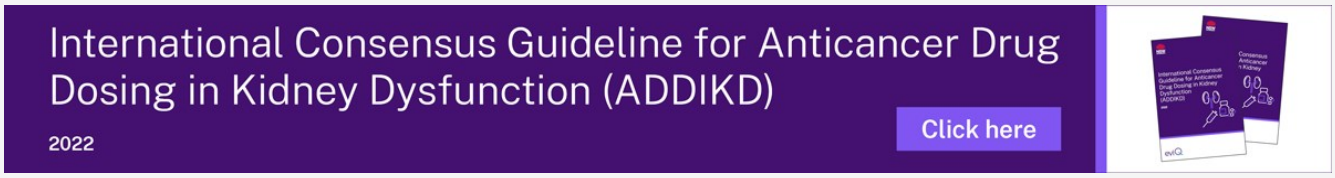
Lymphoma DHAP (dexamethasone cytarabine ciSplatin)

ID: 833 v.3 **Endorsed**

Patients with lymphoma should be considered for inclusion into clinical trials. Link to ALLG website, ANZCTR website and Lymphoma Australia 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.



Treatment schedule - Overview

Cycle 1 and 2

Drug	Dose	Route	Day
Dexamethasone	40 mg ONCE a day	IV/PO	1 to 4
ciSplatin	100 mg/m^2	IV infusion via pump over 24 hours	1
Cytarabine (Ara-C)	2,000 mg/m^2 TWICE a day (12 hours apart) *	IV infusion	2

* Velasquez et al. modified the cytarabine dose for patients aged older than 70 years to 1 g/m^2.[1]

Frequency: 21

Cycles: 2 to 6
In patients with relapsed/refractory Hodgkin lymphoma in whom autologous stem cell transplantation is intended, intensification from 21 to 14 day cycles may increase efficacy, see evidence section.

Notes:
- If this protocol is being used for the mobilisation of peripheral blood haematopoietic stem cells the addition of G-CSF will be required.

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

Dexamethasone is available as **0.5 mg** and **4 mg** tablets

Cost: ~ $1,070 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 2

Day 1		
Netupitant	300 mg (PO)	60 minutes before chemotherapy (fixed dose preparation with palonosetron)
Palonosetron	0.5 mg (PO)	ONCE a day 60 minutes before chemotherapy (fixed dose preparation with netupitant)
Dexamethasone	40 mg (IV/PO)	ONCE a day orally in the morning with food OR by IV infusion on days 1 to 4.
ciSplatin	100 mg/m^2 (IV infusion)	in 1000 mL sodium chloride 0.9% over 24 hours
Day 2		
Dexamethasone	40 mg (IV/PO)	ONCE a day orally in the morning with food OR by IV infusion on days 1 to 4.
Cytarabine (Ara-C)	2,000 mg/m^2 (IV infusion)	in 500 mL sodium chloride 0.9% over 3 hours TWICE a day (12 hours apart) *
Day 3 and 4		
Dexamethasone	40 mg (IV/PO)	ONCE a day orally in the morning with food OR by IV infusion on days 1 to 4.

***** Velasquez et al. modified the cytarabine dose for patients aged older than 70 years to 1 g/m^2.[1]

If this protocol is being used for the mobilisation of peripheral blood haematopoietic stem cells the addition of G-CSF will be required.

Frequency: 21

Cycles: 2 to 6
In patients with relapsed/refractory Hodgkin lymphoma in whom autologous stem cell transplantation is intended, intensification from 21 to 14 day cycles may increase efficacy, see evidence section.

Indications and patient population - Non-Hodgkin lymphoma

- Relapsed/refractory Non-Hodgkin lymphoma

Indications and patient population - Hodgkin lymphoma

- Relapsed/refractory Hodgkin lymphoma

Clinical information

Venous access	Central venous access device (CVAD) is required to administer this treatment. Read more about central venous access device line selection

Emetogenicity HIGH	Suggested default antiemetics have been added to the treatment schedule, and may be substituted to reflect institutional policy. As a steroid has been included as part of this protocol, additional antiemetic steroids are not required. Ensure that patients also have sufficient antiemetics for breakthrough emesis: 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
Cytarabine-induced neurotoxicity	This may occur in patients treated with high-dose cytarabine. Assess cerebellar function prior to each cytarabine dose. Note: an increased risk of cytarabine-induced neurotoxicity has been associated with kidney dysfunction. Read more about neurotoxicity associated with high-dose cytarabine and access the cytarabine cerebellar neurotoxicity assessment chart
Ocular toxicities	Administer corticosteroid eye drops to minimise corneal toxicity from high dose cytarabine. Commence on the day of first dose of cytarabine and continue for at least 72 hours after completion of final cytarabine dose. Read more about ocular toxicities associated with high dose cytarabine
Cytarabine syndrome	Treatment with cytarabine may cause a "cytarabine syndrome" characterised by flu-like symptoms, skin rash and occasionally chest pain.
Ototoxicity	Ototoxicity may occur with platinum-based therapy; patients should be monitored for signs and symptoms. Platinum compounds should be used with caution in patients with pre-existing conditions or risk factors. Ototoxicity may become more severe in patients being treated with other drugs with nephrotoxic potential e.g. aminoglycosides. An audiometry test should be performed if symptoms develop. Read more about ototoxicity - tinnitus and hearing loss
Hydration	Hydration helps to prevent cisplatin-induced nephrotoxicity. The default regimen is appropriate for patients with normal electrolytes, kidney function, fluid status etc. and should be adjusted according to individual requirements. Read more about cisplatin hydration regimens
Peripheral neuropathy	Assess prior to each treatment. If a patient experiences grade 2 or greater peripheral neuropathy, a dose reduction, delay, or omission of treatment may be required; review by medical officer before commencing treatment. Read more about peripheral neuropathy Link to chemotherapy-induced peripheral neuropathy screening tool
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.

Growth factor support	G-CSF (short or long-acting) is available on the PBS for chemotherapy induced neutropenia depending on clinical indication and/or febrile neutropenia risk. Access the PBS website
Blood tests	FBC, EUC, eGFR, LFTs, LDH and BSL at baseline, prior to each cycle and 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. 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 .

The dose recommendations in kidney dysfunction (i.e.renal impairment) displayed may not reflect those in the ADDIKD guideline and have been included for historical reference only. Recommendations will be updated once the individual protocol has been evaluated by the reference committee, with this version of the protocol then being archived. Clinicians are expected to refer to the ADDIKD guideline prior to prescribing in kidney dysfunction.
International Consensus Guideline for Anticancer Drug Dosing in Kidney Dysfunction (ADDIKD).

Note: All dose reductions are calculated as a percentage of the starting dose

Haematological toxicity
Dose reductions for haematological toxicity not usually recommended. Discuss with Haematologist. Consider adding G-CSF

Renal impairment
No specific dose modifications recommended for cytarabine in renal impairment, but please note an increased risk of neurotoxicity has been associated with high dose cytarabine with creatinine clearance less than 60 mL/min.
Creatinine clearance (mL/min)

Renal impairment	
greater than or equal to 70	No dose modifications necessary
50 to less than 70	Reduce cisplatin by 25%
30 to less than 50	Reduce cisplatin by 50%
less than 30	Withhold treatment

Refer to Nephrotoxicity associated with cisplatin for more information

Hepatic impairment
Elevations in liver function tests occur with both standard and high dose cytarabine. Significant liver function abnormalities may require discontinuation or a dose reduction.

Peripheral neuropathy	
Grade 2, Grade 3 or Grade 4	Omit cisplatin

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*

Cisplatin		
	Interaction	**Clinical management**
Nephrotoxic drugs (e.g. aminoglycosides, amphotericin, contrast dye, frusemide, NSAIDs)	Additive nephrotoxicity	Avoid combination or monitor kidney function closely
Ototoxic drugs (e.g. aminoglycosides, frusemide, NSAIDs)	Additive ototoxicity	Avoid combination or perform regular audiometric testing
Neurotoxic drugs (e.g. vincristine, paclitaxel)	Additive neurotoxicity	Monitor closely for neuropathy if combination used
Paclitaxel	Administration schedule may influence the development of myelosuppression	Minimise toxicity by administering paclitaxel first in regimens using the combination
Carbamazepine, phenytoin, valproate	Decreased antiepileptic plasma levels	Monitor antiepileptic serum levels and seizure frequency for efficacy; adjust dosage as appropriate or select alternative antiepileptic (e.g. clonazepam, diazepam, lorazepam)

Cytarabine		
	Interaction	**Clinical management**
Cytidine deaminase (CDA) inhibitors (e.g. cedazuridine)	Potential increased effect/toxicity of cytarabine due to reduced clearance	Avoid combination or monitor for increased cytarabine effect/toxicity

Dexamethasone		
	Interaction	**Clinical management**
CYP3A4 interactions	Dexamethasone is a substrate of CYP3A4 and a weak to moderate inducer of CYP3A4. The clinical relevance of CYP3A4 induction by dexamethasone is unknown as the mechanism has yet to be established	The effects of the concomitant use of dexamethasone with other CYP3A4 inducers, inhibitors or substrates is variable. If used concomitantly, monitor patients closely for adverse drug reactions
Warfarin	Concurrent use may result in increased risk of bleeding or diminished effects of warfarin	Monitor prothrombin time / INR (especially during initiation or discontinuation) and for signs of drug toxicity during concomitant use; adjust warfarin dose as required
Oral hypoglycaemics	Corticosteroids may cause hyperglycaemia and worsen diabetes control	Monitor blood glucose levels and adjust oral hypoglycaemic dose as required

NK-1 antagonist e.g. aprepitant, fosaprepitant, netupitant		
	Interaction	**Clinical management**
Dexamethasone	Increased effects/toxicity of dexamethasone due to inhibition of its metabolism via CYP3A4	Reduce dose of **antiemetic dexamethasone** by approximately 50% when adding a NK-1 antagonist. For protocols that already recommend a NK-1 antagonist, the dose reduction of **antiemetic dexamethasone** has already been taken into account. If **dexamethasone is part of the chemotherapy protocol**, dose reduction as per the product information is not routinely recommended in clinical practice and no additional dexamethasone is required for antiemetic cover.
Warfarin	Reduced anticoagulant efficacy of warfarin due to increased clearance (aprepitant induces CYP2C9). *Note interaction only applicable to aprepitant/ fosaprepitant	INR should be monitored in the 2 week period, particularly at 7 to 10 days following the administration of aprepitant/ fosaprepitant
Combined oral contraceptive	Reduced contraceptive efficacy due to increased clearance. *Note interaction only applicable to aprepitant/ fosaprepitant	Alternative non-hormonal methods should be used during and for 1 month after stopping aprepitant/ fosaprepitant
CYP3A4 inducers (e.g. carbamazepine, phenytoin, phenobarbitone, rifampicin, St John's wort etc.)	Reduced efficacy of NK-1 antagonist possible due to increased clearance	Avoid combination or monitor for decreased antiemetic effect. Consider using an alternative antiemetic regimen
CYP3A4 inhibitors (e.g. azole antifungals, clarithromycin, erythromycin, grapefruit juice, ritonavir etc.)	Increased toxicity of NK-1 antagonist possible due to reduced clearance	Avoid combination or monitor for increased adverse effects of NK-1 antagonist (e.g. headache, hiccups, constipation)
Drugs metabolised by CYP3A4 (e.g. etoposide, imatinib, irinotecan, midazolam, paclitaxel, vinblastine, vincristine etc.)	Increased effects/toxicity of these drugs possible due to inhibition of CYP3A4 by NK-1 antagonist	Avoid combination or monitor for increased toxicity especially with orally administered drugs

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

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).

Access TIVAD or CVAD.

Note: A large volume of intravenous fluid may be given with this protocol. If weight increases by more than 1 kg from baseline or fluid balance becomes positive by one litre or any other signs of fluid overload are present, review by medical officer (diuretics may be required).

- baseline weight
- strict fluid balance
- dipstick urinalysis prior to treatment

Pre treatment medication

Verify antiemetics taken or administer as prescribed.

Commence corticosteroid eye drops 24 hours before starting cytarabine. Continue for 72 hours after completion of the last dose of cytarabine.

Dexamethasone

- administer orally ONCE a day in the morning with food **OR**
- via IV infusion over 15 minutes
- flush with ~ 50mL sodium chloride 0.9%
- patients may receive dexamethasone on day 3 and 4 orally as an outpatient or administered via IV infusion if still an inpatient

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

Chemotherapy - Time out

Cisplatin

Commence prehydration for cisplatin:

- administer 10 mmol magnesium sulphate ($MgSO_4$) in 1000 mL sodium chloride 0.9% over 60 minutes
- ensure patient has passed urine prior to cisplatin administration as per institutional policy.

Administer cisplatin (irritant):

- via IV infusion over 24 hours
- flush with 100 mL of sodium chloride 0.9%.

Post hydration:

- 1000 mL sodium chloride 0.9% over 60 minutes.

20/11/23 Mannitol information removed to align with updated ID 184 Prevention and management of cisplatin induced nephrotoxicity.

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

Day 2

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.

Hydration if prescribed

Pre treatment medication

Verify antiemetics taken or administer as prescribed.

Continue corticosteroid eye drops until 72 hours after completion of the last dose of cytarabine.

Dexamethasone

- administer orally ONCE a day in the morning with food **OR**
- via IV infusion over 15 minutes
- flush with ~ 50mL sodium chloride 0.9%
- patients may receive dexamethasone on day 3 and 4 orally as an outpatient or administered via IV infusion if still an inpatient

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

Chemotherapy - Time out

Cytarabine

Prior to administration:

Ensure corticosteroid eye drops have been administered before starting cytarabine. Please see ocular toxicities associated with high dose cytarabine for more information.

Verify that cytarabine neurological assessment has been performed prior to administration of cytarabine:

- if the patient scores 0 then administer cytarabine as charted
- if the patient scores 1 or above, do not administer the cytarabine and immediately notify medical officer.

Administer cytarabine:

- via IV infusion over 3 hours
- flush with ~50 mL of sodium chloride 0.9%.

Administer second dose of cytarabine 12 hours after first dose.

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

Day 3 and 4

This is an oral treatment

Continue corticosteroid eye drops until 72 hours after completion of the last dose of cytarabine.

Dexamethasone

- administer orally ONCE a day in the morning with food **OR**
- via IV infusion over 15 minutes
- flush with ~ 50mL sodium chloride 0.9%
- patients may receive dexamethasone on day 3 and 4 orally as an outpatient or administered via IV infusion if still an inpatient

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

Deaccess TIVAD or CVAD.

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

Discharge information

Dexamethasone tablets

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

Antiemetics

- Antiemetics as prescribed.

Corticosteroid eye drops

- Continue corticosteroid eye drops for at least 72 hours after completion of final cytarabine dose.

Growth factor support

- Arrangements for administration if prescribed.

Prophylaxis medications

- Prophylaxis medications (if prescribed) i.e. tumour lysis prophylaxis, 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)	
Cytarabine (Ara-C) syndrome	Flu-like symptoms including fever, myalgia and malaise can occur 6 to 12 hours after cytarabine administration. Symptoms generally resolve within 24 hours of completing therapy.
Hypersensitivity reaction	Anaphylaxis and infusion related reactions can occur with this treatment. Read more about hypersensitivity reaction
Nausea and vomiting	Read more about prevention of treatment induced nausea and vomiting
Neurotoxicity	High dose cytarabine has been associated with acute cerebellar syndrome and diffuse cerebral dysfunction. Read more about neurotoxicity associated with high dose cytarabine
Ocular toxicities	Reversible corneal toxicity (keratitis), haemorrhagic conjunctivitis, vision loss and other ocular side effects can occur with high dose cytarabine. Corticosteroid eye drops must be administered concurrently with treatment. Read more about ocular toxicities associated with cytarabine
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
Diarrhoea	Read more about treatment induced diarrhoea
Fatigue	Read more about fatigue
Hypomagnesaemia, hypokalaemia, hypocalcaemia	Abnormally low levels of magnesium, potassium and calcium in the blood.
Nephrotoxicity	Renal dysfunction resulting from damage to the glomeruli, tubules or renal vasculature.
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
Ototoxicity	Tinnitus and hearing loss may occur due to damage in the inner ear. Tinnitus is usually reversible, while hearing loss is generally irreversible. Hearing loss is dose-related, cumulative and may be worse in those with pre-existing hearing problems. Read more about ototoxicity - tinnitus and hearing loss
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
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
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)

Evidence - Non-Hodgkin lymphoma

Extensive evidence supports the use of DHAP (dexamethasone, cytarabine, cisplatin) in patients with relapsed or refractory (RR), intermediate and high-grade non-Hodgkin lymphoma (NHL). DHAP is a treatment regimen in the European Society of Medical Oncology diffuse large B-cell lymphoma (DLBCL) Clinical Practice Guidelines[2] and the Australian Lymphoma Alliance Position Statement.[3] Salvage therapy with DHAP can be considered in appropriately selected patients fit for high-dose chemotherapy and autologous stem cell transplantation (ASCT). The evidence also supports the addition of Rituximab (R) to DHAP in patients with CD20+ B cell NHL.

DHAP was published as salvage therapy in 1988 following a single-arm, single-institution study of 90 patients with RR NHL treated between 1984 and 1986. DHAP was administered every 3-4 weeks, for 6-10 cycles (4 cycles beyond maximum tumour effect).[1]

In the PARMA trial,[4] DHAP (up to 6 cycles) has been compared with ASCT in chemo-sensitive patients with progressive relapsed NHL. Of 215 patients initially treated, median age 43 years, 109 patients completely or partially responded to 2 initial cycles of DHAP and were randomised to either ASCT with BEAC (carmustine, etoposide, cytarabine, cyclophosphamide) conditioning (n=55, "transplantation") or up to 4 more cycles of DHAP chemotherapy (n=54, "conventional therapy"). 106 patients failed to respond to initial DHAP or were otherwise excluded from the study.[4]

The Collaborative Trial in Relapsed Aggressive Lymphoma (CORAL) study was a multicentre international phase III randomised controlled trial (RCT), comparing the efficacy of R-DHAP and RICE (rituximab, ifosfamide, carboplatin, etoposide) in RR CD20+ DLBCL. From 2003 - 2007, 396 patients aged 18 - 65 years in 1st relapse or with refractory lymphoma following 1st line chemotherapy were randomised 1:1 to 3 cycles of R-ICE or 3 cycles of R-DHAP. Responding patients, evaluated after initial chemotherapy, proceeded with BEAM (carmustine, etoposide, cytarabine, melphalan) ASCT. Stem cell mobilisation occurred following the second or third cycle. The ASCT realisation rate was 55%. In both regimens, rituximab (375 mg/m^2) was administered before chemotherapy, and in the first course, additional rituximab was given on day −1.[5]

The NCIC Clinical Trials Group LY.12 study was a multicentre international phase III non-inferiority RCT to assess whether GDP (gemcitabine, dexamethasone, cisplatin) is non-inferior to DHAP in patients 18 years and older (28% >60 years, range 18.7 – 74.3 years), with RR aggressive NHL. From 2003 - 2011, 619 patients were randomly assigned 1:1 to either GDP or DHAP therapy. Patients with B cell NHL (554/619 patients) received rituximab on day 1 of each cycle of chemotherapy. 10.4% of patients were non-B-cell phenotype. The study was assessed by response rate (non-inferiority margin of 10%) and transplantation rate after 2 cycles of therapy. Responding patients proceeded to ASCT. Patients who had not achieved a complete or partial response after two treatment cycles were permitted to receive a third cycle of protocol therapy. ASCT realisation rate was 48.9% (no difference between treatment arms).[6]

Efficacy

In the 1998 study by Velasquez et al., there was an overall response rate (ORR) of 55% and a complete response (CR) rate of 31%.[1]

In the PARMA trial, after a median follow-up of 63 months, DHAP followed by ASCT was associated with an improved 5-year event-free survival (EFS) (46% vs 12%, p = 0.001) and overall survival (OS) (53% vs 32%, p=0.038). The trial was stopped early due to demonstrated superiority of ASCT. This study established the superiority of ASCT with BEAC conditioning over ongoing chemotherapy and provided information on outcomes of patients treated with up to 6 cycles of DHAP alone.[4]

Figure 1. Kaplan-Meier Curves for EFS in the PARMA trial.[4]

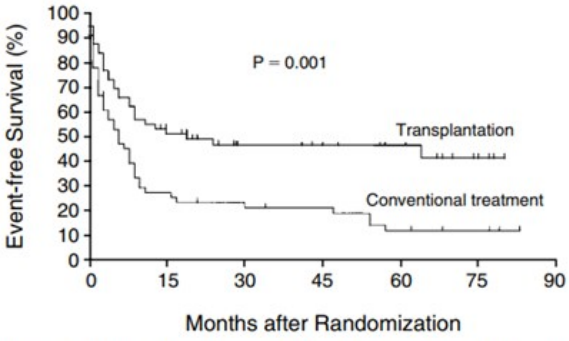


Figure 1. Kaplan–Meier Curves for Event-free Survival of Patients in the Transplantation and Conventional-Treatment Groups. The data are based on an intention-to-treat analysis. Tick marks represent censored data.

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The CORAL study demonstrated similar outcomes between the 2 treatment arms, with the trial failing to show superior efficacy of one treatment over the other. The ORR for patients receiving RICE was 63.5% (95% CI, 56.8 – 70.7%) vs R-DHAP 62.8% (95% CI, 55.6 – 69.7%). With regard to the 191 patients treated with R-DHAP, the CR/unconfirmed CR (CRu) rate was 40% and partial response (PR) rate 24%. For the entire group, with a median follow-up of 27 months, the 3-year EFS and OS was 31% (95% CI, 26 - 36%) and 49% (95% CI, 43 - 55%), respectively. There was no difference between the RICE and R-DHAP (EFS, 26% v 35%, p = 0.6 and OS, 47% v 51%, p = 0.4, respectively).[5]

In the NCIC Clinical Trials Group LY.12 study, there was no difference in ORR between treatment arms following 2 cycles – 45.1% (GDP) vs 44.1% (DHAP). In the DHAP arm, CR/CR(u) rate was 14.3% and PR rate 29.8%. At a median follow-up of 53 months, no differences were detected in EFS or OS between GDP and DHAP. Survival estimates were provided for patients completing ASCT: estimated 4-year EFS for DHAP was 48% (95% CI, 39-57%) vs 43% (95% CI, 34-51%) GDP, and 4-year OS for the DHAP arm was 63%

(95% CI 54-71%) and 62% (95% CI, 53-69%) in the GDP arm. GDP was found to be non-inferior to DHAP. [6]

Figure 2. PFS and OS from the LY.12 study[6]

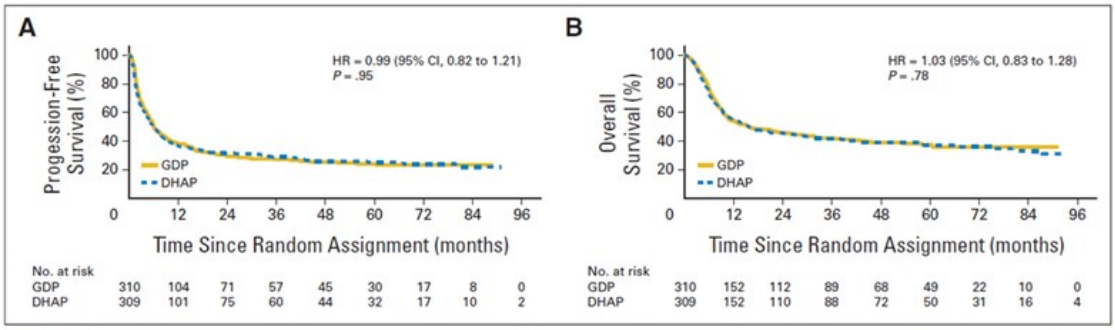

Fig 2. (A) Progression-free survival for patients randomly assigned to gemcitabine, dexamethasone, and cisplatin (GDP; gold line) or dexamethasone, cytarabine, and cisplatin (DHAP; blue dashed line). (B) Overall survival for patients randomly assigned to GDP (gold line) or DHAP (blue dashed line). HR, hazard ratio.

Toxicity

In the Velasquez et al. study, seven (7.7%) early deaths occurred, with myelosuppression, tumour lysis syndrome and renal toxicity noted.[1]

The CORAL study identified that grade 3 - 4 haematological toxicities occurred more often in the R-DHAP arm compared with RICE. 57% of patients treated with R-DHAP needed platelet transfusion vs 35% in the RICE arm. Rates of infection with neutropenia were similar (16%). Grade 3 - 4 non-haematological toxicity was more common in DHAP, including grade 3 - 4 renal toxicity in 6% of patients (versus 1% RICE arm).[5]

In the LY.12 study[6], for those receiving DHAP, 6 patients (2%) died of treatment-related complications. Grade 3 or 4 adverse events were observed significantly less frequently during the first two cycles of chemotherapy amongst patients receiving GDP than DHAP (47% v 61%, P<0.001), including fewer episodes of febrile neutropenia (9% v 23%, P<0.001) and fewer patients requiring hospitalisation for adverse events or other illness (18% v 30%, p<0.001). In those receiving DHAP, 11% of patients had an improved, clinically meaningful, quality of life score (FACT-Total score) while 41% had a worse clinically meaningful change, compared to the GDP arm, which was 18% and 33%, respectively. [6]

Table 1. Grade 3 - 4 adverse events from the LY.12 study[6]

Table 3. Most Serious Adverse Events

Adverse Event	GDP (n = 306) No.	GDP (n = 306) %	DHAP (n = 304) No.	DHAP (n = 304) %	P
Thrombosis/embolism	18	6	18	6	NS
Fatigue	30	10	28	9	NS
Nausea	13	4	25	8	.04
Vomiting	22	7	21	7	NS
Infection					
With grade 3 to 4 neutropenia	18	6	28	9	NS
Without neutropenia	21	7	22	7	NS
Febrile neutropenia	28	9	70	23	< .001
Syncope	7	2	16	5	
Worst overall	143	47	186	61	< .001

NOTE. Comparison of most frequently occurring serious adverse events, occurring in at least 5% of patients who received at least one dose of protocol therapy, at grade 3 or 4 (National Cancer Institute Common Toxicity Criteria version 2.0).
Abbreviations: DHAP, dexamethasone, cytarabine, cisplatin; GDP, gemcitabine, dexamethasone, cisplatin; NS, not significant.

Evidence - Hodgkin lymphoma

DHAP is considered an effective salvage regimen for patients with relapsed and refractory (RR) Hodgkin lymphoma (HL). The evidence for this is supported by a limited number of clinical trials but no randomised studies comparing conventional salvage

chemotherapy approaches. It is, however, recommended in the Hodgkin Lymphoma: ESMO Clinical Practice Guidelines[7]. In eligible patients, treatment consists of 2 cycles of DHAP followed by autologous stem cell transplant (ASCT).

The German Hodgkin Study Group (GHSG) conducted a multicenter, single-arm phase II study, testing the efficacy and tolerability of time-intensified DHAP with sequential dose-intensified chemotherapy and BEAM ASCT in patients with HL.[8] Two cycles of time-intensified DHAP was administered to 102 patients, median age 34 years (range 21-64 years), with first or subsequent relapsed or refractory HL. The second cycle was given at a median of 16 days after cycle 1, with granulocyte-colony stimulating factor (G-CSF) 5 mcg/kg/day given on days 4 - 13. Peripheral blood stem cell (PBSC) harvest was successful in 96% of patients, although the majority of patients were harvested separately during sequential high-dose therapy (cyclophosphamide). [8]

HDR-2 was a randomised, prospective, multicenter intergroup, phase III study in 95 European centres that compared BEAM ASCT with single high-dose therapy and BEAM ASCT in eligible patients who responded to 2 cycles of DHAP salvage chemotherapy.[9] These patients were randomised to either the intensified arm (further chemotherapy and BEAM ASCT) or the standard arm (BEAM ASCT). From 2000 – 2006, 281 patients were initially treated with 2 cycles of DHAP and stem cells were collected following cycle 1, with G-CSF used in both cycles. The primary endpoint was freedom from treatment failure (FFTF). [9]

Efficacy

In the GHSG study,[8] objective response rate (ORR) assessed after 2 cycles was 88%, with 21% complete response (CR) and 67% partial response (PR). Subgroup analysis showed results comparable in patients with early and late relapses (93% vs 91%), but less in those with primary refractory disease (65%). After a median follow-up of 18 months (3 – 31 months), FFTF and overall survival (OS) for the whole high-dose sequential treatment program was 59% and 78%, respectively. By subgroup, FFTF in those with early relapse HL was 64%; late relapse, 68%; primary refractory, 30%; multiple relapses, 55%.[8]

In the HDR-2 trial,[9] after 2 cycles of DHAP, 68 (24%) patients had achieved CR/CR(unconfirmed), 129 (46%) PR, and 55 (20%) with stable disease. For both groups, after a median observation time of 42 months, there was no difference in outcome (FFTF and OS). FFTF rates were 71% and 65% (p = 0.557) for standard versus intensified therapy, respectively, and OS 87% versus 80% (p = 0.816).[9]

Figure 2. HDR-2 trial Kaplan-Meier curves from treatment begin to 5 years.[9]

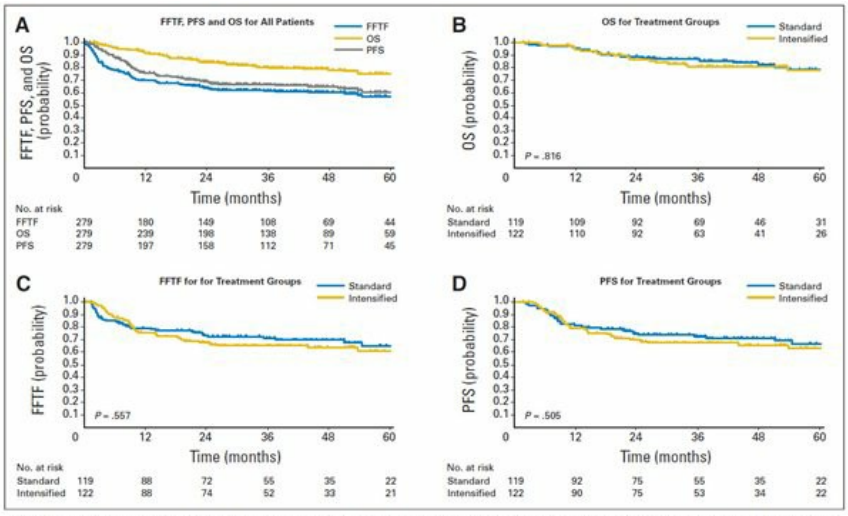

Fig 2. Kaplan-Meier curves from treatment begin to 5 years. (A) Freedom from treatment failure (FFTF), progression-free survival (PFS), and overall survival (OS) for total evaluable intention-to-treat sample. (B) OS of randomly assigned patients in standard arm A and intensified arm B. (C) FFTF in randomly assigned patients of standard arm A and intensified arm B. (D) PFS of randomly assigned patients in standard arm A and intensified arm B.

Toxicity

In the GHSG study, toxicities included myelosuppression in 43% of cycles and platelet count less than 25 in 48% of cycles.[8]

In HDR-2, substantial toxicity was reported for the approach overall, but this was expected due to the nature of high-dose therapy/ASCT. Almost all patients reported at least one adverse event, World Health Organisation (WHO) grade 3 or 4 (96% standard arm and 98% intensified arm).[9]

Table 1. HDR-2 toxicity[9]

Table 2. Toxicity

Variable	Total (N =223) No.	%	Standard Arm A (n = 113) No.	%	Intensified Arm B (n = 110) No.	%
WHO grade 3/4 toxicities						
Anemia	136	61	59	52	77	70
Thrombopenia	202	91	100	89	102	93
Leukopenia	196	88	98	87	98	89
Infection	90	40	37	33	53	48
Nausea	90	40	40	35	50	46
Mucositis	138	62	64	57	74	67
Respiratory	18	8	7	6	11	10
Before BEAM WHO grade						
0-2	25	11	21	19	4	4
3	50	23	41	36	9	8
4	148	66	51	45	97	88

Abbreviation: BEAM, carmustine, etoposide, cytarabine, and melphalan.

References

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History

Version 3

Date	Summary of changes
6/12/2023	Reviewed electronically by the Haematology Reference Committee with the following changes made:

	• frequency variation removed and note added • addition of note about G-CSF • changed into multi-indication format • evidence for non-Hodgkin lymphoma updated • evidence for Hodgkin lymphoma updated Increased to version 3. Review in 4 years.

Version 2

Date	Summary of changes
13/02/2017	Approved and published on eviQ
31/05/2017	Transferred to new eviQ website. Version number changed to V.2. Antiemetic change: Netupitant/palonosetron combination has replaced aprepitant and a $5HT_3$ receptor antagonist in combination with dexamethasone for all highly emetogenic regimens.
10/10/2019	Clinical information updated with PBS expanded indications for G-CSF.
06/07/2020	Note added for modified cytarabine dose for patients aged older than 70 years to $1g/m^2$. Reviewed by Haematology Reference Committee, nil significant changes, review in 4 years.
20/01/2022	Interactions updated.

First approved: 13 February 2017
Last reviewed: 6 December 2023
Review due: 30 June 2027

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/833
08 Dec 2023

Patient information - Lymphoma - DHAP (dexamethasone, cytarabine, cisplatin)

Patient's name:

Your treatment

The treatment schedule below explains how the drugs for this treatment are given. It may be given to treat non-Hodgkin lymphoma or Hodgkin lymphoma.

DHAP (dexamethasone, cytarabine, cisplatin)

This treatment cycle is repeated every 21 days. Your doctor will advise you of the number of treatments you will have.

Day	Treatment	How it is given	How long it takes
1 to 4	**Dexamethasone** (*dex-a-METH-a-sone*)	By a drip into a vein **OR** take orally ONCE a day in the morning with food on days 1 to 4 only. If you forget to take your tablets or vomit your tablets, contact your treating team.	About 15 minutes if given by a drip
1	**Cisplatin** *(siss-PLAT-in)*	By a drip into a vein	About 24 hours
2	**Cytarabine** (*sye-TARE-a-been*)	By a drip into a vein	About 3 hours TWICE a day

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.

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 involves 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.
- **Eye drops:** you will be given eye drops to help prevent sore eyes. You will start using the eye drops before you have your first dose of cytarabine and continue to use the eye drops until 72 hours after your last dose of cytarabine.
- **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.
- **G-CSF:** you may be given injection(s) of a drug called G-CSF (also called filgrastim, lipegfilgrastim or pegfilgrastim) under your skin. This helps to boost your white blood cell count. Your white blood cells help to fight infection. Lipegfilgrastim and pegfilgrastim are given once. Filgrastim is given for several days until your white blood cells recover. Your doctor will decide if you need this medication. Follow this link to read more information on how to give this injection.

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)	
Flu-like symptoms from cytarabine	• You may get a fever, skin rash, aches and pains or increased sweating. • These symptoms are caused by the drug cytarabine. • Symptoms usually happen 6 to 12 hours after your dose, and may last until 24 hours after your treatment has finished. • To reduce any pain or fever, take paracetamol, if needed. • Don't take aspirin, ibuprofen or other similar anti-inflammatory medications unless your doctor tells you to. • Tell your doctor or nurse if these symptoms do not get better after 24 hours.

Allergic reaction	• Allergic reactions are uncommon but can be life threatening. • **If you feel unwell during the infusion or shortly after it, or:** ◦ **get a fever, shivers or shakes** ◦ **feel dizzy, faint, confused or anxious** ◦ **start wheezing or have difficulty breathing** ◦ **have a rash, itch or redness of the face** **<u>While you are in hospital:</u> Tell your doctor or nurse immediately.** **<u>After you leave:</u> Contact your doctor or nurse immediately, or go to the nearest hospital Emergency Department.**
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.**
Nervous system changes from cytarabine	• High doses of cytarabine can affect the nervous system. • **Tell your doctor or nurse immediately, or go to the nearest hospital Emergency Department if you get any of the following symptoms during or soon after your treatment:** ◦ **dizziness, drowsiness or double vision** ◦ **agitation** ◦ **difficulty walking in a straight line** ◦ **difficulty writing with a pen or pencil** ◦ **jerky movements** ◦ **slow, slurred speech.**
Eye problems from cytarabine	• You may get: ◦ eye pain or irritation ◦ blurred vision ◦ watery or gritty eyes ◦ sensitivity to light. • You will be given eye drops to help prevent and control these symptoms. It is important to use these eye drops as directed. • Protect your eyes from the weather (sun and wind) by wearing sunglasses, especially if you have lost your eyelashes. • Tell your doctor or nurse if you get any of the symptoms listed above.
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.**
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.**
Diarrhoea	• 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.**
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.**

Low blood magnesium, potassium and calcium levels (hypomagnesaemia, hypokalaemia, hypocalcaemia)	• This may be found from your routine blood tests and treated by your doctor. • If it is severe you may get: ◦ muscle cramps or twitches ◦ numbness or tingling in your fingers, toes or around your mouth ◦ constipation ◦ an irregular heartbeat ◦ sleepy, drowsy or confused • **Tell your doctor or nurse as soon as possible if you get any of the signs or symptoms listed above.**
Kidney damage	• This treatment can cause changes to how your kidneys work. • You will have blood tests to make sure your kidneys are working properly. • You may need to drink more fluids while you are having treatment. Your doctor or nurse will tell you if you need to do this. • **Tell your doctor or nurse as soon as possible if you notice that your urine changes colour or you don't need to empty your bladder as often.**
Mouth pain and soreness (mucositis)	• 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.**
Hearing changes (ototoxicity)	• You may get ringing in your ears or loss of hearing. • You may have your hearing tested before and during your treatment. • **Tell your doctor or nurse as soon as possible if you notice any changes to your hearing.**
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.

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
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.

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.
- 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.

Risk of developing a second cancer

- Some anticancer treatments can increase your chance of developing a second cancer, this is rare. Your doctor will discuss with you the specific risks of your treatment.

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)
- Call the Myeloma Australia Support Line on 1800 693 566 (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 – https://aci.health.nsw.gov.au/networks/bmtct
- 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
- Carer Help - carerhelp.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: 13 February 2017
Last reviewed: 6 December 2023
Review due: 30 June 2027

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https://www.eviq.org.au/pi/833
08 Dec 2023