Acute lymphoblastic leukaemia Ph+ maintenance therapy (imatinib prednisolone vinCRISTine)

NSW GOVERNMENT | eviQ

ID: 1411 v.5 **Under review** Essential Medicine List

Patients with leukaemia should be considered for inclusion into clinical trials. Link to ALLG website and ANZCTR website.

The anticancer drug(s) in this protocol may have been included in the ADDIKD guideline. Dose recommendations in kidney dysfunction have yet to be updated to align with the ADDIKD guideline. Recommendations will be updated once the individual protocol has been evaluated by the reference committee. For further information refer to the ADDIKD guideline. To assist with calculations, use the eviQ Estimated Glomerular Filtration Rate (eGFR) calculator.

International Consensus Guideline for Anticancer Drug Dosing in Kidney Dysfunction (ADDIKD)

2022

Click here

Related pages:

- Acute lymphoblastic leukaemia Ph+ hyper CVAD and imatinib Part A and B/maintenance overview
- Acute lymphoblastic leukaemia Ph+ hyper CVAD Part A and imatinib
- Acute lymphoblastic leukaemia Ph+ hyper CVAD Part B and imatinib

Treatment schedule - Overview

Cycle 1 and further cycles

Drug	Dose	Route	Day
Imatinib	400 mg TWICE a day	PO	1 to 28
Prednisolone	200 mg ONCE a day	PO	1 to 5
vinCRISTine	2 mg	IV infusion	1

Frequency: 28 days

Cycles: Continuous for a total of 2 years (24 months); imatinib is then continued indefinitely as a sole agent.

Notes:
In the original trial by Thomas et al.[1], maintenance treatment was interrupted with two intensifications of hyper CVAD and imatinib during months 6 and 13; it is the consensus of the Haematology Reference Committee to omit these intensifications from the eviQ protocol.

Drug status: **Imatinib** is PBS authority however it is not PBS subsidised for the dose recommended in this protocol.

All other drugs are on the PBS general schedule

Imatinib is available as **100 mg** and **400 mg** tablets
Prednisolone is available as **25 mg**, **5 mg** and **1 mg** tablets

Cost: ~ $1,080 per cycle

Treatment schedule - Detail

The supportive therapies (e.g. antiemetics, premedications, etc.), infusion times, diluents, volumes and routes of administration, if included, are listed as defaults. They may vary between institutions and can be substituted to reflect individual institutional policy.

*Antiemetics if included in the treatment schedule are based upon recommendations from national and international guidelines. These are **defaults only** and may be substituted to reflect individual institutional policy. Select here for* recommended doses of alternative antiemetics.

Cycle 1 and further cycles

Day 1		
Imatinib	400 mg (PO)	TWICE a day with food (total daily dose of 800 mg)
Prednisolone	200 mg (PO)	ONCE a day on days 1 to 5. Take in the morning with food.
vinCRISTine	2 mg (IV infusion)	in 50 mL sodium chloride 0.9% over 5 to 10 minutes via minibag

Day 2 to 5		
Imatinib	400 mg (PO)	TWICE a day with food (total daily dose of 800 mg)
Prednisolone	200 mg (PO)	ONCE a day on days 1 to 5. Take in the morning with food.

Day 6 to 28		
Imatinib	400 mg (PO)	TWICE a day with food (total daily dose of 800 mg)

Frequency: 28 days

Cycles: Continuous for a total of 2 years (24 months); imatinib is then continued indefinitely as a sole agent.

Indications and patient population

Indications:

- Philadelphia chromosome positive acute lymphoblastic leukaemia (Ph+ ALL) maintenance therapy after completion of hyper CVAD Parts A and B

Caution:

- This protocol is intended for patients 25 years of age and older; an alternate protocol should be considered for patients younger than than 25 years
- Not generally for treatment of Philadelphia chromosome negative acute lymphoblastic leukaemia, refer to:
  - Hyper CVAD Part A and B/POMP

Clinical information

Safety alert vincristine administration	For safe administration of vincristine refer to the safety alert issued by the Australian Commission on Safety and Quality in Health Care
Venous access required	IV cannula (IVC) or central venous access device (CVAD) is required to administer this treatment. Read more about central venous access device line selection
Caution with oral anti-cancer drugs	Select links for information on the safe prescribing, dispensing and administration of orally administered anti-cancer drugs. Read more about the COSA guidelines and oral anti-cancer therapy

Emetogenicity LOW/MODERATE	Although this treatment is classified as having MODERATE emetogenicity, in clinical practice, the administration of oral metoclopramide or prochlorperazine may be sufficient to control nausea. Consider metoclopramide 10 mg three times a day when necessary (maximum of 30 mg/24 hours, up to 5 days) OR Prochlorperazine 10 mg PO every 6 hours when necessary. Read more about preventing anti-cancer therapy induced nausea and vomiting
Cardiac toxicity	Imatinib has been associated with cardiac complications (i.e. left ventricular ejection fraction (LVEF) dysfunction and heart failure). For patients with pre existing cardiac disease, measure LVEF at baseline and as clinically indicated. Monitor patient for signs and symptoms of congestive heart failure. In patients with hypereosinophilic syndrome and cardiac involvement, cardiogenic shock and left ventricular dysfunction have been associated with initiation of imatinib. The condition was reported to be reversible with the administration of systemic steroids, circulatory support measures, and temporary withholding of imatinib. Read more about cardiac toxicity associated with anti-cancer drugs
Gastrointestinal toxicity	Diarrhoea is a common side effect of tyrosine kinase inhibitors (TKI) (e.g imatinib and dasatinib). If severe diarrhoea occurs, discontinue TKI until condition improves or resolves. Constipation has also been commonly reported with these regimens possibly related to the use of vinca alkaloids. Patients should be monitored closely, and prophylactic or symptom control anti-diarrhoeal/laxatives prescribed accordingly.
Hypothyroidism	Hypothyroidism has been reported in thyroidectomy patients undergoing thyroxine replacement during treatment with imatinib. Monitor for signs and symptoms of hypothyroidism in thyroidectomy patients.
Fluid retention/oedema	Patients may experience an increased incidence of fluid retention and periorbital oedema. Monitor for signs and symptoms of fluid retention and if severe fluid retention occurs treatment should be withheld until resolved. Periorbital oedema is a common side effect of imatinib which is usually mild to moderate and managed conservatively.
Efficacy of therapy	Measure efficacy of therapy using a standardised RT-PCR assay for BCR-ABL transcripts. Assess after the first cycle, at 2 to 4 month intervals while on hyper CVAD, and at 4 to 6 month intervals thereafter. Alternate therapies should be considered for patients who do not achieve a major molecular remission (defined as BCR-ABL less than 0.1% in the marrow) by 3 months and for those who lose their initial response on serial monitoring.
Corticosteroids	Diabetic patients should monitor their blood glucose levels closely. To minimise gastric irritation, advise patient to take immediately after food. Consider the use of a H2 antagonist or proton pump inhibitor if appropriate. Read more about acute short term effects from corticosteroids
Peripheral neuropathy	Assess prior to each treatment. Based on clinical findings, temporary omission, dose reduction or cessation of the vinca alkaloid may be indicated; review by medical officer before commencing treatment. Read more about peripheral neuropathy Link to chemotherapy-induced peripheral neuropathy screening tool
Pneumocystis jirovecii pneumonia (PJP) prophylaxis	PJP prophylaxis is recommended e.g. trimethoprim/sulfamethoxazole 160/800 mg PO one tablet twice daily, twice weekly (e.g. on Mondays and Thursdays) OR one tablet three times weekly (e.g. on Mondays, Wednesdays and Fridays). Read more about prophylaxis of pneumocystis jiroveci (carinii) in cancer patients
Antifungals and antivirals	There are no specific recommendations for the use of antifungal or antiviral prophylaxis with this treatment. The use of prophylaxis should be at the discretion of the treating clinician and based on patient risk factors and local guidelines. Read more about antifungal and antiviral prophylaxis

Blood tests	FBC, EUC, eGFR, LFTs, LDH, calcium, magnesium, phosphate, TSH and BSL at baseline. Consider weekly FBC for the first month of maintenance treatment. Repeat FBC prior to each cycle and EUC, eGFR, LFTs, LDH, calcium, magnesium, phosphate, TSH and BSL regularly throughout treatment as clinically indicated.
Hepatitis B screening and prophylaxis	Routine screening for HBsAg and anti-HBc is recommended prior to initiation of treatment. Prophylaxis should be determined according to individual institutional policy. Read more about hepatitis B screening and prophylaxis in cancer patients requiring cytotoxic and/or immunosuppressive therapy
Vaccinations	Live vaccines are contraindicated in cancer patients receiving immunosuppressive therapy and/or who have poorly controlled malignant disease. Refer to the recommended schedule of vaccination for immunocompromised patients, as outlined in the Australian Immunisation Handbook. Read more about COVID-19 vaccines and cancer.
Fertility, pregnancy and lactation	Cancer treatment can have harmful effects on fertility and this should be discussed with all patients of reproductive potential prior to commencing treatment. There is a risk of foetal harm in pregnant women. A pregnancy test should be considered prior to initiating treatment in females of reproductive potential if sexually active. Pregnancy must be avoided while a female patient is on tyrosine kinase inhibitor (TKI) therapy. There are very few reports of pregnancy outcomes in partners of men receiving second or third-generation TKIs. Although the majority of infants fathered by men taking dasatinib were reported to be without congenital disabilities at birth, the general advice is for couples to avoid pregnancy (Carlier et al., 2017; Cortes et al., 2015). The safety of these drugs has not been proven, and therefore, pregnancy should be avoided. Effective contraception methods and adequate contraception timeframes should be discussed with all patients of reproductive potential. Possibility of infant risk should be discussed with breastfeeding patients. Read more about the effect of cancer treatment on fertility. Link to Carlier et al. and Cortes et al. references.

Dose modifications

Evidence for dose modifications is limited, and the recommendations made on eviQ are intended as a guide only. They are generally conservative with an emphasis on safety. Any dose modification should be based on clinical judgement, and the individual patient's situation including but not limited to treatment intent (curative vs palliative), the anti-cancer regimen (single versus combination therapy versus chemotherapy versus immunotherapy), biology of the cancer (site, size, mutations, metastases), other treatment related side effects, additional co-morbidities, performance status and patient preferences.Suggested dose modifications are based on clinical trial findings, product information, published guidelines and reference committee consensus . The dose reduction applies to each individual dose and not to the total number of days or duration of treatment cycle unless stated otherwise. Non-haematological gradings are based on Common Terminology Criteria for Adverse Events (CTCAE) unless otherwise specified. Renal and hepatic dose modifications have been standardised where possible. For more information see dosing considerations & disclaimer .

Note:

- All dose reductions are calculated as a percentage of the starting dose
- All imatinib dose modifications are taken directly from the imatinib product information and should be considered at the discretion of the treating Haematologist

Haematological toxicity
Prolonged haematological toxicity in the absence of bone marrow involvement may require a dose reduction at the discretion of the Haematologist

Renal impairment
Imatinib and its metabolites are not significantly excreted via the kidney, therefore a decrease in free drug clearance is not expected in renal insufficiency. The product information does however recommend that patients with mild, moderate or severe renal dysfunction start with a reduced daily dose of 400 mg

Hepatic impairment
If severe hepatotoxicity develops, attributable to imatinib, withhold imatinib until resolution then it may be resumed at a reduced daily dose. It is recommended that the daily dose is reduced from 800 mg to 600 mg or from 600 mg to 400 mg or from 400 mg to 300 mg

Peripheral neuropathy	
Grade 2 which is present at the start of the next cycle	Reduce vincristine by 50%
Grade 3 or Grade 4	Omit vincristine

Interactions

Drug interactions in eviQ protocols are under review and being updated to align with current literature. Further site-wide updates and changes will occur in due course. *References & Disclaimer*

The drug interactions shown below are not an exhaustive list. For a more comprehensive list and for detailed information on specific drug interactions and clinical management, please refer to the specific drug product information and the following key resources:

- *MIMS - interactions tab (includes link to a CYP-450 table) (login required)*
- *Australian Medicines Handbook (AMH) – interactions tab (login required)*
- *Micromedex Drug Interactions (login required)*
- *Cancer Drug Interactions*
- *Cytochrome P450 Drug Interactions*

Imatinib

	Interaction	Clinical management
Gemfibrozil	Increased toxicity OR reduced efficacy of imatinib possible due to inhibition of CYP2C8-mediated metabolism of imatinib OR reduced imatinib absorption and impaired CYP2C8-mediated conversion of imatinib to its active metabolite by gemfibrozil	Avoid combination Caution advised if other CYP2C8 inhibitors are to be used (e.g. trimethoprim, glitazones, montelukast etc.)
CYP3A4 inhibitors (e.g. aprepitant, azole antifungals, clarithromycin, erythromycin, grapefruit juice, ritonavir etc.)	Increased toxicity of imatinib possible due to reduced clearance	Monitor for imatinib toxicity
CYP3A4 inducers (e.g. carbamazepine, phenytoin, phenobarbitone, rifampicin, St John's wort etc.)	Reduced efficacy of imatinib possible due to increased clearance	Avoid combination or monitor for decreased clinical response to imatinib
Drugs metabolised by CYP3A4 (e.g. atorvastatin, benzodiazepines, calcineurin inhibitors, clarithromycin, dihydroergotamine, simvastatin, etc.)	Increased effect/toxicity of these drugs possible due to inhibition of CYP3A4 by imatinib resulting in reduced clearance	Avoid combination or monitor for increased effect/toxicity of interacting drugs
Levothyroxine (thyroxine, Oroxine®, Eutroxsig®)	Reduced efficacy of thyroid replacement therapy resulting in hypothyroid symptoms; possibly due to induction of levothyroxine metabolism by imatinib and subsequent TSH elevation	Monitor closely for signs and symptoms of hypothyroidism, serum thyroxine and TSH levels; increase levothyroxine dose if needed
Paracetamol	Risk of liver toxicity due to inhibition of metabolism of paracetamol by imatinib	Avoid combination or monitor liver function closely

Prednisolone		
	Interaction	**Clinical management**
Antidiabetic agents (e.g. insulin, glibenclamide, glicazide, metformin, pioglitazone, etc)	The efficacy of antidiabetic agents may be decreased	Use with caution and monitor blood glucose
Azole antifungals (e.g. fluconazole, itraconazole, ketoconazole, posaconazole)	Increased toxicity of prednisolone possible due to reduced clearance	Avoid combination or monitor for prednisolone toxicity
Oestrogens (e.g. oral contraceptives)	Increased toxicity of prednisolone possible due to reduced clearance	Avoid combination or monitor for prednisolone toxicity. Dose reduction of prednisolone may be required
Ritonavir	Increased toxicity of prednisolone possible due to reduced clearance	Avoid combination or monitor for prednisolone toxicity

Vincristine		
	Interaction	**Clinical management**
CYP3A4 and P-gp inhibitors (e.g. amiodarone, aprepitant, azole-antifungals, ritonavir, lapatinib, nilotinib, sorafenib, macrolides, ciclosporin, grapefruit juice etc.)	Increased toxicity of vincristine possible due to reduced clearance	Monitor for vincristine toxicity (esp. neurotoxicity, paralytic ileus)
CYP3A4 inducers (e.g. carbamazepine, phenytoin, phenobarbitone, rifampicin, St John's wort etc.)	Reduced efficacy of vincristine possible due to increased clearance	Monitor for decreased clinical response to vincristine
Mitomycin	Acute shortness of breath and severe bronchospasm has occurred following use of vincristine in patients who had received mitomycin simultaneously or within 2 weeks	Use combination with caution
Ototoxic drugs (e.g. cisplatin, aminoglycosides, frusemide, NSAIDs)	Additive ototoxicity	Avoid combination or perform regular audiometric testing

General		
	Interaction	**Clinical management**
Warfarin	Anti-cancer drugs may alter the anticoagulant effect of warfarin.	Monitor INR regularly and adjust warfarin dosage as appropriate; consider alternative anticoagulant.
Direct oral anticoagulants (DOACs) e.g. apixaban, rivaroxaban, dabigatran	Interaction with both CYP3A4 and P-gp inhibitors /inducers. DOAC and anti-cancer drug levels may both be altered, possibly leading to loss of efficacy or toxicity (i.e. increased bleeding).	Apixaban: avoid concurrent use with strong CYP3A4 and P-gp inhibitors. If treating VTE, avoid use with strong CYP3A4 and P-gp inducers. Rivaroxaban: avoid concurrent use with strong CYP3A4 and P-gp inhibitors. Dabigatran: avoid combination with strong P-gp inducers and inhibitors. If concurrent use is unavoidable, monitor closely for efficacy/toxicity of both drugs.
Digoxin	Anti-cancer drugs can damage the lining of the intestine; affecting the absorption of digoxin.	Monitor digoxin serum levels; adjust digoxin dosage as appropriate.
Antiepileptics	Both altered antiepileptic and anti-cancer drug levels may occur, possibly leading to loss of efficacy or toxicity.	Where concurrent use of an enzyme-inducing antiepileptic cannot be avoided, monitor antiepileptic serum levels for toxicity, as well as seizure frequency for efficacy; adjust dosage as appropriate. Also monitor closely for efficacy of the anti-cancer therapy.
Antiplatelet agents and NSAIDs	Increased risk of bleeding due to treatment related thrombocytopenia.	Avoid or minimise combination. If combination deemed essential, (e.g. low dose aspirin for ischaemic heart disease) monitor for signs of bleeding.
Serotonergic drugs, including selective serotonin reuptake inhibitors (SSRIs e.g. paroxetine) and serotonin noradrenaline reuptake inhibitors (SNRIs e.g. venlafaxine)	Increased risk of serotonin syndrome with concurrent use of 5-HT3 receptor antagonists (e.g. palonosetron, ondansetron, granisetron, tropisetron, dolasetron, etc.)	Avoid combination. If combination is clinically warranted, monitor for signs and symptoms of serotonin syndrome (e.g. confusion, agitation, tachycardia, hyperreflexia). For more information link to TGA Medicines Safety Update
Vaccines	Diminished response to vaccines and increased risk of infection with live vaccines.	Live vaccines (e.g. BCG, MMR, zoster and varicella) are contraindicated in patients on immunosuppressive therapy. Use with caution in patients on non-immunosuppressive therapy. For more information; refer to the recommended schedule of vaccination for cancer patients, as outlined in the Australian Immunisation Handbook

Administration

eviQ provides safe and effective instructions on how to administer cancer treatments. However, eviQ does not provide every treatment delivery option, and is unable to provide a comprehensive list of cancer treatment agents and their required IV line giving set/filter. There may be alternative methods of treatment administration, and alternative supportive treatments that are also appropriate. Please refer to the individual

product information monographs via the TGA website for further information.

Day 1

Approximate treatment time: 30 minutes

Safe handling and waste management

Safe administration

General patient assessment prior to each day of treatment.

Peripheral neuropathy assessment tool

Any toxicity grade 2 or greater may require dose reduction, delay or omission of treatment and review by medical officer before commencing treatment.

Prime IV line(s).

Insert IV cannula or access TIVAD or CVAD.

- baseline weight
- baseline urinalysis

Pre treatment medication

Verify antiemetics taken or administer as prescribed.

Treatment - Time out

Imatinib

- administer orally TWICE a day on **days 1 to 28**
- to be swallowed whole; do not break, crush or chew
  to be taken with a large glass of water and food to minimise GI irritation
- if difficulty is experienced swallowing the tablet advise patient to
  - place tablets in a glass of water or apple juice (using ~50 mL for 100 mg tablet, ~200 mL for 400 mg tablet)
  - stir until tablet dissolves
  - to drink straight away
  - to rinse glass and drink this too

Note: missed doses should not be replaced, if a dose is forgotten or vomited, normal dosing should be resumed at the next scheduled dose.

Prednisolone

- administer orally ONCE a day on **days 1 to 5**
- to be taken in the morning with or immediately after food

Note: if a dose is forgotten or vomited, contact treating team.

Chemotherapy - Time out

Vincristine

Administer vincristine (vesicant)

- via a minibag over 5 to 10 minutes
- ensure vein is patent and monitor for signs of extravasation throughout administration
- flush with ~150 mL of sodium chloride 0.9%.

Remove IV cannula and/or deaccess TIVAD or CVAD.

Continue safe handling precautions until 7 days after completion of drug(s)

Day 2 to 5

This is an oral treatment

Safe handling and waste management

Safe administration

General patient assessment prior to each treatment.

Any toxicity grade 2 or greater may require dose reduction, delay or omission of treatment and review by medical officer before recommencing treatment.

- weigh patient on each visit

Pre treatment medication

Verify antiemetics taken or administer as prescribed.

Treatment - Time out

Imatinib

- administer orally TWICE a day on **days 1 to 28**
- to be swallowed whole; do not break, crush or chew
  to be taken with a large glass of water and food to minimise GI irritation
- if difficulty is experienced swallowing the tablet advise patient to
  - place tablets in a glass of water or apple juice (using ~50 mL for 100 mg tablet, ~200 mL for 400 mg tablet)
  - stir until tablet dissolves
  - to drink straight away
  - to rinse glass and drink this too

Note: missed doses should not be replaced, if a dose is forgotten or vomited, normal dosing should be resumed at the next scheduled dose.

Prednisolone

- administer orally ONCE a day on **days 1 to 5**
- to be taken in the morning with or immediately after food

Note: if a dose is forgotten or vomited, contact treating team.

Continue safe handling precautions until 7 days after completion of drug(s)

Day 6 to 28

This is an oral treatment

Safe handling and waste management

Safe administration

General patient assessment prior to each treatment.

Any toxicity grade 2 or greater may require dose reduction, delay or omission of treatment and review by medical officer before recommencing treatment.

- weigh patient on each visit

Treatment - Time out

Imatinib

- administer orally TWICE a day on **days 1 to 28**
- to be swallowed whole; do not break, crush or chew
  to be taken with a large glass of water and food to minimise GI irritation
- if difficulty is experienced swallowing the tablet advise patient to
  - place tablets in a glass of water or apple juice (using ~50 mL for 100 mg tablet, ~200 mL for 400 mg tablet)
  - stir until tablet dissolves
  - to drink straight away
  - to rinse glass and drink this too

Note: missed doses should not be replaced, if a dose is forgotten or vomited, normal dosing should be resumed at the next scheduled dose.

Continue safe handling precautions until 7 days after completion of drug(s)

Discharge information

Imatinib tablets

- With written instructions on how to take them .
- Advise patients to weigh themselves regularly and to report any increase by more than 1 to 2 kg in a week.

Prednisolone tablets

- Prednisolone tablets with written instructions on how to take them.

Laxatives

- Ensure patient has prophylactic laxatives.

Prophylaxis medications

- Prophylaxis medications (if prescribed) e.g. PJP prophylaxis, antifungals, antivirals.

Patient information

- Ensure patient receives patient information sheet.

Side effects

The side effects listed below are not a complete list of all possible side effects for this treatment. Side effects are categorised into the approximate onset of presentation and should only be used as a guide.

Immediate (onset hours to days)	
Extravasation, tissue or vein injury	The unintentional instillation or leakage of a drug or substance out of a blood vessel into surrounding tissue. This has the potential to cause damage to affected tissue. Read more about extravasation management
Nausea and vomiting	Read more about prevention of treatment induced nausea and vomiting
Taste and smell alteration	Read more about taste and smell changes

Early (onset days to weeks)	
Neutropenia	Abnormally low levels of neutrophils in the blood. This increases the risk of infection. Any fever or suspicion of infection should be investigated immediately and managed aggressively. Read more about immediate management of neutropenic fever
Thrombocytopenia	A reduction in the normal levels of functional platelets, increasing the risk of abnormal bleeding. Read more about thrombocytopenia
Abdominal pain	Dull ache, cramping or sharp pains are common with some anti-cancer drugs. These are caused by either increased or decreased gastrointestinal motility and can be associated with diarrhoea or constipation.
Cardiotoxicity	Cardiotoxicity may manifest as asymptomatic reduction in left ventricular ejection fraction (LVEF), arrhythmia, cardiomyopathy, hypertension, cardiac ischaemia and congestive heart failure (CHF). The risk of cardiotoxicity is increased by a number of factors, particularly a history of heart disease and electrolyte imbalances. Read more about cardiotoxicity associated with anti-cancer drugs
Constipation	
Diarrhoea	Read more about treatment induced diarrhoea
Fatigue	Read more about fatigue
Fluid retention and oedema	An excess amount of fluid around the cells, tissues or serous cavities of the body, leading to swelling.
Hepatotoxicity	Anti-cancer drugs administered either alone or in combination with other drugs and/or radiation may cause direct or indirect hepatotoxicity. Hepatic dysfunction can alter the metabolism of some drugs resulting in systemic toxicity.
Oral mucositis	Erythematous and ulcerative lesions of the gastrointestinal tract (GIT). It commonly develops following chemotherapy, radiation therapy to the head, neck or oesophagus, and high dose chemotherapy followed by a blood and marrow transplant (BMT). Read more about oral mucositis
Side effects of corticosteroids	Insomnia, oedema, increased risk of infection e.g. oral thrush, gastric irritation, worsening of peptic ulcer disease, increased blood sugar levels, loss of diabetic control, mood and behavioural changes - including anxiety, euphoria, depression, mood swings, increased appetite and weight gain, osteoporosis and fractures (long term use), bruising and skin fragility are associated with corticosteroid use.
Skin rash	Anti-cancer drugs can cause a number of changes in the skin with maculo-papular rash the most common type of drug-induced skin reaction. Read more about skin rash
Peripheral neuropathy	Typically symmetrical sensory neuropathy, affecting the fingers and toes, sometimes progressing to the hands and feet. It is associated with several classes of anti-cancer drugs. These include taxanes, platinum-based compounds, vinca alkaloids and some drugs used to treat multiple myeloma. Read more about peripheral neuropathy
Photosensitivity	Increased sensitivity to ultraviolet (UV) light resulting in an exaggerated sunburn-like reaction accompanied by stinging sensations and urticaria.

Late (onset weeks to months)	
Anaemia	Abnormally low levels of red blood cells (RBCs) or haemoglobin in the blood. Read more about anaemia
Alopecia - partial	Hair thinning and/or patchy hair loss. Patients can also experience mild to moderate discomfort of the hair follicles, and rarely pain as the hair is falling out. Read more about alopecia and scalp cooling
Cognitive changes (chemo fog)	Changes in cognition characterised by memory loss, forgetfulness and feeling vague. This is also referred to as 'chemo brain' or 'chemo fog'. Read more about cognitive changes (chemo fog)
Periorbital oedema	Accumulation of fluid in the tissue surrounding the eye sockets (orbits).

Evidence

Evidence

Philadelphia positive acute lymphoblastic leukaemia (Ph+ ALL) has historically responded poorly to induction chemotherapy regimens with lower complete response (CR) rates than Philadelphia negative (Ph-) ALL, and a median overall survival (OS) of 8 months.[2] The addition of imatinib to standard protocols has demonstrated efficacy compared to historical controls; however, dosing strategies vary. This review will summarise the data from recent trials and provide a recommendation for the optimal dosing strategy of imatinib in combination with hyper CVAD in patients deemed able to tolerate intensive induction chemotherapy.

More than 800 patients have been enrolled in multiple trials examining the use of imatinib in ALL. Studies by Yanada et al.,[3] de Labarathe et al.,[4] Thomas et al.,[1] Bassan et al.,[5] Wassman et al.,[6] Chalandon et al.[7] and Lim et al.[8] all demonstrated CR rates of 90 to 95%. These protocols used a variety of imatinib dosing schedules allied to various chemotherapy regimens during the induction, consolidation and maintenance phases.

Efficacy

Yanada et al. reported on 80 patients receiving a Japan Adult Leukemia Study Group (JALSG) protocol using imatinib 600 mg from day 8 to day 63 in combination with chemotherapy as induction, with consolidation consisting of alternating imatinib and chemotherapy followed by vincristine, prednisone and imatinib 600 mg for up to 2 years.[3] The final analysis of the JALSG study included 99 patients with a CR of 97% and a 5-year OS and disease-free survival (DFS) of 50 and 43%, respectively.[9] Wassman et al. examined imatinib in doses from 400 to 600 mg using a variation of the GMALL protocol.[6] The French GRAAPH-2005 study[7] achieved a CR rate of 98% in the arm randomised to imatinib/prednisone/doxorubicin compared to 91% in those receiving imatinib with a hyper CVAD Part A cycle. Induction deaths were lower with less intensive therapy, but 5-year OS and DFS rates were similar, indicating that tyrosine kinase inhibition may allow a reduction in the intensity of chemotherapy.

Thomas et al. at MD Anderson demonstrated a 75% OS at 2 years using imatinib at a dose of 400 mg on days 1 to 14 of each cycle of hyper CVAD followed by 600 mg for 13 months.[1] Only 20 patients were enrolled in the trial. A final report was published in 2015 describing an expanded cohort of 54 patients untreated or minimally treated (age 17-84, median 51 years) who received the protocol with the final modified version of imatinib 600 mg days 1 to 14 of induction cycle 1, then 600 mg continuously with courses 2 to 8, followed by escalation to imatinib 800 mg as tolerated during 24 months of maintenance therapy with monthly vincristine and prednisone interrupted by 2 intensifications with hyper CVAD and imatinib, then imatinib indefinitely.[10] Allogeneic stem cell transplant was performed in CR1 where feasible at the treating clinician's discretion. 5-year DFS rates were 63% vs 43% with or without haematopoietic stem cell transplant (HSCT), respectively. Minimal residual disease (MRD) monitoring was with quantitative reverse transcription polymerase chain reaction (RT-PCR) on bone marrow samples. These were obtained after the first cycle, at 2-4 month intervals while on hyper CVAD, and at 4-6 month intervals, thereafter. Patients who had not achieved a major molecular response (MMR; defined as BCR-ABL < 0.1% in the marrow) had an inferior 5-year DFS compared to those who achieved at least this depth of response (60% vs. 25%).

Imatinib dose intensity was investigated by Lim et al.,[8] who used continuous imatinib at a dose of 600 mg commencing day 8 of induction then followed through five courses of consolidation or allogeneic HSCT (age 16-71, median 41 years). Although, the hyper CVAD chemotherapy backbone was not included. Patients who were not transplanted were maintained on imatinib for two years. Among the 82 patients in CR, the 5-year cumulative incidence of relapse and OS rates were 59% and 52%, respectively. The group analysed patients based on initial imatinib dose intensity (IDI), calculated by dividing the total administered dose of imatinib over the first eight weeks of induction by the intended dose of imatinib for the eight weeks. An IDI > 90% compared to < 90% was associated with a median 5-year relapse-free survival (RFS) and OS of 70 months versus 14 months and 39 months versus 17 months, respectively. This suggests maintaining imatinib dose intensity > 90% during the early phase of treatment was an

important factor in longer remission-free period and improved survival.

Notable differences to the current eviQ Ph- ALL hyper CVAD protocol include omission of methotrexate in the POMP maintenance schedule and intensification with hyper CVAD and imatinib at months 6 and 13 in 2004 schedule (details not published) (or 6 and 13 in the R-hyper CVAD protocol[11]).

Toxicity

Toxicities with hyper CVAD and imatinib were similar to toxicities experienced with hyper CVAD only.

Table 1: Toxicities of hyper CVAD and imatinib mesylate in 91 postinduction courses[1]

Table 3. Toxicities of hyper-CVAD and imatinib mesylate in 91 postinduction courses

Parameter	No. (%)*	
	Grades 1-2	Grades 3-4
Infections (overall)†	—	23 (25)
FUO	—	7 (8)
Pneumonia	—	6 (7)
Bacterial	—	3 (3)
Atypical	—	2 (2)
Fungal/presumed fungal	—	1 (1)
Sepsis	—	9 (10)
GNR bacteremia	—	5 (5)
Catheter-related bacteremia	—	4 (4)
Other	—	8 (9)
Sinusitis	—	3 (3)
Osteomyelitis	—	2 (2)
Herpes zoster	—	2 (2)
Upper respiratory infections (RSV)	—	1 (1)
Cardiovascular		
Fluid retention	5 (25)	1 (5)
Arrythmia (supraventricular)	2 (10)	2 (10)
Deep venous thrombosis	—	2 (10)
Syncope	—	2 (10)
Reduction in ejection fraction	2 (10)	—
Hepatic		
Increase in bilirubin	5 (25)	—
Increase in transaminases	5 (25)	—
Neuromuscular		
Fatigue	6 (30)	2 (10)
Peripheral neuropathy	6 (30)	1 (5)
Headaches (postlumbar puncture)	2 (10)	2 (10)
Bone pain	3 (15)	—
Myalgias	2 (10)	—
Fracture (femur/vertebral)	—	2 (10)
Gastrointestinal		
Stomatitis	5 (25)	—
Constipation	4 (20)	1 (5)
Diarrhea	2 (10)	2 (10)
Nausea	2 (10)	1 (5)
Reflux	1 (5)	2 (10)
Ileus	—	1 (5)
Coagulopathy		
Hypofibrinogenemia	2 (10)	1 (5)
Hemorrhage		
Gastrointestinal	—	1 (5)
Skin		
Rash	2 (10)	—
Renal		
Increase in creatinine	5 (25)	—
Hyponatremia	—	1 (5)

GNR indicates gram-negative rod; —, not applicable.

*Incidence of infections episodes/courses; all other toxicities according to occurrence by patient since usually intermittent in nature (no. at risk = 20).

†Refer to Table 2 for infections specific for induction (course 1).

© Blood 2004

Notable toxicities reported in the final report on the extended cohort include the following:[11]

Description	Prevalence (%)
Infections in induction	52
Infections in consolidation	70
Hyperglycaemia	43
Hypophosphataemia	59
DVT	7

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11 Thomas, D. A., S. O'Brien, S. Faderl, et al. 2010. "Chemoimmunotherapy with a modified hyper-CVAD and rituximab regimen improves outcome in de novo Philadelphia chromosome-negative precursor B-lineage acute lymphoblastic leukemia." J Clin Oncol 28(24):3880-3889.

History

Version 5

Date	Summary of changes
04/05/2012	New protocol taken to Haematology Reference Committee meeting.
24/01/2013	Approved and published on eviQ.
01/08/2014	Protocol reviewed by email survey. Added link to ALLG and ANZCTR with statement 'Patients with ALL should be considered for inclusion into clinical trials'. Next review in 2 years.
20/05/2016	Reviewed at the Haematology Reference Committee meeting: • phosphate levels included in the blood test clinical information block • efficacy of therapy clinical information block added • evidence updated.
31/05/2017	Transferred to new eviQ website. Version number change to v.4. Other changes include: • diluent volume of vincristine changed from ‘50 to 100 mL’ to ‘50 mL’ as per Australian Injectable Handbook

Date	Summary of changes
	Sixth Edition.
21/09/2018	Protocol reviewed by the Haematology Reference Committee with the following changes: • dose modifications updated • wording adjusted for CYP 3A4 inhibitor and imatinib interaction • evidence reviewed and updated • constipation clinical information block replaced with gastrointestinal toxicity block • version change to v.5.
23/10/2020	Protocol reviewed electronically by Haematology Reference Committee, no changes. Review in 2 years.
21/01/2022	Blood tests updated in clinical information.
25/07/2023	• Updated fertility information • Reformatted evidence section • Added "Extravasation, tissue or vein injury" to side effects.

The information contained in this protocol is based on the highest level of available evidence and consensus of the eviQ reference committee regarding their views of currently accepted approaches to treatment. Any clinician (medical oncologist, haematologist, radiation oncologist, medical physicist, radiation therapist, pharmacist or nurse) seeking to apply or consult this protocol is expected to use independent clinical judgement in the context of individual clinical circumstances to determine any patient's care or treatment. While eviQ endeavours to link to reliable sources that provide accurate information, eviQ and the Cancer Institute NSW do not endorse or accept responsibility for the accuracy, currency, reliability or correctness of the content of linked external information sources. Use is subject to eviQ's disclaimer available at www.eviQ.org.au

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First approved: 23 January 2013
Last reviewed: 23 October 2020
Review due: 31 December 2022

The currency of this information is guaranteed only up until the date of printing, for any updates please check:
https://www.eviq.org.au/p/1411
31 Jul 2023

Patient information - Acute lymphoblastic leukaemia (ALL) - maintenance therapy (imatinib, prednisolone and vincristine)

Patient's name:

Your treatment

The treatment schedule below explains how the drugs for this treatment are given.

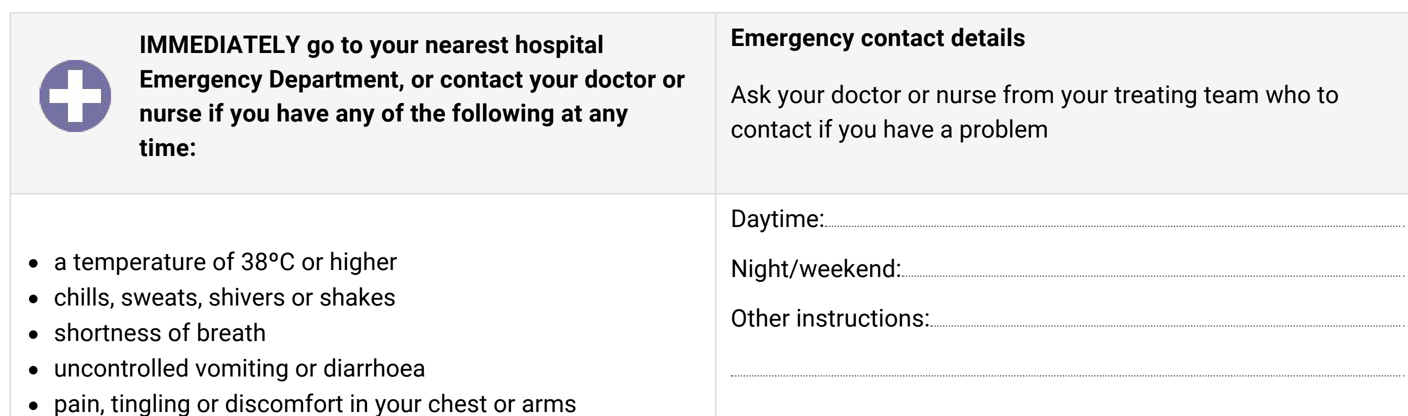
Maintenance therapy (imatinib, prednisolone and vincristine)			
This treatment is started after you have finished treatment with the Ph+ Hyper CVAD and imatinib protocols. This treatment cycle is repeated every 28 days and is ongoing for up to 2 years, imatinib will then be continued as a single agent indefinitely.			
Day	**Treatment**	**How it is given**	**How long it takes**
1 to 28	**Imatinib** (*im-AT-in-ib*)	Take orally TWICE a day with food and a large glass of water. Tablet(s) should be swallowed whole. If you are unable to swallow the tablets whole they may be dissolved in water and the solution swallowed (see directions in *Other information about your treatment*).	
1 to 5	**Prednisolone** (*pred-NIS-oh-lone*)	Take orally ONCE in the morning with food on days 1 to 5.	
1	**Vincristine** (*vin-KRIS-teen*)	By a drip into a vein	About 10 minutes

Missed doses:

- **Imatinib**: if you forget to take a tablet or vomit a tablet, take your normal dose the next time it is due. Do not take an extra dose.
- **Prednisolone:** if you forget to take your tablets or vomit your tablets, contact your treating team.

When to get help

Anticancer drugs (drugs used to treat cancer) can sometimes cause serious problems. It is important to get medical help immediately if you become unwell.



IMMEDIATELY go to your nearest hospital Emergency Department, or contact your doctor or nurse if you have any of the following at any time:	**Emergency contact details** Ask your doctor or nurse from your treating team who to contact if you have a problem
- a temperature of 38°C or higher - chills, sweats, shivers or shakes - shortness of breath - uncontrolled vomiting or diarrhoea - pain, tingling or discomfort in your chest or arms	Daytime: Night/weekend: Other instructions:

- you become unwell.

During your treatment immediately tell the doctor or nurse looking after you if you get any of the following problems:

- leaking from the area where the drugs are being given
- pain, stinging, swelling or redness in the area where the drugs are being given or at any injection sites
- a skin rash, itching, feeling short of breath, wheezing, fever, shivers, or feeling dizzy or unwell in any way (allergic reaction).

Other information about your treatment

Changes to your dose or treatment delays

Sometimes a treatment may be started at a lower dose or the dose needs to be changed during treatment. There may also be times when your treatment is delayed. This can happen if your doctor thinks you are likely to have severe side effects, if you get severe side effects, if your blood counts are affected and causing delays in treatment, or if you are finding it hard to cope with the treatment. This is called a dose reduction, dose change or treatment delay. Your doctor will explain if you need any changes or delays to your treatment and the reason why.

Blood tests and monitoring

Anti-cancer drugs can reduce the number of blood cells in your body. You will need to have regular blood tests to check that your blood cell count has returned to normal. If your blood count is low, your treatment may be delayed until it has returned to normal. Your doctor or nurse will tell you when to have these blood tests.

Central venous access devices (CVADs)

This treatment may involve having chemotherapy through a central venous access device (CVAD). Your doctor or nurse will explain this to you. For more information, see the eviQ patient information sheets on CVADs.

Other medications given during this treatment

- **Anti-sickness (anti-nausea) medication:** you may be given some anti-sickness medication. Make sure you take this medication as your doctor or nurse tells you, even if you don't feel sick. This can help to prevent the sickness starting.

- **Laxatives:** you may be given some medication to prevent or treat constipation. Your doctor or nurse will tell you how and when to take the laxatives.

- **Prophylaxis medication:** you may need to take some medications to prevent infection and to help prevent or reduce some of the side effects of the chemotherapy. Your doctor or nurse will tell you how and when to take these medications.

Instructions for dissolving imatinib tablets:

- Imatinib tablets should not be crushed, cut or chewed. For patients with swallowing difficulties imatinib tablets can be dissolved.
- You (or whoever is dissolving the tablets) should wear disposable gloves and try to minimise touching the tablets.
- Place the imatinib tablet(s) in a glass of water or apple juice (using approximately 50 mL for 100 mg tablet and approximately 200mL for 400mg tablet).
- Stir until tablet dissolves.
- Drink straight away.
- Rinse glass and drink this too.

Side effects

Cancer treatments can cause damage to normal cells in your body, which can cause side effects. Everyone gets different side effects, and some people will have more problems than others.

The table below shows some of the side effects you may get with this treatment. You are unlikely to get all of those listed and you may also get some side effects that have not been listed.

Tell your doctor or nurse about any side effects that worry you. Follow the instructions below and those given to you by your doctor

or nurse.

Immediate (onset hours to days)	
Pain or swelling at injection site (extravasation)	• This treatment can cause serious injury if it leaks from the area where it is going into the vein. • This can cause pain, stinging, swelling or redness at or near the site where the drug enters the vein. • If not treated correctly, you may get blistering and ulceration. • **Tell your doctor or nurse immediately if you get any of the symptoms listed above during or after treatment.**
Nausea and vomiting	• You may feel sick (nausea) or be sick (vomit). • Take your anti-sickness medication as directed even if you don't feel sick. • Drink plenty of fluids (unless you are fluid restricted). • Eat small meals more frequently. • Try food that does not require much preparation. • Try bland foods like dry biscuits or toast. • Gentle exercise may help with nausea. • Ask your doctor or nurse for eviQ patient information - Nausea and vomiting during cancer treatment. • **Tell your doctor or nurse immediately, or go to the nearest hospital Emergency Department if you have uncontrolled vomiting or feel dizzy or light-headed.**
Taste and smell changes	• You may find that food loses its taste or tastes different. • These changes are likely to go away with time. • Do your mouth care regularly. • Chew on sugar-free gum or eat sugar-free mints. • Add flavour to your food with sauces and herbs. • Ask your doctor or nurse for eviQ patient information - Taste and smell changes during cancer treatment.

Early (onset days to weeks)	

Infection risk (neutropenia)	• This treatment lowers the amount of white blood cells in your body. The type of white blood cells that help to fight infection are called neutrophils. Having low level of neutrophils is called neutropenia. If you have neutropenia, you are at greater risk of getting an infection. It also means that your body can't fight infections as well as usual. This is a serious side effect, and can be life threatening.
	• Wash your hands often.
	• Keep a thermometer at home and take your temperature regularly, and if you feel unwell.
	• Do your mouth care regularly.
	• Inspect your central line site (if you have one) daily for any redness, pus or swelling.
	• Limit contact with people who are sick.
	• Learn how to recognise the signs of infection.
	• Ask your doctor or nurse for eviQ patient information - Infection during cancer treatment.
	• **Tell your doctor or nurse immediately, or go to the nearest hospital Emergency Department if you get any of the following signs or symptoms:**
	  ◦ **a temperature of 38°C or higher**
	  ◦ **chills, shivers, sweats or shakes**
	  ◦ **a sore throat or cough**
	  ◦ **uncontrolled diarrhoea**
	  ◦ **shortness of breath**
	  ◦ **a fast heartbeat**
	  ◦ **become unwell even without a temperature.**

<table>
<tr><td>Low platelets (thrombocytopenia)</td><td>

This treatment lowers the amount of platelets in your blood. Platelets help your blood to clot. When they are low, you are at an increased risk of bleeding and bruising.
Try not to bruise or cut yourself.
Avoid contact sport or vigorous exercise.
Clear your nose by blowing gently.
Avoid constipation.
Brush your teeth with a soft toothbrush.
Don't take aspirin, ibuprofen or other similar anti-inflammatory medications unless your doctor tells you to.
Tell your doctor or nurse if you have any bruising or bleeding.
Tell your doctor or nurse immediately, or go to your nearest hospital Emergency Department if you have any uncontrolled bleeding.

</td></tr>
<tr><td>Stomach pain</td><td>

You may get:

dull aches
cramping or pain
bloating or flatulence (gas).

Tell your doctor or nurse immediately, or go to the nearest hospital Emergency Department if you have stomach pain that you are unable to control.

</td></tr>
<tr><td>Heart problems</td><td>

You may get:

chest pain or tightness
shortness of breath
swelling of your ankles
an abnormal heartbeat.

Heart problems can occur months to years after treatment.
Tell your doctor if you have a history of heart problems or high blood pressure.
Before or during treatment, you may be asked to have a test to see how well your heart is working.
Tell your doctor or nurse immediately, or go to the nearest hospital Emergency Department if you get any of the symptoms listed above.

</td></tr>
<tr><td>Constipation</td><td>

You may have bowel motions (stools, poo) that are less frequent, harder, smaller, painful or difficult to pass.
You may also get:

bloating, cramping or pain
a loss of appetite
nausea or vomiting.

Drink plenty of fluids (unless you are fluid restricted).
Eat plenty of fibre-containing foods such as fruit, vegetables and bran.
Take laxatives as directed by your doctor.
Try some gentle exercise daily.
Tell your doctor or nurse if you have not opened your bowels for more than 3 days.

</td></tr>
<tr><td>Diarrhoea</td><td>

You may get bowel motions (stools, poo) that are more frequent or more liquid.
You may also get bloating, cramping or pain.
Take your antidiarrhoeal medication as directed by your doctor.
Drink plenty of fluids (unless you are fluid restricted).
Eat and drink small amounts more often.
Avoid spicy foods, dairy products, high fibre foods, and coffee.
Ask your doctor or nurse for eviQ patient information - Diarrhoea during cancer treatment.
Tell your doctor or nurse immediately, or go to your nearest hospital Emergency Department if your diarrhoea is not controlled, you have 4 or more loose bowel motions per day, and if you feel dizzy or light-headed.

</td></tr>
</table>

<table>
<tr><td>Tiredness and lack of energy (fatigue)</td><td>You may feel very tired, have no energy, sleep a lot, and not be able to do normal activities or things you enjoy.
Do not drive or operate machinery if you are feeling tired.
Nap for short periods (only 1 hour at a time)
Prioritise your tasks to ensure the best use of your energy.
Eat a well balanced diet and drink plenty of fluids (unless you are fluid restricted).
Try some gentle exercise daily.
Allow your friends and family to help.
Tell your doctor or nurse if you get any of the symptoms listed above.</td></tr>
<tr><td>Extra fluid in the body (fluid retention)</td><td>You may gain weight over a short amount of time.
Your hands and feet may become swollen, appear red or feel hot and uncomfortable.
Wear loose clothing and shoes that are not too tight.
Try not to stand up or walk around too much at one time.
If your ankles or legs get swollen, try raising them.
Make sure that any cuts or areas of broken skin are treated as soon as possible.
Tell your doctor or nurse as soon as possible if you get any of the symptoms listed above or gain 1 to 2 kg in a week.
Tell your doctor or nurse immediately or go to the nearest hospital Emergency Department if you become short of breath.</td></tr>
<tr><td>Liver problems</td><td>You may get:
yellowing of your skin or eyes
itchy skin
pain or tenderness in your stomach
nausea and vomiting
loss of appetite
You will have regular blood tests to check how well your liver is working.
Tell your doctor or nurse as soon as possible if you notice that your urine is a dark colour, the whites of your eyes look yellow, or if you have stomach pain.</td></tr>
<tr><td>Mouth pain and soreness (mucositis)</td><td>You may have:
bleeding gums
mouth ulcers
a white coating on your tongue
pain in the mouth or throat
difficulty eating or swallowing.
Avoid spicy, acidic or crunchy foods and very hot or cold food and drinks.
Try bland and soft foods.
Brush your teeth gently with a soft toothbrush after each meal and at bedtime. If you normally floss continue to do so.
Rinse your mouth after you eat and brush your teeth, using either:
1/4 teaspoon of salt in 1 cup of warm water, or
1/4 teaspoon of bicarbonate of soda in 1 cup of warm water
Ask your doctor or nurse for eviQ patient information - Mouth problems during cancer treatment.
Tell your doctor or nurse if you get any of the symptoms listed above.</td></tr>
</table>

Side effects from steroid medication	• Steroid medication may cause:
	  ◦ mood swings and behaviour changes
	  ◦ an increased appetite
	  ◦ weight gain
	  ◦ swelling in your hands and feet
	  ◦ stomach upsets
	  ◦ trouble sleeping
	  ◦ fragile skin and bruising
	  ◦ an increase in your blood sugar level
	  ◦ weak and brittle bones (osteoporosis)
	• Take your steroid medication with food to reduce stomach upset
	• If you have diabetes, your blood sugar levels may be tested more often.
	• Tell your doctor or nurse if you get any of the symptoms listed above.

Skin rash	• You may get a red, bumpy rash and dry, itchy skin. • Moisturise your skin with a gentle non-perfumed moisturising cream like sorbolene or aqueous cream. • Do not scratch your skin. • Protect your skin from the sun by wearing sun-protective clothing, a wide-brimmed hat, sunglasses and sunscreen of SPF 50 or higher. • **Talk to your doctor or nurse about other ways to manage your skin rash.**

Nerve damage (peripheral neuropathy)	• You may notice a change in the sensations in your hands and feet, including:
	  ◦ tingling or pins and needles
	  ◦ numbness or loss of feeling
	  ◦ pain.
	• You may find it difficult to do everyday activities, such as doing up buttons or picking up small objects.
	• Test water temperature with your elbow when bathing to avoid burns.
	• Use rubber gloves, pot holders and oven mitts in the kitchen.
	• Wear rubber shoes or boots when working in the garden or garage.
	• Keep rooms well lit and uncluttered.
	• Ask your doctor or nurse for eviQ patient information – Nerve problems during cancer treatment.
	• Tell your doctor or nurse if you get any of the symptoms listed above.

Skin that is more sensitive to the sun (photosensitivity)	• After being out in the sun you may develop a rash like a bad sunburn. • Your skin may become red, swollen and blistered. • Avoid direct sunlight. • Protect your skin from the sun by wearing sun-protective clothing, a wide-brimmed hat, sunglasses and a sunscreen of SPF 50 or higher. • **Tell your doctor or nurse if you get any of the symptoms listed above.**

Late (onset weeks to months)	
Low red blood cells (anaemia)	• You may feel dizzy, light-headed, tired and appear more pale than usual. • Tell your doctor or nurse if you have any of these signs or symptoms. You might need a blood transfusion. • **Tell your doctor or nurse immediately, or go to the nearest hospital Emergency Department if you have any chest pain, trouble breathing, or feel like your heart is racing.**
Hair thinning	• Your hair may become dry and may break easily. • You may lose some of your hair. • Use a gentle shampoo and a soft hairbrush. • Take care with hair products like hairspray, hair dye, bleaches and perms. • Protect your scalp from the cold with a hat or scarf. • Protect your scalp from the sun with a hat and sunscreen of SPF 50 or higher. • Ask your doctor or nurse about the Look Good Feel Better program (www.lgfb.org.au)
Chemo brain (chemotherapy-related cognitive impairment)	• You may notice that you are unable to concentrate, feel unusually disorganised or tired (lethargic) and have trouble with your memory. • These symptoms usually improve once treatment is completed. • Ask your doctor or nurse for eviQ patient information – Memory changes and chemotherapy (chemo brain). • Tell your doctor or nurse if you get any of the symptoms listed above.

Swelling around the eyes	• You may get:
	  ◦ swelling or heaviness around your eyes
	  ◦ irritated eyes
	  ◦ eye discharge
	  ◦ changes to your vision.
	• **Tell your doctor or nurse if you get any of these symptoms.**

General advice for people having cancer treatment

Chemotherapy safety

- Learn how to keep you and your family safe while you are having anticancer drugs.
- See our patient information sheet - Chemotherapy safety at home.

Blood clot risk

- Cancer and anticancer drugs can increase the risk of a blood clot (thrombosis).
- Tell your doctor if you have a family history of blood clots.
- A blood clot can cause pain, redness, swelling in your arms or legs, shortness of breath or chest pain.
- If you have any of these symptoms go to your nearest hospital Emergency Department.

Medications and vaccinations

- Before you start treatment, tell your doctor about any medications you are taking, including vitamins or herbal supplements.
- Don’t stop or start any medications during treatment without talking to your doctor and pharmacist first.
- Some pain medications, e.g. paracetamol, can interact with your treatment. Check with your doctor or pharmacist before taking any medications for a headache or mild pain.
- Vaccinations such as flu and tetanus vaccines are safe to receive while having treatment. Do not have any live vaccines during your treatment or for 6 months after it finishes. If you are unsure, check with your doctor before you have any vaccinations.
- People you live with should be fully vaccinated, including having live vaccines according to the current vaccination schedule. Extra care needs to be taken with hand washing and careful disposal of soiled nappies for infants who have recently received the rotavirus vaccine.

Other medical and dental treatment

- If you go to hospital or any other medical appointment (including dental appointments), always tell the person treating you that you are receiving anticancer drugs.

- Before you have any dental treatment, talk to your doctor.

Diet and food safety

- While you are receiving this treatment, it is important that you try to maintain a healthy diet.
- Grapefruit and grapefruit juice can interact with your medication and should be avoided while you are on this treatment.
- Speak to your doctor or nurse about whether drinking alcohol is safe with your treatment.
- If you have any concerns about recent weight loss or weight gain or questions about your diet, ask to speak to a dietitian.
- There are some foods that may cause infection in high risk individuals and should be avoided. For further information on foods to avoid and food hygiene please ask for a copy of the Listeria and food brochure.

Fertility

- Some cancer treatments can reduce your fertility. This can make it difficult or impossible to get pregnant or father a child.
- Talk to your doctor or nurse before you start any treatment. Depending on your situation there may be fertility sparing options available to you and/or your partner, discuss these with your doctor or nurse.

Pregnancy and breastfeeding

- Some cancer treatments can be dangerous to unborn babies. Talk to your doctor or nurse if you think there is any chance that you could be pregnant.
- Do not try to get pregnant or father a child during this treatment. Contraception should be used during treatment and after stopping treatment. Ask your doctor or nurse about what type of contraception you should use.
- If you are planning pregnancy/fatherhood after completing this treatment, talk to your doctor. Some doctors advise waiting between 6 months and 2 years after treatment.
- Do not breastfeed if you are on this treatment, as anti-cancer medications can also pass into breast milk.

Sex life and sexuality

- The desire to have sex may decrease as a result of this treatment or its side effects.
- Your emotions and the way you feel about yourself may also be affected by this treatment.
- It may help to discuss your concerns with your partner and doctor or nurse.

Quitting smoking

- It is never too late to quit smoking. Quitting smoking is one of the best things you can do to help your treatment work better.
- There are many effective tools to improve your chances of quitting.
- Talk to your treating team for more information and referral to a smoking cessation support service.

Staying active

- Research shows that exercise, no matter how small, has many benefits for people during and after cancer treatment.
- Talk to your doctor before starting an exercise program. Your doctor can advise whether you need a modified exercise program.

For more information about cancer treatment, side effects and side effect management see our Patient and carers section.

Where to get more information

Telephone support

- Call Cancer Council on 13 11 20 for cancer information and support
- Call the Leukaemia Foundation on 1800 620 420 (Mon to Fri 9am – 5pm)
- Call the Lymphoma Nurse Support Line on 1800 953 081 (Mon to Fri 9am - 5pm)

Haematology, transplant and cellular therapy information

- Arrow bone marrow transplant foundation – arrow.org.au
- Australasian Menopause Society – menopause.org.au
- Chris O'Brien Lifehouse - Total Body Irradiation - mylifehouse.org.au/departments/radiation-oncology/total-body-irradiation/
- Healthy Male Andrology Australia – healthymale.org.au/
- International Myeloma Foundation – myeloma.org
- Leukaemia Foundation – leukaemia.org.au
- Lymphoma Australia – lymphoma.org.au

- Myeloma Australia – myeloma.org.au
- NSW Agency for Clinical Innovation, Blood & Marrow Transplant Network – aci.health.nsw.gov.au/resources/blood-and-marrow-transplant
- NSW Agency for Clinical Innovation - aci.health.nsw.gov.au/projects/immune-effector-cell-service
- NCCN Guidelines for Patients Immunotherapy Side Effects: CAR T-Cell Therapy - nccn.org/patientresources/patient-resources/guidelines-for-patients
- Talk Blood Cancer – cmlsupport.org.uk/organisation-type/social-media-groups

General cancer information and support

- Australian Rare Cancer (ARC) Portal – arcportal.org.au/
- Beyondblue – beyondblue.org.au
- Cancer Australia – canceraustralia.gov.au
- Cancer Council Australia – cancer.org.au
- Cancer Voices Australia – cancervoicesaustralia.org
- CanTeen – canteen.org.au
- Carers Australia – carersaustralia.com.au
- eviQ Cancer Treatments Online – eviQ.org.au
- Food Standards Australia New Zealand: Listeria & Food Safety – foodstandards.gov.au/publications/pages/listeriabrochuretext.aspx
- LGBTQI+ People and Cancer - cancercouncil.com.au/cancer-information/lgbtqi
- Look Good Feel Better – lgfb.org.au
- Patient Information - patients.cancer.nsw.gov.au
- Radiation Oncology Targeting Cancer - targetingcancer.com.au
- Redkite – redkite.org.au
- Return Unwanted Medicines – returnmed.com.au
- Staying active during cancer treatment – patients.cancer.nsw.gov.au/coping-with-cancer/physical-wellbeing/staying-active

Quit smoking information and support

Quitting smoking is helpful even after you have been diagnosed with cancer. The following resources provide useful information and support to help you quit smoking. Talk to your treating team about any other questions you may have.

- Call Quitline on 13 QUIT (13 78 48)
- iCanQuit – iCanQuit.com.au
- Patient Information - patients.cancer.nsw.gov.au/coping-with-cancer/physical-wellbeing/quitting-smoking
- Quitnow – quitnow.gov.au

Additional notes:

This document is a guide only and cannot cover every possible situation. The health professionals caring for you should always consider your individual situation when making decisions about your care. Contact your cancer clinic staff or doctor if you have any questions or concerns about your treatment, or you are having problems coping with side effects. While eviQ endeavours to link to reliable sources that provide accurate information, eviQ and the Cancer Institute NSW do not endorse or accept responsibility for the accuracy, currency, reliability or correctness of the content of linked external information sources. Use of this document is subject to eviQ's disclaimer available at www.eviQ.org.au

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