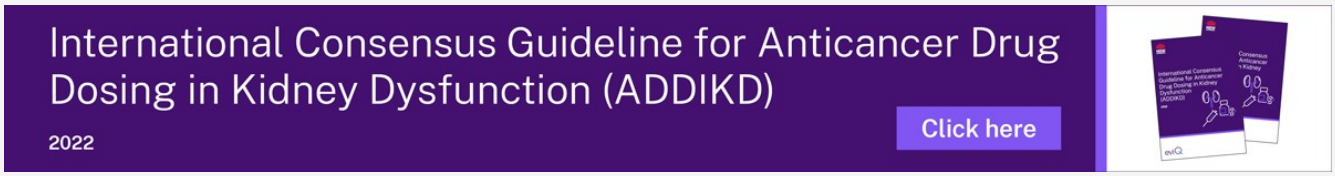
Acute lymphoblastic leukaemia Ph+ GRAAPH-2005 prephase

ID: 1975 v.3 **Endorsed** 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.



Related pages:

- Acute lymphoblastic leukaemia Ph+ GRAAPH-2005 overview

Treatment schedule - Overview

Drug	Dose	Route	Day
Prednisolone	60 mg/m^2 ONCE a day	PO	1 to 7
Methotrexate	15 mg	Intrathecal	1 *

* Can be administered ONCE on any day between days 1 to 4.[1]

Duration: 7 days

Cycles: 1
Prephase is immediately followed by cycle 1.

Notes:

- If patients had **initial CNS involvement**, a total of 12 IT therapies were given (8 doses of triple IT therapy over 28 days during prephase and cycle 1, followed by 4 additional weekly doses).
- Cranial irradiation of 15 Gy was given before SCT or 24 Gy after cycle 8 in non-SCT patients.
- Imatinib 300 mg TWICE a day was given orally throughout cranial irradiation.[1]

Drug status: All drugs in this protocol are on the PBS general schedule

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

Cost: ~ $70

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**.*

Day 1		
Prednisolone	60 mg/m^2 (PO)	ONCE a day on days 1 to 7. Take in the morning with food.
Methotrexate	15 mg (Intrathecal)	adhere to local institution intrathecal policy. Can be administered ONCE on any day between days 1 to 4.

Day 2 to 7		
Prednisolone	60 mg/m^2 (PO)	ONCE a day on days 1 to 7. Take in the morning with food.

CNS treatment

- If patients had **initial CNS involvement**, a total of 12 IT therapies were given (8 doses of triple IT therapy over 28 days during prephase and cycle 1, followed by 4 additional weekly doses).
- Cranial irradiation of 15 Gy was given before SCT or 24 Gy after cycle 8 in non-SCT patients.
- Imatinib 300 mg TWICE a day was given orally throughout cranial irradiation.[1]

Duration: 7 days

Cycles: 1
Prephase is immediately followed by cycle 1.

Indications and patient population

- Patients with newly diagnosed Philadelphia chromosome-positive (Ph+) acute lymphoblastic leukaemia, aged 18 to 60 years, who are planned to receive a stem cell transplant (allogeneic or autologous) if a major molecular response is achieved.

Clinical information

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 MINIMAL	No antiemetics should be routinely administered before treatment in patients without a history of nausea and vomiting. If patients experience nausea and/or vomiting, consider using the low antiemetic prophylaxis regimen. Read more about preventing anti-cancer therapy induced nausea and vomiting
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
Tumour lysis risk	Patients are at high risk of developing tumour lysis syndrome, prophylaxis is recommended. Read more about the prevention and management of tumour lysis syndrome.
Pneumocystis jirovecii pneumonia (PJP) prophylaxis	Read more about prophylaxis of pneumocystis jiroveci (carinii) in cancer patients
Antiviral prophylaxis	Read more about antiviral prophylaxis drugs and doses
Antifungal prophylaxis	Read more about antifungal prophylaxis drugs and doses.
Blood tests	FBC, EUC, LFTs, LDH and BSL baseline then 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. It is important that all patients of reproductive potential use effective contraception whilst on therapy and after treatment finishes. Effective contraception methods and adequate contraception timeframe 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

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 .

Doses are rarely modified in acute lymphoblastic leukaemia chemotherapy protocols, except in instances of severe hepatic or renal impairment or toxicity. Consult with treating team and pharmacist.

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*

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

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: 3 to 4 hours

Safe handling and waste management

Safe administration

General patient assessment prior to each day of treatment.

Pre treatment medication

Verify antiemetics taken or administer as prescribed.

Prednisolone

- administer orally ONCE a day **days 1 to 7**
- 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

Intrathecal methotrexate

Intrathecal methotrexate is to be administered today. The intrathecal procedure is to be done separately to the IV administration of all other cytotoxic drugs

Read more about the procedure for intrathecal methotrexate administration.

Post intrathecal care:

Local policies and guidelines regarding bed rest post dural puncture should be adhered to. At a minimum:

- the patient should have at least 1 set of observations including:
  - vital signs and GCS
  - any abnormal neurological signs such as nausea, vomiting, chills, fever, confusion, headache or other changes in neurological status
- educate the patient to recognise and immediately report any adverse reactions including blurred vision, dizziness, pain and or headache
- observe the lumbar puncture site for any leakage or bleeding post procedure
- document the procedure including outcomes in the patients notes

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

Days 2 to 7

This is an oral treatment

Prednisolone

- administer orally ONCE a day **days 1 to 7**
- to be taken in the morning with or immediately after food

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

Discharge information

Prednisolone tablets

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

Antiemetics

- Antiemetics as prescribed.

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)	
Nausea and vomiting	Read more about prevention of treatment induced nausea and vomiting

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
Fatigue	Read more about fatigue
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.

Late (onset weeks to months)	
Anaemia	Abnormally low levels of red blood cells (RBCs) or haemoglobin in the blood. Read more about anaemia
Alopecia	Hair loss may occur from all parts of the body. 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

Delayed (onset months to years)	
Pulmonary toxicity	Pulmonary toxicity may include damage to the lungs, airways, pleura and pulmonary circulation. Read more about pulmonary toxicity associated with anti-cancer drugs

Evidence

The evidence supporting this protocol is provided by a multicentre, randomised trial (GRAAPH-2005)[1], involving 268 patients aged 18 to 60 years with Philadelphia chromosome-positive acute lymphoblastic leukaemia (Ph+ ALL), who are planned to receive a stem cell transplant (allogeneic or autologous) if a major molecular remission is achieved. GRAAPH-2005 examined the hypothesis that a reduced-intensity induction regimen was non-inferior to a standard intensity regimen in patients with Ph+ ALL. Imatinib was given for a total of 8 weeks during induction with the reduced-intensity regimen, and for a total of 6 weeks with the standard regimen. All patients were planned to receive stem cell transplantation (SCT) (either allogeneic or autologous) if a major molecular remission (MMolR, defined as BCR-ABL1/ABL1 ratio < 0.1%) was achieved. Patients who did not achieve a major molecular response after 2 induction cycles received further treatment according to the imatinib/hyper-CVAD protocol.

Between 2006 and 2011, after a prednisolone prephase, 135 patients were randomised to receive imatinib for 4 weeks along with vincristine and dexamethasone (arm A), and 133 patients were randomised to receive imatinib for 2 weeks with the hyper-CVAD part A regimen (arm B). Patients in both arms then received the hyper-CVAD part B regimen (methotrexate and cytarabine) with

continuous imatinib. If CR was achieved a further 2 'interphase' cycles, consisting of imatinib along with 6-mercaptopurine and oral methotrexate, were given prior to transplant. The GRAAPH-2005 study used steady state mobilisation with filgrastim in between the two interphase cycles. The haematologic CR rate was higher in arm A than arm B (98.5% vs 91%) due to fewer induction deaths and therefore has been included in the eviQ GRAAPH-2005 protocol.

A myeloablative conditioning regimen (total body irradiation and cyclophosphamide) was used for patients ≤ 55 years receiving allogeneic SCT as well as for all those undergoing autologous SCT. Patients > 55 years undergoing allogeneic SCT received a reduced intensity conditioning regimen (fludarabine, busulfan, and antithymocyte globulin). No maintenance was planned after allogeneic SCT. Maintenance with alternating months of imatinib and 6-mercaptourine/methotrexate was given for 2 years after autologous SCT.

The primary endpoint was the major molecular response at the end of cycle 2. Secondary endpoints included event-free survival (EFS), relapse-free survival (RFS), and overall survival (OS).

The study demonstrated the non-inferiority of the reduced-intensity arm with respect to MMolR. CR rates were higher, and EFS and OS were similar in this arm. Essentially, the trial showed that the continuous use of imatinib allowed the intensity of the initial induction therapy to be reduced without compromising outcomes, provided that all patients were intended to receive a transplant.

Efficacy

MMolR rates were similar (66.1% vs 64.5%), and CR rates were higher (98.5% vs 91.0%, p = 0.006), in the reduced-intensity arm after 2 cycles due to fewer early deaths.[1]

Figure 1: Response to the first 2 treatment cycles[1]

	All patients (n = 268)	Arm A (n = 135)	Arm B (n = 133)	P
Hematologic CR, n (%)	254 (94.8)	133 (98.5)	121 (91.0)	.006
After cycle 1	249	131	118	.009
After cycle 2	5	2	3	.68
Refractory ALL after cycle 2, n (%)	4 (1.5)	1 (0.7)	3 (2.2)	.37
MMolR, n/tested (%)				
After cycle 1	96/217 (44.2)	50/116 (43.1)	46/101 (45.5)	.78
After cycle 2	134/205 (65.4)	74/112 (66.1)	60/93 (64.5)	.88
Molecular CR, n/tested (%)				
After cycle 1	21/217 (9.7)	11/116 (9.5)	10/101 (9.9)	.99
After cycle 2	53/205 (25.8)	32/112 (28.6)	21/93 (22.6)	.34
Induction deaths, n (%)				
Early deaths*	10 (3.7)	1 (0.7)	9 (6.7)	.010
Day 60 mortality†	15 (5.6)	3 (2.2)	12 (9.0)	.017

*Early death was defined as death occurring during cycle 1 or 2, before the assessment of hematologic response after cycle 1 or 2.
†Five patients died in CR before day 60 (2 in arm A and 3 in arm B).

After a median follow-up of 4.8 years, the median EFS estimates were 2.5 years and 1.8 years (HR 1.27 [95% CI, 0.93-1.72]) in the reduced and standard intensity arms respectively. Median OS was 4.1 vs 3.3 years (HR 1.17 [95% CI, 0.84-1.62]) in the two groups respectively.[1]

Figure 2: Event-free survival and overall survival[1]

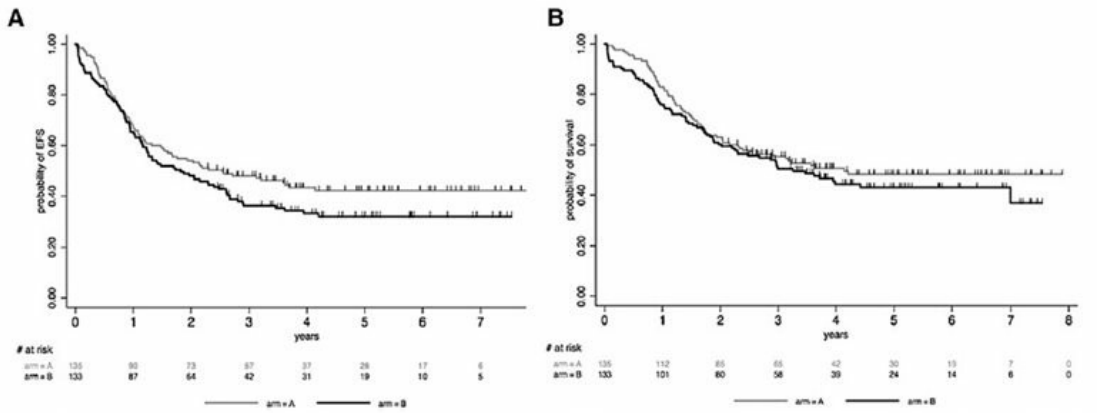


Figure 1. Outcome by randomization arm. (A) EFS by randomization arm. At 5 years, the EFS rate was estimated at 32.1% (95% CI, 24.0-40.4) in arm B vs 42.2% (95% CI, 33.5-50.6) in arm A ($P = .13$). (B) OS by randomization arm. At 5 years, the OS rate was estimated at 43.0% (95% CI, 33.9-51.7) in arm B vs 48.3% (95% CI, 39.2-56.8) in arm A ($P = .37$).

The percentage of patients proceeding to SCT was identical (73%) in both arms. Allogeneic SCT was included as a time-dependent covariate in a multivariate model and found to significantly improve RFS. A donor no-donor comparison also suggested better

outcomes with allogeneic SCT although the differences did not reach statistical significance. It is possible that patients who had presenting WBC < $30x10^9$/L and/or those who were MRD negative after the 2nd cycle did not benefit greatly from allo-SCT. However, these findings are not conclusive as the study was not designed to evaluate the role of allogeneic SCT in first-line treatment of Ph+ ALL.[1]

No QOL data were reported in the primary publication.

Toxicity

Unsurprisingly, the less-intensive induction cycle 1 was associated with fewer toxicities, and as shown above, with fewer deaths. However, toxicities were higher in arm A during cycle 2. Overall there were fewer deaths within the first 60 days in the reduced-intensity arm (2.2% vs. 9.7%, p = 0.17).[1]

Table 1: Toxicity during the first two treatment cycles[1]

	Arm A	Arm B	P value
Patients, N	135	133	-
First cycle			
Number of days with neutrophils < 0.5 10^9/L, median (range)	5.5 (0-13.75)	13.5 (10-17)	<0.001
Number of days with platelets < 20 10^9/L, median (range)	0 (0-2)	2.5 (0-6)	<0.001
Grade 3-4 infectious event, N (%)	50 (37%)	77 (58%)	0.001
Other Grade 3-4 event, N (%)	56 (41%)	61 (46%)	0.54
Second cycle			
Number of days with neutrophils < 0.5 10^9/L, median (range)	7 (5-9)	5 (3-7)	<0.001
Number of days with platelets < 20 10^9/L, median (range)	1 (0-2)	1 (0-4)	0.12
Grade 3-4 infectious event, N (%)	60 (44%)	42 (32%)	0.03
Other Grade 3-4 event, N (%)	41 (30%)	22 (17%)	0.01

References

1 Chalandon, Y., X. Thomas, S. Hayette, et al. 2015. “Randomized study of reduced-intensity chemotherapy combined with imatinib in adults with Ph-positive acute lymphoblastic leukemia.” Blood 125(24):3711-3719

History

Version 3

Date	Summary of changes
30/06/2022	Protocol reviewed electronically by Haematology Reference Committee. Minor updates include: • Removal of "prime IV line", "access CVAD", and "deaccess CVAD" in the administration section as this is not required for this protocol • Image titles and references added to efficacy and toxicity sections • Minor grammatical changes Version number changed to v.3. Review in 2 years

Version 2

Date	Summary of changes
20/02/2017	Approved and published on eviQ.

Date	Summary of changes
31/05/2017	Transferred to new eviQ website. Version number change to V.2.
12/04/2019	Reviewed by Haematology Reference Committee with no significant changes, review in 2 years.
23/10/2020	Protocol review electronically by Haematology Reference Committee, no changes. Review in 2 years.
21/01/2022	Pulmonary toxicity added to side effects.
01/07/2022	Reviewed electronically by Haematology Reference Committee, nil significant changes. Review in 2 years.

First approved: 20 February 2017
Last reviewed: 30 June 2022
Review due: 30 June 2024

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/1975
28 Jun 2023

Patient information - Acute lymphoblastic leukaemia (ALL) - GRAAPH-2005 prephase

Patient's name:

Your treatment

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

GRAAPH-2005 prephase			
This treatment cycle is given once only.			
Day	**Treatment**	**How it is given**	**How long it takes**
1 to 7	**Prednisolone** (*pred-NIS-oh-lone*)	Take orally ONCE a day in the morning with food on days 1 to 7. If you forget to take your tablets or vomit your tablets, contact your treating team.	
1	**Methotrexate** (*meth-o-TREX-ate*)	By injection into your spine	About 4 hours

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 • you become unwell.	Daytime:..... Night/weekend:..... Other instructions:..... ....

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.

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.
- **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.

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)	
Nausea and vomiting	• You may feel sick (nausea) or be sick (vomit). • 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. • Anti-sickness medication is usually not needed but may help in some people. • 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.**
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.**
Low platelets (thrombocytopenia)	• 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.**
Tiredness and lack of energy (fatigue)	• 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.**
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.

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 loss (alopecia)	• Your hair may start to fall out from your head and body. • Hair loss usually starts 2 to 3 weeks after your first treatment. • You may become completely bald and your scalp might feel tender. • Use a gentle shampoo and a soft brush. • Take care with hair products like hairspray, hair dye, bleaches and perms. • Protect your scalp from the cold with a hat, scarf or wig. • Protect your scalp from the sun with a hat or sunscreen of SPF 50 or higher. • Moisturise your scalp to prevent itching. • Ask your doctor or nurse about the Look Good Feel Better program

Delayed (onset months to years)	

Lung problems	• Lung problems are rare, but can be serious. They may occur throughout treatment or after the completion of treatment.
	• You may get:
	  ◦ shortness of breath
	  ◦ fever
	  ◦ dry cough
	  ◦ wheezing
	  ◦ fast heartbeat
	  ◦ chest pain.
	• Your doctor will monitor how well your lungs are working during your treatment.
	• **Tell your doctor or nurse immediately, or go to the nearest hospital Emergency Department if you have chest pain or become short of breath.**

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.
- Paracetamol is safe to take if you have a headache or other mild aches and pains. It is recommended that you avoid taking aspirin, ibuprofen and other anti-inflammatory type medications for pain while you are having treatment. However, if these medications have been prescribed by your doctor, do not stop taking them without speaking with your doctor.
- 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.
- 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 more 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:

First approved: 20 February 2017
Last reviewed: 30 June 2022
Review due: 30 June 2024

The currency of this information is guaranteed only up until the date of printing, for any updates please check:
https://www.eviq.org.au/pi/1975
28 Jun 2023