
 - PO dexamethasone taken twice daily for 3 days (the day before, during, and the day after pemetrexed administration) to reduce the incidence and severity of skin reactions.
- Folic acid and vitamin B₁₂ administered to reduce treatment related toxicities (bone marrow suppression, diarrhoea and mucositis).

Storage

- Store at room temperature.

Precaution

- Use with caution in renal impairment. May need dose modification.
- Pregnancy Risk Factor: D

Drug-Drug Interaction

- Ibuprofen and other short acting NSAIDS (diclofenac, indomethacine, ketoprofen, ketorolac, indomethacine): May increase pemetrexed level.
- Nephrotoxic drugs (aminoglycosides, radiocontrast media, sulphonamides): May increase pemetrexed level.

Side Effects

- Fatigue.
- Haematologic toxicities (anaemia, neutropenia, thrombocytopenia).
- Skin toxicities (rashes).
- GI toxicities (low: nausea and vomiting, diarrhoea, constipation, mucositis).
- Renal toxicity.
- Cardiotoxicity (chest pain).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/pemetrexedisodium> [Accessed: 19th October 2016]
3. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/32300> [Accessed: 19th October 2016]
4. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/32301> [Accessed: 19th October 2016]

Procarbazine HCl - 50mg Capsule

Instruction

- Route of administration: PO
- Take with food (to reduce the risk of nausea and vomiting) or take on an empty stomach. Take at night before bed.
- Do not smoke during treatment to minimise the risk of developing lung cancer.

Storage

- Protect from light.

Precaution

- Renal and hepatic impairment. May need dose modification (avoid use if bilirubin more than 5mg/dl and aminotransferases more than 3 times ULN).
- If radiation or chemotherapy (known to cause marrow depression) have been used, an interval of 1 month or longer is recommended before starting therapy.
- May cause sterility in men and menopause in women. Discuss with doctor if plan to have children. Pregnancy Risk Factor: D

Drug-Drug Interaction

- Ephedrine, pseudoephedrine, local anaesthetic: May cause serotonin syndrome (flushing, hypertension).
- Carbamazepine, phenytoin, phenobarbital: May increase procarbazine hypersensitivity reaction.
- Digoxin: May decrease digoxin effect.
- Barbiturate, anti-histamine, hypotensive agent, opioid analgesic: May cause CNS depression.

Drug-Food Interaction

- Avoid tyramine-containing food and fermented milk product (cheeses, yeast or meat extracts, broad bean pods, pickled herring, sausages, overripe fruits) during the therapy and for 4 weeks after therapy. All of these food may cause an increase in blood pressure.
- Avoid supplement containing caffeine, tyrosine, tryptophan, phenylalanine.
- Alcohol: May cause disulfiram like reaction (facial flushing, headache).

Side Effects

- Haematologic toxicities (leucopenia, anaemia, thrombocytopenia), GI toxicities (high to moderate: nausea and vomiting), Cardiotoxicity (hypertension), Skin toxicity (rash), CNS toxicities (headache, nervousness, insomnia).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a682094.html> [Accessed: 19th October 2016]
3. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/386> [Accessed: 19th October 2016]

Rituximab - 10mg/ml Injection

Instruction

- Route of administration: IV
- Do not administer as an IV push/bolus.
- For the first infusion course, the recommended initial rate for infusion is 50mg/hr; after the first 30 minutes, it can be escalated in 50mg/hr increments every 30 minutes to a maximum of 400mg/hr.
- Premedication: IV chlorpheniramine, PO paracetamol 30 minutes prior to infusion.

Storage

- Store in a refrigerator, do not shake and protect from light.

Precaution

- Infusion reactions (hypotension, fever, chill, rigors, urticaria, SOB, pruritis). Premedication as per protocol.
- May cause reactivation of hepatitis B and tuberculosis with rituximab use.
- Pregnancy Risk Factor: C
- Avoid pregnancy while on therapy and for at least 12 months following discontinuation of therapy.

Drug-Drug Interaction

- Antihypertensive agents: May increase hypotensive effect of rituximab.

Drug-Food Interaction

- Echinacea: May decrease the therapeutic effect of rituximab.

Side Effects

- Cytokine release syndrome (sign and symptoms similar to anaphylactic or severe infusion-related reaction): Reduce infusion rate or split dose over 2 days.
- Haematologic toxicity (neutropenia).
- Reversible posterior leukoencephalopathy syndrome (RPLS): Visual disturbances, headache, seizure, altered mental status with or without hypertension. Manage by controlling hypertension, electrolyte correction, seizure management and discontinuation of rituximab.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/2570> [Accessed: 19th October 2016]

Sorafenib - 200mg Tablet

Instruction

- Route of administration: PO
- Take on an empty stomach, at least 1 hour before or 2 hours after food. Bioavailability reduced 29% by high fat meal.
- Treatment should continue as long as clinical benefit is observed or until unacceptable toxicity occurs.

Storage

- Store at room temperature and protect from moisture.

Precaution

- Temporary interruption in therapy of patients undergoing major surgical procedure (precaution for wound healing).
- May increase risk of cardiac ischaemic and/or infarction, haemorrhage, hypertension, dermatologic toxicities and GI perforation.
- Pregnancy Risk Factor: D
- Avoid pregnancy while on therapy and for at least 12 weeks following discontinuation of therapy.

Drug-Disease Interaction

- Cardiovascular disease: May increase risk of CAD, MI.
- Uncontrolled hypertension: May increase risk of hypertension.

Drug-Drug Interaction

- Warfarin: May increase anticoagulant effects of Warfarin. Monitor INR and bleeding signs.
- Doxorubicin, docetaxel: May increase plasma concentration of both drugs.
- Irinotecan: May increase AUC of irinotecan and its metabolite.
- Rifampicin: May decrease AUC of sorafenib.
- Paclitaxel, carboplatin: May increase level of sorafenib and paclitaxel.
 - When co-administration with paclitaxel (225mg/m², once every 3 weeks) and carboplatin (AUC=6) with sorafenib (\leq 400 mg twice daily) without a break in sorafenib dosing.

Drug-Herb Interaction

- St. John's Wort: May decrease plasma level of sorafenib.
- Grapefruit juice: May increase plasma level of sorafenib.

Side Effects

- Skin toxicities (hand-foot skin reaction: especially in first 6 weeks, rash, erythema, yellow skin discolouration, alopecia). May need dose modification in cutaneous toxicity.
- GI toxicities (diarrhoea, constipation, mucositis).
- Cardiotoxicity (mild to moderate hypertension: especially in the first 6 weeks, MI, arrhythmia).
- Metabolism and nutrition disorders (hypophosphataemia, hypocalcaemia, increase lipase and amylase, transient increase in transaminase).
- General (fatigue, asthenia, pain).
- Haematologic toxicities (lymphopenia, neutropenia, thrombocytopenia, leucopenia, anaemia) If haemorrhage, discontinue therapy.
- Pulmonary toxicity (hoarseness, interstitial lung disease).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/18520> [Accessed: 19th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a607051.html> [Accessed: 19th October 2016]

Sunitinib - 12.5mg, 25mg, 50mg Capsule

Instruction

- Route of administration: PO
- Take with food or on an empty stomach. Oral liquid formulation may be compounded for patients who are unable to swallow the capsules. Mix with a 1:1 mixture of ORA-PLUS®:ORA-SWEET® to yield a final concentration of 10mg/ml.

Storage

- Store at room temperature and protect from light and moisture.

Precaution

- Use with caution in pre-existing arrhythmias or in patients taking concomitant drugs with arrhythmic potential.
- May increase risk of haemorrhage (epistaxis, gingival, upper GI).
- Dose interruption and/or adjustment should be based on safety and tolerability.
- Pregnancy Risk Factor: D

Drug-Disease Interaction

- Uncontrolled hypertension: May increase risk of hypertension.
- Left ventricular dysfunction: Decrease in LVEF.

Drug-Drug Interaction

- Intravenous biphosphonate: May increase risk of osteonecrosis of the jaw.
- Ketoconazole, itraconazole, ritonavir, erythromycin, clarithromycin: May increase sunitinib plasma concentration.
- Rifampicin, phenytoin, carbamazepine, phenobarbitone: May decrease sunitinib plasma concentration.

Drug-Food/Herb Interaction

- Grapefruit and grapefruit juice: May increase plasma level of sunitinib.
- St. John's Wort: May decrease plasma level of sunitinib.

Side Effects

- Haematologic toxicities (anaemia, lymphopenia, neutropenia, thrombocytopenia).
- GI toxicities (diarrhoea, mucositis, nausea)
- Skin toxicities (hand-foot skin reaction, hair discolouration, yellow discolouration of skin: reversible)
- Cardiotoxicities (left ventricular dysfunction, hypertension, arrhythmia, CHF),
- Hepatotoxicity (elevated LFT).
- Endocrine (hypothyroidism), Metabolic and electrolyte changes (hypoglycaemia), General (fatigue, haemorrhage).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/18531> [Accessed: 19th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a607052.html> [Accessed: 19th October 2016]

Tamoxifen Citrate - 20mg Tablet

Instruction

- Route of administration: PO
- Take with food or on an empty stomach.

Storage

- Store at room temperature, protect from light, heat and moisture.

Precaution

- Caution in patient with personal or family history of VTE.
- Increased risk of VTE events in immobile, severe obese and elderly patients.
- Pregnancy Risk Factor: D
- Use barrier or non-hormonal contraceptive while on therapy and for 2 months following discontinuation of therapy.

Drug-Drug Interaction

- Warfarin: May increase anticoagulant effects of Warfarin. Monitor INR and bleeding signs.
- Clopidogrel: May increase tamoxifen toxicity.
- CYP3A4 & CYP2D6 inducers or inhibitors: Will affect serum concentration of tamoxifen.

Drug-Herb Interaction

- St John's Wort: May decrease tamoxifen effectiveness.

Side Effects

- Endocrine (hot flashes: take tablet at bedtime).
- Musculoskeletal (arthralgia, myalgia, back pain).
- Ocular toxicity (reduced visual acuity, blurred vision).
- Cardiotoxicity (thromboembolic events).
- Hepatotoxicity (increased liver enzymes, altered lipid profile, rarely with cholestasis and hepatitis).
- CNS toxicity (depression, headache, dizziness).
- Secondary malignancy (endometrial cancer, uterine sarcoma).
- General (haemorrhage: vaginal bleeding/discharge, itching, fatigue, sweating).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/30769> [Accessed: 19th October 2016]

Tegafur 100mg + Uracil 224mg Capsule

Instruction

- Route of administration: PO
- Take on an empty stomach, at least 1 hour before or 1 hour after food. Should be swallowed whole.

Storage

- Store at room temperature.

Precaution

- Severe liver, renal dysfunction, heart diseases or a history heart disease and elderly patients. Monitor closely by regular laboratory examinations.
- Aggravation of infectious disease may occur as a result of potential bone marrow depression.
- Glucose intolerance may be aggravated.
- Patients with gastric/duodenal symptoms may have aggravation of symptoms.
- May impair activities requiring alertness or coordination (such as driving) due to its central nervous system side effects.
- Pregnancy Risk Factor: Clinical data not available. Women of childbearing potential should avoid becoming pregnant while receiving treatment.
 - Adequate contraception should be used by both sexes while on therapy and for 3 months following discontinuation of therapy.
 - Women who are breast-feeding must not take this medicine.

Drug-Drug Interaction

- Warfarin: May increase the anticoagulant effects of Warfarin. Monitor INR and bleeding signs.
- Sorivudine: May inhibit the metabolism of fluorouracil group drug, resulting in elevated blood concentration, which may cause drug reaction such as severe blood dyscrasia.
- Phenytoin: May increase phenytoin plasma concentration.
- Tegafur, Gimeracil and Oteracil potassium combination product: Serious blood dyscrasia and gastrointestinal disorder such as diarrhoea and stomatitis. Should not be administered during this combination product or within at least 7 days after withdrawal of this combination.

Side Effects

- Haematologic toxicity (anaemia, leucopenia, thrombocytopenia).
- GI toxicities (nausea and vomiting, diarrhoea, abdominal pain, mucositis).
- Hepatotoxicity (rarely fulminant hepatitis).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.

Temozolomide - 20mg, 100mg Capsule

Instruction

- Route of administration: PO
- Take on an empty stomach or at bedtime with a glass of water to reduce nausea and vomiting.
- Food delays absorption, consistency of administration with respect to food is recommended.

Storage

- Store at room temperature.

Precaution

- Use with caution in renal and severe hepatic impairment.
- Pregnancy Risk Factor: D
 - Adequate contraception should be used by both sexes while on therapy and for 6 months following discontinuation of therapy.

Drug-Drug Interaction

- Valproic acid: Enhance the adverse effect of temozolomide.

Side Effects

- GI toxicities (moderate to high nausea and vomiting, constipation).
- Haematologic toxicities (thrombocytopenia, neutropenia).
- Hepatotoxicity (liver enzyme elevation, hyperbilirubinemia, cholestasis, hepatitis, fatal hepatic failure). LFT should be assessed prior to therapy and regularly throughout therapy.
- Infection: *Pneumocystis jiroveci* pneumonia (PJP) prophylaxis recommended during concurrent radiotherapy (based on risk factors including concurrent high dose steroids and/or lymphocyte count).
- General (fatigue, bruising).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/30453> [Accessed: 19th October 2016]

Thalidomide - 50mg Capsule

Instruction

- Route of administration: PO
- Take with food or on an empty stomach.
- Take at night before bed.

Storage

- Store at room temperature and protect from light.

Precaution

- May influence activities requiring alertness or coordination (such as driving) due to its central nervous system side effects.
- Pregnancy Risk Factor: X
 - Avoid pregnancy for at least 4 weeks before, during and 4 weeks following discontinuation of therapy. Negative pregnancy test must be obtained before initiation of treatment. Men should use condom during treatment and at least 4 weeks following discontinuation of therapy.

Drug-Drug Interaction

- Avoid drugs that interact with oral contraceptives (HIV-protease inhibitor, carbamazepine, rifampicin) in women taking thalidomide. Use 2 other reliable methods (other than oral contraceptives) if these drugs must be used concurrently.
- Barbiturates, chlorpromazine: Enhance sedative activity.

Side Effects

- Thromboembolic events (DVT, PE, MI).
- Haematologic toxicities (neutropenia, anaemia, thrombocytopenia).
- GI toxicities (constipation).
- Neurotoxicity (peripheral neuropathy, numbness, tingling, pain in the hand and feet). Discontinue treatment if neuropathy present in early stage. May rechallenge if baseline status returns.
- CNS toxicities (somnolence, dizziness).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/21005> [Accessed: 19th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a699032.html> [Accessed: 19th October 2016]

Thioguanine - 40mg Tablet

Instruction

- Route of administration: PO
- Take on an empty stomach, or with food if needed.

Storage

- Store at room temperature and protect from moisture.

Precaution

- Use with caution in the elderly (start with a low dose).
- Discontinue therapy if decreased LFT, toxic hepatitis, biliary stasis, clinical jaundice, evidence of sinusoidal obstruction syndrome or portal hypertension.
- Pregnancy Risk Factor: D
- May cause sterility in men and menopause in women. Discuss with doctor if plan to have children.

Drug-Disease Interaction

- Thiopurine methyltransferase (TMPT) deficiency: Increased risk of myelosuppression. May need dose modification.

Side Effects

- Haematologic toxicities (may be delayed: anaemia, leucopenia, thrombocytopenia).
- Hepatotoxicity (veno-occlusive disease, ascites, fluid retention, hyperbilirubinaemia).
- GI toxicities (anorexia, diarrhoea, mucositis, low: nausea and vomiting).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/24687> [Accessed: 19th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a682099.html> [Accessed: 19th October 2016]

Trastuzumab - 440mg Injection

Instruction

- Route of administration: IV
- Do not administer IV push/ bolus. Infused over 90 minutes as loading dose, if tolerated next infusion can be given over 30 minutes as maintenance dose.
- Incompatible with D5W.

Storage

- Store in a refrigerator.

Precaution

- Pre-existing cardiac dysfunction (LVEF < 55%) or extensive pulmonary disease.
- Patient with prior adjuvant therapy of anthracycline are at higher risk of developing cardiotoxicity.
- Avoid use of anthracyclines concurrently with trastuzumab.
- Pregnancy Risk Factor: D
 - Avoid pregnancy while on therapy and for at least 3 months following discontinuation of therapy.

Drug-Drug Interaction

- May increase anticoagulant effects of Warfarin. Monitor INR & bleeding signs.
- Anthracycline chemotherapy: May induce cardiac dysfunction.
- Paclitaxel: May increase trastuzumab serum level.

Side Effects

- Infusion related reactions (occur with first infusion, severe reactions include hypo/hypertension, bronchospasm, tachycardia, reduce oxygen saturation and respiratory distress). Discontinue the infusion if severe reactions such as anaphylaxis, angioedema, pneumonitis. Decrease the rate and interrupt the infusion for mild or moderate reaction in patients experiencing dyspnoea or hypotension.
- Flu-like symptoms (fever, chill, rigor).
- Cardiotoxicity (withhold trastuzumab approximately 3 weeks if LVEF falls 10-15 ejection point below baseline and/or below 50%, discontinue if no improvement after 3 weeks).
- Skin toxicity (rash), GI toxicity (diarrhoea), CNS toxicity (headache).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/3567> [Accessed: 19th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a699019.html> [Accessed: 19th October 2016]
4. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/trastuzumab> [Accessed: 19th October 2016]

Vinblastine - 10mg Injection

Instruction

- Route of administration: IV
- Do not administer IT.

Storage

- Store in a refrigerator and protect from light.

Precaution

- Hepatic impairment. May need dose modification.
- Elderly with cachexia or skin ulcers. May develop a more profound leucopenia.
- Pregnancy Risk Factor: D
- Extravasation injury: may cause severe tissue necrosis. Inform doctor immediately when extravasation occurs.

Drug-Drug Interaction

- Carbamazepine: May decrease effect of vinblastine.
- Erythromycin: May increase toxic effect of vinblastine.
- Phenytoin: May decrease effect of phenytoin.
- Itraconazole: May cause an earlier onset and/or severe neuromuscular side effect.
- Mitomycin: Associated with increased dyspnoea, cough, hypoxemia.

Drug-Herb Interaction

- St John's Wort: May decrease vinblastine level.

Side Effects

- Haematologic toxicity (leucopenia).
- Neurotoxicity (numbness, neuritis, jaw pain, mild paraesthesia: reversible on discontinuation of therapy).
- GI toxicity (constipation).
- Skin toxicity (alopecia).
- Pulmonary toxicities (SOB, bronchospasm).
- Ototoxicity.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/6549> [Accessed: 19th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a682848.html> [Accessed: 19th October 2016]

Vincristine - 1mg Injection

Instruction

- Route of administration: IV
- Do not administer IT.
- Max dose: 2mg/dose within a week

Storage

- Store in a refrigerator and protect from light.

Precaution

- Use with caution in hepatic impairment and neurotoxicity. May need dose modification.
- Pregnancy Risk Factor: D
- Extravasation injury: may cause severe tissue necrosis. Inform doctor immediately when extravasation occurs.

Drug-Drug Interaction

- Allopurinol, pyridoxine, isoniazid: May increase the incidence of bone marrow depression.
- Phenytoin: May decrease effect of phenytoin.
- Itraconazole, ketoconazole, erythromycin: May increase neuromuscular side effect of vincristine.
- L-asparaginase: May decrease hepatic clearance of vincristine. Give vincristine 12 to 24 hours before administration of asparaginase.
- Carbamazepine: May decrease vincristine plasma concentration.

Drug-Radiation Interaction

- Abdominal radiation therapy: May increase hepatic toxicity.

Drug-Herb Interaction

- St John's Wort: May decrease vincristine level.

Side Effects

- GI toxicity (constipation, nausea and vomiting).
- Skin toxicity (alopecia).
- Neurotoxicity (peripheral autonomic and central neuropathy). Most neurotoxicity are reversible. Infants are at a higher risk.
- Ototoxicity.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/7298> [Accessed: 19th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a682822.html> [Accessed: 19th October 2016]
4. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/vincristinesulfate> [Accessed: 19th October 2016]

Vindesine - 5mg/5ml Injection

Instruction

- Route of administration: IV only
- Do not administer IT.

Storage

- Store in a refrigerator.

Precaution

- Use with caution in hepatic impairment and neurotoxicity.
- Pregnancy Risk Factor: Clinical data not available. Women of childbearing potential should avoid becoming pregnant while receiving therapy.
- Extravasation injury: May cause severe tissue necrosis. Inform doctor immediately when extravasation occurs.

Drug-Disease Interaction

- Neuromuscular disease (charcot-marie-tooth syndrome): May increase neurotoxicity.

Drug-Drug Interaction

- Mitomycin-C: Associated with increased frequency of acute SOB and severe bronchospasm.
- Phenytoin: May decrease phenytoin level.

Drug-Radiation Interaction

- Radiation therapy: May increase hepatic toxicity.

Side Effects

- Haematologic toxicity (granulocytopenia, thrombocytopenia).
- Neurotoxicity (peripheral neuropathy, numbness, neuritis, jaw pain).
- GI toxicities (constipation, nausea and vomiting).
- Ototoxicity.
- Skin toxicity (alopecia).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/26811> [Accessed: 19th October 2016]

Vinorelbine - 10mg, 50mg Injection

Instruction

- Route of administration: IV only
- Do not administer IT.

Storage

- Store in a refrigerator.
- Protect from light and freezing.
- Clear and colourless to pale yellow, but may develop a slightly darker yellow to light amber colour in time but it does not indicate a change which should preclude its use.

Precaution

- Use with caution in hepatic impairment. May need dose modification.
- Pregnancy Risk Factor: D
- Extravasation injury: May cause severe tissue necrosis. Inform doctor immediately when extravasation occurs.

Drug-Drug Interaction

- Mitomycin: Acute dyspnoea, bronchospasm.
- Cisplatin: Increase risk of granulocytopenia, high frequency hearing loss and tinnitus.
- Paclitaxel: Neuropathy.

Drug-Radiation Interaction

- Prior or concomitantly with radiotherapy: Radiosensitising effects.

Side Effects

- Haematologic toxicities (leucopenia, neutropenia, anaemia).
- Injection site reaction (phlebitis, erythema, pain at injection site, vein discolouration, urticaria). Severity reduced when given as a 6-10 minutes injection.
- Neurotoxicity (peripheral neuropathy, paraesthesia). Usually reversible with discontinuation of therapy.
- GI toxicity (low: nausea and vomiting, constipation, diarrhoea).
- Pulmonary toxicity (dyspnoea, bronchospasm).
- Hepatotoxicity (transient LFT elevation).
- General (fatigue).

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Electronic Medical Compendium. (2016) [Online] Available from - <https://www.medicines.org.uk/emc/medicine/16029> [Accessed: 19th October 2016]
3. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a695013.html> [Accessed: 19th October 2016]
4. NIH National Cancer Institute.(2016) [Online] Available from - <https://www.cancer.gov/about-cancer/treatment/drugs/vinorelbine> [Accessed: 19th October 2016]

Zoledronic Acid - 4mg Injection

Instruction

- Route of administration: IV
- Further dilute with 100ml NS or D5W
- Patients must be adequately hydrated.
- Infuse not less than 15 minutes.
- Retreatment: 7 days after initial treatment to allow full response to initial dose.

Storage

- Store at room temperature and protect from light.

Precaution

- Use with caution in renal impairment. May need dose modification.
- Pregnancy Risk Factor: D

Drug-Drug Interaction

- Aminoglycosides, diuretics: May increase hypocalcaemic effect.
- Use cautiously with other nephrotoxic drugs.

Side Effects

- GI toxicities (nausea and vomiting, constipation, diarrhoea, abdominal pain).
- Haematologic toxicities (anaemia, neutropenia, thrombocytopenia).
- Musculoskeletal (bone, joint, muscle pain, bone fracture, osteonecrosis of jaw: avoid invasive dental procedures).
- Pulmonary toxicities (dyspnoea, coughing).
- CNS toxicities (headache, insomnia, depression, anxiety, fatigue).
- Metabolism and nutrition disorders (hypocalcaemia, hypophosphataemia, hypomagnesaemia).
- Infection (urinary tract infection).
- Fever.

References:

1. *Drug information handbook*. 24th edition. Lexicomp.
2. Medline Plus. (2016) [Online] Available from - <https://medlineplus.gov/druginfo/meds/a605023.html> [Accessed: 19th October 2016]

CHAPTER 3 - GUIDING PATIENTS TO MANAGE COMMON SIDE EFFECTS OF CANCER DRUGS

Myelosuppression

a) Infection

- Fever can be a sign of an infection. Unless the infection is treated promptly, it can become life threatening. Anti-microbials need to be initiated urgently to treat the condition.
- Good personal hygiene (e.g. good oral hygiene and regular bath) is very important to minimise risk of infection.

b) Bleeding

- Symptoms of thrombocytopenia are such as:
 - Skin changes: Bruises, petechiae (tiny, red, pinpoint spots on skin) especially arms, legs or trunk.
- Headaches (can be a symptom of internal bleeding in the brain)
- Prolonged bleeding: Bleeding from mouth (gum)/ nose/ vagina when not menstruating, heavy bleeding during menstruation, blood in stool or urine.
- Preventing Bleeding Episode:
 - Use an electric shaver, not a razor.
 - Be careful when using scissors, knives, or other sharp objects to prevent injury.
 - Wear good fitting shoes all the time to protect feet.
 - Brush teeth with a soft toothbrush. Do not use dental floss or toothpicks.
 - Do not try to strain during bowel movements. Tell doctor or pharmacist if you are having constipation.
 - Do not use suppositories and enemas.
 - Do not use tampons. Use pads.
- Consult with doctor if bleeding or bruises occurs.

Gastrointestinal Toxicities

a) Nausea and Vomiting

- Types of nausea and vomiting need to be aware of:
 - **Acute nausea and vomiting:** Some patients experience nausea and vomiting within 24 hours of receiving chemotherapy.
 - **Delayed nausea and vomiting:** Some patients develop nausea and vomiting after 24 hours of chemotherapy and this may extend to the next few days.
 - **Anticipatory nausea and vomiting:** Some patients may begin to feel ill from chemotherapy, even before their treatment begins. The sight, sound, or smell of the treatment room can trigger anticipatory nausea and vomiting.
- Coping with Nausea and Vomiting
 - Eat and drink slowly. Try having small frequent meals throughout the day instead of usual portion of breakfast, lunch, and dinner.
 - Avoid sweet, fried, or fatty foods, as well as foods with strong smell. Eating cold foods or at room temperature can help to avoid strong smells.
 - Ensure full understanding of doctor's and pharmacist's instructions on taking anti-nausea and vomiting medicines.
 - Ensure a sufficient supply of the correct drugs.
 - Consume adequate fluids. Ask doctor, pharmacist or dietician about proper nutrition during this time.
 - Do not starve for long periods, as this may make the nausea worsen.
 - Find out from doctor or pharmacist if any other medicines taken may require special precautions.
- Nausea and vomiting are side effects that can and should be managed effectively. Doctors can optimise the medication before the next round of chemotherapy.

b) Mucositis

- Some cancer drugs can cause mouth sore. Mouth sores is a serious problem because it can cause pain and infection (mucositis), making it difficult to eat, drink, and swallow. You may get ulcer over the lips region, tongue, buccal mucosa or palate.
- Preventing Mucositis:
 - Avoid salty, spicy or dry food, avoid drinks containing caffeine or alcohol.

- Eat food at room temperature rather than food served hot.
- Practice good oral hygiene to prevent infection.
- Use soft bristle toothbrush or an oral sponge (rinsing the bristles in hot water can make them even softer).
- Gargle regularly (avoid gargles that contain alcohol).
- Drink plenty of water.
- Try sipping cups of water throughout the day to avoid dry mouth.
- If wearing dentures, remove them once mouth becomes sensitive.
- Inform doctor if experience tooth or gum problem. They can refer to dentist for further management before chemotherapy starts.
- It is important to inform doctor, pharmacist or nurse when having mouth sores to manage this side effect more effectively.
- Painkillers would be prescribed by doctors if indicated.
- Obtain more dietary information from dietician to help during mouth sores.

c) Constipation

- Having fewer than three bowel movements a week (although fewer than four or five may be a reduced number for some people), this symptom can be caused by:
 - Some of the chemotherapy drugs
 - Inactivity
 - Low fluid intake
 - Low intake of dietary fiber
 - Anti-nausea medications
 - Opioid pain medications
- Avoiding Constipation
 - Eat plenty of food with high dietary fiber (breads, grains, fruits and vegetables).
 - Drink plenty of fluids.
 - Make light exercise a part of everyday schedule, e.g. walk or ride an exercise bike for 15 to 30 minutes a day.
- Inform doctor or pharmacist if no bowel movement in 2 days or are passing hard stools.
- Doctor may prescribe laxatives to prevent or treat constipation.
- A dietician will also be able to give more dietary tips to help these symptoms.

d) Diarrhoea

- It is defined as two or more loose stools per day. Diarrhoea may be caused by some types of chemotherapy. Report to doctor, pharmacist or nurse, if:
 - Diarrhoea persists, especially in large and frequent stools (more than 4 times per day).
 - Diarrhoea and cramps for more than a day.
 - Anus area is sore or bleeds.
 - Dizzy.
- Coping with diarrhoea:
 - Replace lost fluids and salts.
 - Drink plenty of fluids (at least 2 L).
 - Take oral rehydration salt (ORS).
- Consume food that is nourishing without contributing to diarrhoea
 - Clear broth (soup) or porridge such as chicken, vegetable or beef.
 - High-protein foods such as eggs (well cooked), lean meat, fish or poultry.
 - Bananas.
 - Potatoes (boiled, without the skin).
 - Oatmeal.
- Avoid foods and drinks that can make diarrhoea worse
 - Dairy products, such as milk and cheese.
 - Spicy, greasy or fried food.
 - Food that cause gas, such as broccoli and cabbage.
 - Food that are high in fiber, such as whole-wheat breads and bran cereals.
 - Beer, wine, and other drinks with alcohol in them.
 - Caffeinated drinks like cola, coffee, and black tea.
- Consult doctor or pharmacist before taking medicine for diarrhoea.
 - Obtain dietary advice to help reduce these symptoms.
- Occasionally, intravenous fluids are needed if the diarrhoea is severe or has caused dehydration. You are advised to come to the hospital immediately if you have severe diarrhoea.

Fatigue

- a) Fatigue can be due to:
 - The cancer itself /symptoms due to the disease.
 - Side effects from the treatment.
 - The emotional aspects of dealing with cancer and cancer pain.

- b) Dealing with fatigue:
 - Take several naps in a comfortable chair rather than in bed.
 - Take short walks or do some light exercise if possible.
 - Try easier or shorter versions of the activities or exercise you enjoy.
 - Ask family members or friends to help with difficult tasks.
 - Save energy for more important things.
 - Eat and drink slowly. Try having small frequent meals throughout the day instead of usual portion of breakfast, lunch, and dinner.
 - If unable to perform daily activities, even after resting or sleeping, seek for doctor's advice.

Diet

- a) Diet is an important part of cancer treatment. There are many benefits from eating well before, during, and after treatment such as:
 - Cope better with the unpleasant effect of cancer and cancer treatment.
 - Faster recovery following treatment.
 - Feels more energetic.
 - Maintain body weight.

- b) There is no special "anti-cancer" diet or chemotherapy diet. However, it is important to follow some basic rules of safe storing, cooking and handling of food.

- c) Types of food which should be avoided during chemotherapy:
 - Raw food, raw fruits (e.g. tempoyak), raw and unpasteurised honey
 - Unpasteurised milk and fresh milk product
 - Salad and cheese
 - Preserved food (e.g. salted fish, salted vegetable, "salai" meat, cincalok, belacan)
 - Raw/half cooked fungus (e.g. mushroom)
 - Half cooked food
 - Spicy food, oily food

- Carbonated drinks
- Drinking water:
 - Drink boiled water.
 - Filtered water which is not boiled should be avoided.
 - Wash the outer area of bottled water before opening
- Alcohol
 - Avoid alcohol throughout treatment period.

Exercise

- a) All patients are encouraged to slowly adopt active lifestyle. Below are the examples of light exercise that can be done:
- Walking or riding a bike for 15 to 30 minutes a day
 - Yoga
 - Tai Chi
 - Aerobic exercise
- b) Remember not to exercise beyond what can be done. Try to have a good exercise regularly to prevent muscle wasting, and maintain physical fitness.

Neuropathy

- a) Patients might experience numbness or tingling in hands and feet. Symptoms related to nerve damage include:
- Difficulty in picking up objects or buttoning clothes.
 - Problems with balance (e.g. prone to falls).
 - Difficulty in walking.
 - Hearing loss/reduced hearing.
- b) These symptoms might worsen over time. It is important to inform doctor as soon as possible if these side effects occur. Often, nerve damage takes time to recover.
- c) Take extra caution when handling hot or sharp objects. Use handrails on stairs. Take extra precaution against risk of slipping in the bathroom. Avoid using excessive force of hand movement such as opening the cover of a container.

Dermatological Toxicities

a) Hair Loss (alopecia)

- Depending on the type of drug received, hair (body hair and scalp hair) may be unaffected, thinned, or completely fall out. Hair loss may start anywhere from seven to 21 days after the first chemotherapy session. It will grow again following the completion or termination of chemotherapy, it may have a different texture or color, but these changes are usually temporary.
- Head covers such as scarves, hats and wigs may be considered.

b) Photosensitivity

- Some cancer drugs may cause photosensitivity reactions which can result in symptoms such as severe sunburn, itchy or rash. In order to protect against these reactions, there are certain precautions that can be taken:
 - Avoid unnecessary exposure to sunlight.
 - Cover up with a long-sleeved shirt, long pants or skirt and a broad-brimmed hat when going outdoor.
 - Use a broad-spectrum sunscreen (protects against both UVA and UVB) that has a sun protection factor (SPF) of at least 30.

c) Hand Foot Syndrome

- Hand Foot Syndrome (HFS) is characterised by redness and pain on the palms and soles, and occasionally on other body surfaces. It is also known as Palmar-Plantar Erythrodysesthesia (PPE). HFS can be seen with some cytotoxic chemotherapies, including capecitabine, fluorouracil and targeted therapy.
- Skin care and hygiene:
 - Clean hands, feet and skin fold areas with lukewarm water; gently dry with soft cloth.
 - Keep skin clean.
 - Avoid hot water (e.g. while bathing or when cleaning dishes).
 - Apply emollient creams or non-fragrant moisturiser to keep skin hydrated.
 - Avoid sun exposure during treatment.
 - Wear proper fitting sandals.
 - Avoid bare feet when going outdoor.
- Prevent constriction of the skin:
 - Avoid tight-fitting clothes, shoes, socks, belts and jewellery as well as harsh fabrics.
 - Avoid tight bandages, dressings or adhesive tape to the skin.

- Avoid abrasive conditions and mechanical stress:
 - Use non-rubberised protective gloves when hands come into contact with strong detergent, bleach or other chemicals.
 - Avoid activities that might cause abrasion or mechanical stress, require tight gripping (e.g. tools, musical instruments, driving) and vigorous activities (e.g. jogging, aerobics).
- Avoid leaning on bony prominences (e.g. elbows, knees):
 - Sit or lie on padded surfaces.
 - Raise legs with cushions when possible.
 - Place pillow between knees if knees feel sore.
- Maintain adequate hydration/nutrition during treatment to help prevent skin dryness/ desquamation.
- Patient need to consult doctor when:
 - Having fever (temperature $\geq 38^{\circ}$ C and/or there is redness, discharge or odour from any open areas – as this could be due to possible infection.
 - Unable to perform activities of daily living – reflects deteriorating patient status and severity of HFS.
 - Having uncontrolled pain in hands and feet.

Sexuality

- a) Cancer cannot be transmitted through sexual contact. Discuss concerns with doctor regarding sexual activity during chemotherapy. Discuss with your spouse about family planning.
- b) The side effects of chemotherapy can cause certain physical changes in men and women such as temporary or permanent sterility, depending on the drug, dosage and time of chemotherapy.
- c) It is important that you discuss these issues with your doctor before chemotherapy is started so that you understand the risks

APPENDIX: Oral Chemotherapy Administration Guide

Generic Name	Administration	Generic Name	Administration
Anagrelide (Agraylin)	Regardless	Lenalidomide (Revlimid)	Regardless
Anastrozole (Arimidex)	Regardless	Letrozole (Femara)	Regardless
Bicalutamide (Casodex)	Regardless	Lomustine (CeeNU)	Before
Busulfan (Myleran)	Regardless	Melphalan (Alkeran)	Before
Capecitabine (Xeloda)	Within 30 mins After	Mercaptopurine (Purinethol)	Before (6pm)
Chlorambucil (Leukeran)	Before	Methotrexate (Rheumatrex)	Before
Clodronate (Bonefos)	1 hr Before	Nilotinib (Tasigna)	Before
Cyclophosphamide (Cytosan)	Regardless (recommended : Morning)	Pazopanib (Votrient)	Before
Erlotinib (Tarceva)	Before	Procarbazine (Natulan)	Regardless (Recommended :After)
Etoposide (VePesid)	Before	Sorafenib (Nexavar)	Before
Everolimus (Afinitor)	Regardless	Sunitinib (Sutent)	Regardless
Exemestane (Aromasin)	Regardless (recommended : After)	Tamoxifen (Nolvadex)	Regardless
Fludarabine (Fludara)	Regardless	Tegafur & Uracil (Ufur)	Before
Flutamide (Eulexin)	Regardless	Tegafur, Gimeracil, Oteracil (TS-1)	After
Gefitinib (Iressa)	Regardless	Temozolomide (Temodar)	Before (Bedtime)
Hydroxyurea (Hydrea)	Regardless	Thalidomide (Thalomid)	Regardless (Recommended: Before bedtime)
Imatinib (Gleevec)	After	Thioguanine (Tabloid)	Before
Lapatinib (Tykerb)	Before	Tretinoin (ATRA)	After



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