GMALL 2002 block A (patients over 55 years) SUPERSEDED

ID: 1956 v.8 **Superseded**

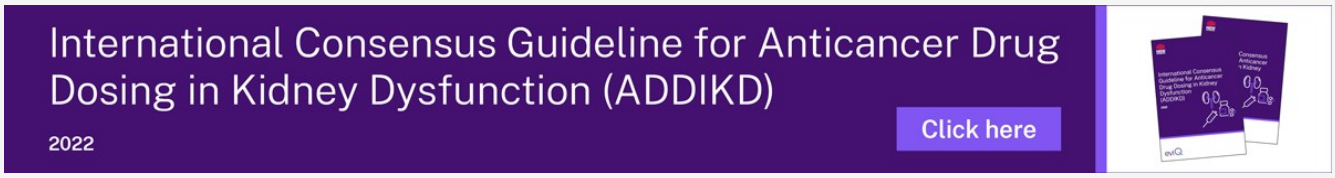
This protocol has been superseded due to unavailability of teniposide. It has been replaced by ID 3929 GMALL 2002 block A (patients over 55 years)

⚠ Teniposide drug supply:
Teniposide was removed from the Australian Register of Therapeutic Goods (ARTG) in June 2017 as global production was ceased. Access to teniposide may still be available via the Special Access Scheme.

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

This protocol is based on limited evidence; refer to the evidence section of this protocol for more information.

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:

- GMALL 2002 overview (patients over 55 years)
- GMALL 2002 overview (patients under 55 years)

Treatment schedule - Overview

Cycle 1 and 2

Drug	Dose	Route	Day
Rituximab	375 mg/m^2	IV infusion	1
Dexamethasone	10 mg/m^2 ONCE a day	PO	2 to 6
iFOSFamide	400 mg/m^2	IV infusion	2 to 6
Mesna	400 mg/m^2	IV infusion	2 to 6
Mesna	400 mg at 2 and 6 hours post completion of ifosfamide infusion	PO	2 to 6
Methotrexate	50 mg/m^2	IV infusion	2
Methotrexate	450 mg/m^2	IV infusion	2
Methotrexate	12 mg	Intrathecal	2
Calcium folinate (Leucovorin)	50 mg every 6 hours *	IV bolus	3
Cytarabine (Ara-C)	60 mg/m^2 TWICE a day	IV infusion	5 and 6

Drug	Dose	Route	Day
Teniposide	60 mg/m^2	IV infusion	5 and 6
Filgrastim	5 micrograms/kg	Subcut	8 and continue daily until neutrophil recovery

* for 24 hours, followed by 15 mg every 6 hours until methotrexate level is less than 0.1 micromol/L. Commence 42 hours after the start of methotrexate infusion.

Frequency: 21 days

Cycles: 2 to 3 depending on the stage of disease.

Stage I/II disease	Total of 4 cycles (A1-B1-A2-B2) followed by two additional doses of rituximab every 21 days after completion of B2.[1]
Stage III/IV disease or mediastinal and extra-nodal involvement	Total of 6 cycles (A1-B1-A2-B2-A3-B3) followed by two additional doses of rituximab every 21 days after completion of B3.[1]

Notes:

- Before each cycle, haematologic regeneration with granulocytes >1000/mL, platelets >50000/mL, the absence of grade 3/4 mucositis, or other severe organ toxicities was required.[1]
- This treatment should only be carried out in a major centre as intense monitoring and support is required.
- Central nervous system (CNS) irradiation (24 Gy) was recommended after 6 cycles for all patients with initial CNS involvement; mediastinal irradiation (36 Gy) was recommended for those with residual tumours at other sites.[1]

Drug status: **Filgrastim:** (PBS authority)

Rituximab, dexamethasone, **methotrexate**, **calcium folinate**, **ifosfamide**, **mesna** (IV) and **cytarabine** are on the PBS general schedule

Mesna (oral) is TGA approved but not PBS reimbursed

Teniposide was removed from the ARTG in June 2017 due to worldwide production cessation. Access to teniposide may still be available via the Special Access Scheme. opens in a new tab or window

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

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		
Paracetamol	1,000 mg (PO)	60 minutes before treatment
Loratadine	10 mg (PO)	60 minutes before treatment
Hydrocortisone	100 mg (IV)	30 minutes before treatment
Rituximab	375 mg/m^2 (IV infusion)	in 500 mL sodium chloride 0.9% as per graded administration rate

Day 2		
Dexamethasone	10 mg/m^2 (PO)	ONCE a day on days 2 to 6. Take in the morning with food.

Day 2		
iFOSFamide	400 mg/m^2 (IV infusion)	in 1000 mL sodium chloride 0.9% over 2 hours (loaded with mesna)
Mesna	400 mg/m^2 (IV infusion)	in 1000 mL sodium chloride 0.9% over 2 hours (loaded with ifosfamide)
Mesna	400 mg (PO)	at 2 hours and 6 hours after completion of ifosfamide infusion
Methotrexate	50 mg/m^2 (IV infusion)	in 100 mL sodium chloride 0.9% over 30 minutes.
Methotrexate	450 mg/m^2 (IV infusion)	in 500 mL sodium chloride 0.9% over 23.5 hours
Methotrexate	12 mg (Intrathecal)	adhere to local institution intrathecal policy

Day 3		
Dexamethasone	10 mg/m^2 (PO)	ONCE a day on days 2 to 6. Take in the morning with food.
iFOSFamide	400 mg/m^2 (IV infusion)	in 1000 mL sodium chloride 0.9% over 2 hours (loaded with mesna)
Mesna	400 mg/m^2 (IV infusion)	in 1000 mL sodium chloride 0.9% over 2 hours (loaded with ifosfamide)
Mesna	400 mg (PO)	at 2 hours and 6 hours after completion of ifosfamide infusion
Calcium folinate (Leucovorin)	50 mg (IV bolus)	over 1 to 2 minutes every 6 hours for 24 hours, followed by 15 mg every 6 hours until methotrexate level is less than 0.1 micromol/L. Commence 42 hours after the start of methotrexate infusion.

Day 4		
Dexamethasone	10 mg/m^2 (PO)	ONCE a day on days 2 to 6. Take in the morning with food.
iFOSFamide	400 mg/m^2 (IV infusion)	in 1000 mL sodium chloride 0.9% over 2 hours (loaded with mesna)
Mesna	400 mg/m^2 (IV infusion)	in 1000 mL sodium chloride 0.9% over 2 hours (loaded with ifosfamide)
Mesna	400 mg (PO)	at 2 hours and 6 hours after completion of ifosfamide infusion

Day 5 and 6		
Dexamethasone	10 mg/m^2 (PO)	ONCE a day on days 2 to 6. Take in the morning with food.
Cytarabine (Ara-C)	60 mg/m^2 (IV infusion)	TWICE a day in 100 mL sodium chloride 0.9% over 60 minutes (12 hours apart)
Teniposide	60 mg/m^2 (IV infusion)	in 500 mL sodium chloride 0.9% over 30 to 60 minutes (in non-PVC containers only)
iFOSFamide	400 mg/m^2 (IV infusion)	in 1000 mL sodium chloride 0.9% over 2 hours (loaded with mesna)
Mesna	400 mg/m^2 (IV infusion)	in 1000 mL sodium chloride 0.9% over 2 hours (loaded with ifosfamide)
Mesna	400 mg (PO)	at 2 hours and 6 hours after completion of ifosfamide infusion

Day 8		

Day 8		
Filgrastim	5 micrograms/kg (Subcut)	inject subcutaneously on day 8 and continue daily until neutrophil recovery.

Frequency: 21 days

Cycles: 2 to 3 depending on the stage of disease.

Stage I/II disease	Total of 4 cycles (A1-B1-A2-B2) followed by two additional doses of rituximab every 21 days after completion of B2.[1]
Stage III/IV disease or mediastinal and extra-nodal involvement	Total of 6 cycles (A1-B1-A2-B2-A3-B3) followed by two additional doses of rituximab every 21 days after completion of B3.[1]

Indications and patient population

- Burkitt lymphoma and/or mature B-cell acute lymphoblastic leukaemia in patients over 55 years of age

Clinical information

Venous access	Central venous access device (CVAD) is required to administer this treatment. Read more about central venous access device line selection
Hypersensitivity/infusion related reaction	High risk with rituximab and teniposide. Read more about Hypersensitivity reaction
Premedication	The product information states that premedication is required for this treatment. Please refer to the treatment schedule for suggested premedication regimen. This may be substituted to reflect institutional policy.
Antiemetics for multi-day protocols	Antiemetic therapy should be administered throughout the duration of the chemotherapy protocol and to cover delayed nausea. The acute and delayed emetic risk of multi-day chemotherapy protocols will overlap depending on the individual drugs and their sequence of administration. More or less antiemetic cover may be required. For patients with a prior episode of chemotherapy induced nausea or vomiting, a NK1 receptor antagonist is available on the PBS in combination with a $5HT_3$ receptor antagonist and dexamethasone. 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
Rituximab rapid infusion	This regimen is not in line with the product monograph, however published literature indicates that it can be completed safely. Read more about the rapid infusion of rituximab
Progressive multifocal leukoencephalopathy	Use of monoclonal antibodies may be associated with an increased risk of progressive multifocal leukoencephalopathy (PML), a rare but potentially fatal opportunistic viral infection of the brain. Patients must be monitored for any new or worsening neurological symptoms. Read more about progressive multifocal leukoencephalopathy and the Therapeutic Goods Administration Medicines Safety update on progressive multifocal leukoencephalopathy from the Australian Government, Department of Health.

Pre-hydration	Pre-hydration with sodium bicarbonate 8.4% infusion. Urinary pH must be greater than 7 prior to commencing methotrexate infusion. Consider prescribing sodium bicarbonate oral capsules for administration prior to methotrexate infusion. Sodium bicarbonate 8.4% should continue until the methotrexate level is equal to or less than 0.1 micromol/L. Read more about high dose methotrexate-induced toxicity.
High dose methotrexate	Monitoring of methotrexate levels is essential as delayed methotrexate excretion is potentially an emergency situation. Methotrexate levels to be monitored every 24 hours until level is less than 0.1 micromol/L. Methotrexate is renally eliminated. Kidney function must be evaluated prior to treatment. Methotrexate exits slowly from third space compartments (e.g. pleural effusions or ascites), resulting in a prolonged terminal plasma half-life and unexpected toxicity. In patients with significant third space accumulations, it is advisable to evacuate the fluid before treatment and to monitor plasma methotrexate levels. Glucarpidase is recommended in patients with high dose methotrexate (HDMTX)-induced acute kidney injury and delayed methotrexate clearance. It can rapidly lower methotrexate levels and early administration within 48 to 60 hours from the start of the HDMTX infusion is critical, as life-threatening toxicities may not be preventable beyond this time point.[2] Read more about high dose methotrexate-induced toxicity.
Methotrexate interactions	Avoid administering the following drugs in combination with high dose methotrexate: ciprofloxacin, NSAIDs, probenecid, proton pump inhibitors (PPIs) (e.g. esomeprazole, omeprazole, pantoprazole), sulphonamides (e.g. sulfamethoxazole (in Bactrim®, Septrin®)), penicillins (e.g. piperacillin (in Tazocin®)) and trimethoprim. Severe mucositis may occur if administered together.
Haemorrhagic cystitis associated with high dose chemotherapy	Hydration regimen pre high dose cyclophosphamide or ifosfamide (as per local guidelines). There is limited evidence and no consensus regarding hydration regimens and mesna dose, route or timing of administration. Read more about haemorrhagic cystitis
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	Assess patient for risk of developing tumour lysis syndrome. Read more about prevention and management of tumour lysis syndrome.
Mesna dosing and administration	There is evidence supporting variations in mesna doses and administration timings, with no clear evidence that one particular regimen is superior to another. The eviQ mesna recommendations may be based upon the individual trial/study or reference committee consensus and provide guidance on one safe way to administer the protocol. Individual institutional policy may vary and should be evidence-based. Read more about haemorrhagic cystitis
Pneumocystis jirovecii pneumonia (PJP) prophylaxis	PJP prophylaxis is recommended. Myelosuppression may be exacerbated if trimethoprim/sulfamethoxazole is used in combination with methotrexate. Read about prophylaxis of pneumocystis jirovecii (carinii) in cancer patients
Antiviral prophylaxis	Antiviral prophylaxis is recommended. 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
Biosimilar drug	Read more about biosimilar drugs on the Biosimilar Awareness Initiative page

Blood tests	FBC, EUC, eGFR, LFTs, LDH and BSL at baseline, prior to each treatment and regularly throughout treatment. Methotrexate levels to be monitored every 24 hours until level is less than 0.1 micromol/L.
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 reduction may be required at the discretion of the Haematologist

Renal impairment
Creatinine clearance must be greater than 50 mL/min prior to administration of high dose methotrexate

Hepatic impairment	
Hepatic dysfunction	
Severe	Reduce methotrexate by 25%

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.

Mucositis, stomatitis and diarrhoea	
Grade 3 or Grade 4	Diarrhoea and ulcerative stomatitis require interruption of therapy otherwise haemorrhagic enteritis and death from intestinal perforation may occur; reduce methotrexate by 25%

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*

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

Ifosfamide		
	Interaction	**Clinical management**
Aprepitant	Increased risk of ifosfamide-induced neurotoxicity due to increased levels of active metabolites	Avoid combination or monitor closely for neurotoxicity; consider alternate antiemetic regimens
Nephrotoxic drugs (e.g. aminoglycosides, amphotericin, contrast dye, frusemide, NSAIDs)	Additive nephrotoxicity	Avoid combination or monitor kidney function closely
CYP3A4 inducers (e.g. carbamazepine,	Increased toxicity of ifosfamide possible	Avoid combination or monitor for

Ifosfamide		
phenytoin, phenobarbitone, rifampicin, St John's wort etc.)	due to increased conversion to active and toxic metabolites	ifosfamide toxicity
CYP3A4 inhibitors (e.g. azole antifungals, clarithromycin, erythromycin, grapefruit juice, ritonavir etc.)	Reduced efficacy of ifosfamide possible due to decreased conversion to active metabolites	Avoid combination or monitor for decreased clinical response to ifosfamide
Suxamethonium	Potentiation of muscle relaxant effect possible	Alert the anaesthetist if a patient has been treated with ifosfamide within ten days of planned general anaesthesia
CNS depressants (including opiates, opioids, phenothiazines)	Increased risk of ifosfamide-induced neurotoxicity due to additive CNS effects	Avoid combination or monitor for excessive CNS depression/encephalopathy

Mesna
No specific or clinically significant drug interactions

Methotrexate		
	Interaction	**Clinical management**
Ciprofloxacin **NSAIDS** **Probenecid** **Proton pump inhibitors (e.g. esomeprazole, omeprazole, pantoprazole)**	Increased toxicity of methotrexate possible due to reduced clearance	Avoid combination or monitor for methotrexate toxicity Important note: with high-dose methotrexate therapy, many of these drug combinations are *contraindicated*
Sulphonamides and penicillins (e.g. sulfamethoxazole (in Bactrim®, Septrin®), piperacillin (in Tazocin®) etc.)	Increased toxicity of methotrexate possible due to displacement from serum protein binding	Avoid combination or monitor for methotrexate toxicity
Trimethoprim	Increased toxicity of methotrexate possible due to additive antifolate activity	Avoid combination or monitor for methotrexate toxicity
Mercaptopurine	Increased toxicity of mercaptopurine possible due to reduced clearance	Avoid combination or monitor for mercaptopurine toxicity
Nephrotoxic drugs (e.g. aminoglycosides, amphotericin, contrast dye, frusemide, NSAIDs)	Additive nephrotoxicity	Avoid combination or monitor kidney function closely
Hepatotoxic drugs (e.g. azathioprine, leflunomide, retinoids, sulfasalazine)	Additive hepatotoxicity	Avoid combination or monitor liver function closely
Folic acid (e.g. as in multivitamins) **Asparaginase (administered immediately prior or concurrently)**	Reduced efficacy of methotrexate possible due antagonism of its action	Avoid combination or monitor for decreased clinical response to methotrexate Note: asparaginase administered shortly after methotrexate can enhance its efficacy and reduce its toxicity
Infliximab	Altered methotrexate concentration	Monitor for signs of methotrexate toxicity or reduced efficacy

Rituximab		
	Interaction	**Clinical management**
Antihypertensives	Additive hypotensive effect	Consider withholding antihypertensive medications 12 hours prior to the rituximab infusion
Immunosuppressants (eg. abatacept and baricitinib etc.)	Increased risk of infection	Concurrent use not recommended. If an immunosuppressant must be used, monitor closely for signs of infection

Teniposide		
	Interaction	**Clinical management**
Anticonvulsants (e.g. phenytoin, phenobarbitone)	Reduced efficacy of teniposide possible due to increased clearance	Avoid combination or monitor for decreased clinical response to teniposide. Consider increasing the dose of teniposide

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

Handling of monoclonal antibodies and waste management

Safe administration

General patient assessment prior to each day of treatment.

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.

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

Pre treatment medication

Verify premedication taken or administer as prescribed.

Treatment - Time out

Rituximab

Prior to administration:

- check baseline observations
- check for previous adverse events during previous infusions
- verify premedication has been taken. If not, administer 30 to 60 minutes prior to rituximab administration:
  - paracetamol 1000 mg orally AND
  - loratadine 10 mg orally (or similar antihistamine)
  - a steroid may also be included as a premed according to local guidelines: dexamethasone (part of this protocol) or hydrocortisone 100 mg IV

Initial infusion:

- **commence rituximab** infusion at 50 mg/hr for 30 minutes
- repeat observations prior to each rate increase
- **increase rate** by 50 mg/hr every 30 minutes, up to a maximum of 400 mg/hr if observations are stable
- flush with ~ 50 mL of sodium chloride 0.9%

If an infusion reaction occurs, temporarily discontinue the infusion and notify medical officer

- when symptoms have completely resolved, recommence the infusion at **half the rate** prior to the reaction
- for severe reactions **stop** infusion and manage as per emergency

Transient hypotension may occur. Consider withholding antihypertensive medication for 12 hours before and during infusion.

Subsequent infusions:

If an adverse event was experienced with initial infusion recommence infusion at the same rate as initial infusion

If **no** adverse event experienced with initial infusion:

- perform baseline observations and repeat observations prior to each rate increase
- **commence** rituximab infusion at 100 mg/hr
- increase rate by 100 mg/hr increments every 30 minutes to a maximum of 400 mg/hr if observations are stable
- flush with ~ 50 mL of sodium chloride 0.9%

If an infusion reaction occurs, temporarily discontinue the infusion and notify medical officer

- when symptoms have resolved, recommence the infusion at **half the rate** prior to the reaction
- for severe reactions **stop** infusion and manage as per emergency

Read more about rapid infusion rituximab

Day 2

Safe handling and waste management

Safe administration

General patient assessment prior to each day of treatment.

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

- daily weight
- strict fluid balance
- dipstick urinalysis:
  - prior to treatment for haematuria and pH level
  - on all urine output to monitor pH

Hydration if prescribed

Pre treatment medication

Verify antiemetics taken or administer as prescribed.

Dexamethasone

- administer orally ONCE a day in the morning on **days 2 to 6**
- to be taken with or immediately after food.

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

Chemotherapy - Time out

Ifosfamide

Prior to administration:

- assess neurological function at baseline and prior to each ifosfamide dose
  - inpatients: 4 hourly assessments until 24 hours after ifosfamide infusion is completed
  - outpatients: advise patient/carer of the potential for neurotoxicity
    - neurological assessment tool
- perform baseline urinalysis and monitor for haematuria prior to each ifosfamide dose
  - note the administration of mesna will cause a false positive for ketonuria
- ensure patient receives at least 3 L of IV or oral fluids per day

Administer ifosfamide (irritant) with mesna:

- via IV infusion over 2 hours
- flush with ~100 mL of sodium chloride 0.9%

Oral mesna

- administer 400 mg orally at 2 hours and 6 hours post completion of ifosfamide/mesna infusion
- if vomiting occurs within 2 hours of taking oral mesna, repeat the dose or give IV mesna
- if patient cannot tolerate oral mesna, it may be given by IV bolus
- the oral mesna dose is equivalent to twice the IV dose.

Methotrexate infusion

Prehydration:

- administer 100 mL sodium bicarbonate 8.4% in 1000 mL glucose 5% **OR** sodium chloride 0.9% over 4 hours
- continuous hydration with sodium bicarbonate 8.4% as prescribed
- when urine pH is greater than 7 commence methotrexate

If the urine pH drops below 7 during the methotrexate infusion:

- administer stat dose of 100 mL sodium bicarbonate 8.4% over 15 minutes
- continue to test all urine for pH, if the pH continues to drop below 7 seek medical review as further doses of sodium bicarbonate may be required

Note: A large volume of intravenous fluid is 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 is present review by medical officer (diuretics may be required)

First dose of methotrexate:

- administer via IV infusion over 30 minutes
- the starting time of the methotrexate infusion **must** be documented as the calcium folinate (leucovorin) rescue is to commence exactly 42 hours after the commencement of the methotrexate and continue until the methotrexate level is less than 0.1 micromol/L

Second dose of methotrexate (to commence immediately after the first dose):

- administer via IV infusion over 23 and a half hours
- flush with ~50 mL of sodium chloride 0.9%
- **Stop the methotrexate infusion after 23 and a half hours even if the infusion is not completed**

Post methotrexate:

- continue hydration over 8 hours with sodium bicarbonate 8.4% until methotrexate level is less than 0.1 micromol/L
- a minimum of 3 litres of fluid should be administered daily
- continue to monitor all urine pH and fluid input and output
- monitor methotrexate concentration every 24 hours until the level is less than 0.1 micromol/L

Note: Start calcium folinate (leucovorin) rescue 42 hours after commencement of methotrexate infusion and repeat every 6 hours until methotrexate level is less than 0.1 micromol/L.

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 3 and 4

Safe handling and waste management

Safe administration

General patient assessment prior to each day of treatment.

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

- daily weight

- strict fluid balance
- dipstick urinalysis:
  - prior to treatment for haematuria and pH level
  - on all urine output to monitor pH

Hydration if prescribed

Pre treatment medication

Verify antiemetics taken or administer as prescribed.

Dexamethasone

- administer orally ONCE a day in the morning on **days 2 to 6**
- to be taken with or immediately after food.

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

Chemotherapy - Time out

Ifosfamide

Prior to administration:

- assess neurological function at baseline and prior to each ifosfamide dose
  - inpatients: 4 hourly assessments until 24 hours after ifosfamide infusion is completed
  - outpatients: advise patient/carer of the potential for neurotoxicity
    - neurological assessment tool
- perform baseline urinalysis and monitor for haematuria prior to each ifosfamide dose
  - note the administration of mesna will cause a false positive for ketonuria
- ensure patient receives at least 3 L of IV or oral fluids per day

Administer ifosfamide (irritant) with mesna:

- via IV infusion over 2 hours
- flush with ~100 mL of sodium chloride 0.9%

Oral mesna

- administer 400 mg orally at 2 hours and 6 hours post completion of ifosfamide/mesna infusion
- if vomiting occurs within 2 hours of taking oral mesna, repeat the dose or give IV mesna
- if patient cannot tolerate oral mesna, it may be given by IV bolus
- the oral mesna dose is equivalent to twice the IV dose.

Calcium Folinate (Leucovorin)

Commence 42 hours after commencement of methotrexate infusion and repeat every 6 hours until methotrexate level is less than 0.1 micromol/L.

- administer via IV bolus via the side port of the IV line over 1 to 2 minutes
- flush with ~ 50 mL of sodium chloride 0.9%

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

Days 5 and 6

Safe handling and waste management

Safe administration

General patient assessment prior to each day of treatment.

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

- daily weight
- daily dipstick urinalysis
- strict fluid balance

Hydration if prescribed

Pre treatment medication

Verify antiemetics taken or administer as prescribed.

Dexamethasone

- administer orally ONCE a day in the morning on **days 2 to 6**
- to be taken with or immediately after food.

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

Chemotherapy - Time out

Cytarabine infusion:

- administer via IV infusion over 60 minutes
- flush with ~50 mL of sodium chloride 0.9%.

Administer second dose of cytarabine 12 hours after first dose.

Teniposide

Administer teniposide (irritant):

- via IV infusion over 30 to 60 minutes
- use non PVC containers and tubing
- rapid infusion may cause hypotension
- observe for hypersensitivity
- flush with ~ 100 mL sodium chloride 0.9%.

Stop infusion at first sign of reaction:

- if symptoms are mild and resolve when infusion is stopped, consider recommencing infusion after review by medical officer at a slower rate.
- for severe reactions seek medical assistance immediately and do not restart infusion.

Ifosfamide

Prior to administration:

- assess neurological function at baseline and prior to each ifosfamide dose
  - inpatients: 4 hourly assessments until 24 hours after ifosfamide infusion is completed
  - outpatients: advise patient/carer of the potential for neurotoxicity
    - neurological assessment tool
- perform baseline urinalysis and monitor for haematuria prior to each ifosfamide dose
  - note the administration of mesna will cause a false positive for ketonuria
- ensure patient receives at least 3 L of IV or oral fluids per day

Administer ifosfamide (irritant) with mesna:

- via IV infusion over 2 hours
- flush with ~100 mL of sodium chloride 0.9%

Oral mesna

- administer 400 mg orally at 2 hours and 6 hours post completion of ifosfamide/mesna infusion
- if vomiting occurs within 2 hours of taking oral mesna, repeat the dose or give IV mesna
- if patient cannot tolerate oral mesna, it may be given by IV bolus
- the oral mesna dose is equivalent to twice the IV dose.

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

Day 8

Filgrastim

- inject subcutaneously ONCE daily, starting on day 8 and continue until neutrophil recovery

Discharge information

Antiemetics

- Antiemetics as prescribed.

Growth factor support

- Growth factor support arrangements for administration and detailed instructions of when to present for blood tests/monitoring.

Patient information

- Ensure patient receives patient information sheet.

Prophylaxis medications

- Prophylaxis medications (if prescribed) i.e. tumour lysis prophylaxis, PJP prophylaxis, antifungals, antivirals.

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)	
Bone pain	Bone pain, usually in the lower back or pelvis, associated with G-CSF.
Encephalopathy	Ifosfamide induced encephalopathy has been reported in 10 to 30% of patients receiving high dose ifosfamide. Common symptoms include confusion, ataxia, weakness, seizures, somnolence and hallucinations. Onset may be 2 to 48 hours after commencing treatment. When reversible, symptoms usually resolve within 1 to 3 days. Read more about ifosfamide-induced encephalopathy
Flu-like symptoms	Symptoms include fever, chills, rigors, diaphoresis, malaise, myalgia, arthralgia, loss of appetite, dry cough and headache.
Haemorrhagic cystitis	An inflammatory process, characterised by diffuse bladder mucosal inflammation resulting in haemorrhage. Patients are at risk following blood and marrow transplant (BMT) or treatment with cyclophosphamide, ifosfamide and/or radiation therapy. Read more about haemorrhagic cystitis
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
Taste and smell alteration	Read more about taste and smell changes
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.

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
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
Anorexia	Loss of appetite accompanied by decreased food intake. Read more about anorexia
Diarrhoea	Read more about treatment induced diarrhoea
Fatigue	Read more about fatigue
Hepatotoxicity	Anti-cancer drugs administered either alone or in combination with other drugs and/or radiation may cause direct or indirect hepatotoxicity. Hepatic dysfunction can alter the metabolism of some drugs resulting in systemic toxicity.
Nephrotoxicity	Renal dysfunction resulting from damage to the glomeruli, tubules or renal vasculature.
Palmar-plantar erythrodysaesthesia (PPE) - hand-foot syndrome (HFS)	Bilateral erythema, tenderness, pain, swelling, tingling, numbness, pruritus, dry rash, or moist desquamation and ulceration of the palms and soles. It is also known as hand-foot syndrome (HFS). Symptoms appear to be dose dependent and palms are affected more than soles. Read more about hand-foot syndrome associated with chemotherapy
Side effects of corticosteroids	Insomnia, oedema, increased risk of infection e.g. oral thrush, gastric irritation, worsening of peptic ulcer disease, increased blood sugar levels, loss of diabetic control, mood and behavioural changes - including anxiety, euphoria, depression, mood swings, increased appetite and weight gain, osteoporosis and fractures (long term use), bruising and skin fragility are associated with corticosteroid use.
Skin rash	Anti-cancer drugs can cause a number of changes in the skin with maculo-papular rash the most common type of drug-induced skin reaction. Read more about skin rash

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)
Progressive multifocal leukoencephalopathy (PML)	A rare opportunistic viral infection of the brain, usually leading to death or severe disability, can occur with monoclonal antibodies (e.g. rituximab, obinutuzumab, ofatumumab, brentuximab vedotin) and other targeted therapies (e.g. ibrutinib, ruxolitinib, idelalisib). Onset may occur up to months after the final dose. Read more about progressive multifocal leukoencephalopathy (PML)
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

This protocol has been superseded due to unavailability of teniposide. It has been replaced by ID 3929 GMALL 2002 block A (patients over 55 years)

This GMALL B-ALL/NHL 2002 protocol was developed for treatment of mature B-ALL and Burkitt lymphoma and evolved from 3 preceding protocols: B-NHL83, B-NHL86 and B-NHL90.[3] The GMALL study group developed these protocols based on concepts employed successfully in the treatment of paediatric mature B-ALL. All used short, alternating cycles of intensive chemotherapy (in an ABABAB pattern) that included high doses of methotrexate and cyclophosphamide. The B-NHL90 protocol incorporated an increase in methotrexate doses to 3 g/m^2 but this did not result in improvement in outcomes when compared with B-NHL86.[3]

GMALL B-ALL/NHL 2002 differs from the preceding protocols in the addition of 8 doses of rituximab and of cycle C, incorporating high dose cytarabine and methotrexate for patients ≤55 years (changing the schedule to ABCABC).[3, 1] The methotrexate dose is reduced back to 1.5 g/m^2. In patients over 55 years, no high dose cytarabine is given and the methotrexate dose is 500 mg/m^2 (schedule ABABAB;).[1] In all patients with stage I/II disease and CR after 2 cycles, treatment is abbreviated to 4 cycles.[1] In addition to the chemo-immunotherapy, the GMALL group recommend radiation therapy to the CNS (24Gy; for CNS involvement) and to large mediastinal tumours (36Gy; >7.5 cm mass).[1]

Source	Study & Year Published	Supports Use	Is the dose and regimen consistent with the protocol?	Comments
Phase II trials	Oriol et al. 2008[4]	**Yes**	Yes	
Prospective study	Intermesoli et al. 2013[5]	**Yes**	Yes	
	Hoelzer et al. 2014[1]	**Yes**	Yes	
Observational studies	N/A	**N/A**	N/A	
Guidelines	**Date published/revised**	**Supports Use**	**Is the dose and regimen consistent with the protocol?**	**Comments**
NCCN	N/A	**N/A**	N/A	
BCCA	N/A	**N/A**	N/A	
CCO	N/A	**N/A**	N/A	

Efficacy

The outcomes of 363 patients with Burkitt Lymphoma and Burkitt's Leukaemia (mature B cell or L3-ALL) treated with the GMALL B-ALL/NHL 2002 protocol were reported in 2014.[1] The complete remission (CR) rate was 88% with 5 year progression free survival (PFS) 75% and overall survival (OS) 80%. There were significant differences in CR, PFS and OS between the ≤55 years and >55 years groups (see table).

Table 2. Overall results in Burkitt lymphoma/leukemia patients according to age: 15 to 55 years and older than 55 years

	Total	Age group, y		*P*
		15 to ≤55	>55	
No. of patients	363	265	98	
Response				
CR	319 (88)	237 (89)	82 (84)	.0002
PR	13 (4)	9 (3)	4 (4)	
Failure/progression	16 (4)	15 (6)	1 (1)	
Death	15 (4)	4 (2)	11 (11)	
Outcome of CR patients	319	237	82	
Relapse	37 (12)	20 (8)	17 (21)	
Death in CR	2 (1)	2 (1)	0	
PFS	0.75 ± 0.03	0.82 ± 0.03	0.60 ± 0.05	<.0001
OS	0.80 ± 0.02	0.86 ± 0.02	0.62 ± 0.02	<.0001

Values are n (%) or mean ± standard deviation.

Multivariate analysis revealed the following factors predicted overall survival in this group of patients: age (≤55 vs >55 years), bone

marrow involvement, LDH, and gender.[1]

The GMALL B-ALL/NHL 2002 protocol has been trialled by other groups. The Northern Italy Leukemia Group (NILG) treated 105 patients with Burkitt lymphoma and leukaemia (mature B-ALL, 48%) with GMALL B-ALL/NHL 2002.[5] Twenty-five percent of their cohort were over 55 years old, 14% were HIV positive and 37% had an ECOG >1.[5] The CR rate was 79%, 3 year OS 67% and disease free survival (DFS) 75%. Outcomes were better in the younger group (≤60 years), with OS 75% and DFS 82%. On multivariate analysis, the two significant indicators of prognosis were age (≤60 vs >60 years) and performance status (0-1 vs >1).[5]

Oriol et al also reported CR rates of 84 to 88% in 36 patients with Burkitt's lymphoma/leukaemia treated with the GMALL regimen. Nineteen (56%) of the patients were HIV positive and there were no significant differences in response rates or 2 year survival in the HIV positive, compared with negative, patients.[4]

Toxicity

The GMALL group listed the major grade 3 and 4 toxicities of the GMALL B-ALL/NHL 2002 protocol as haematological, especially grade 3-4 neutropenia during cycle A1, and infections (occurring in 38% of patients in cycle A1). Liver toxicity was most common during the first cycle and grade 3/4 mucositis was common during the first 2 cycles.[1] Therapy related deaths occurred in 2% of the ≤55 years patients but 11% of the >55 group, with >90% of deaths caused by infection.[1]

The NILG reported treatment related mortality in 14 (of 105) patients during induction (79% due to infection) and 5 patients during consolidation therapy. Severe neutropenia (<0.5x10^9/L) was present for a median of 7 days (0-25) in ≤55 year olds and 8 days (0-23) in the older patients. Thrombocytopenia (<20x10^9/L) was present for a median of 3(0-45) and 5(0-32) days respectively.[5] The rate of infection was 48%. Chemotherapy-induced mucositis and severe infections were more common in HIV positive patients compared with HIV negative.[4]

References

1 Hoelzer, D., J. Walewski, H. Dohner, et al. 2014. "Improved outcome of adult Burkitt lymphoma/leukemia with rituximab and chemotherapy: report of a large prospective multicenter trial." Blood 124(26):3870-3879.

2 Ramsey, L. B., F. M. Balis, M. M. O'Brien, et al. 2018. "Consensus Guideline for Use of Glucarpidase in Patients with High-Dose Methotrexate Induced Acute Kidney Injury and Delayed Methotrexate Clearance." Oncologist 23(1):52-61.

3 Gokbuget, N., D. Hoelzer, R. Arnold, et al. 2000. "Treatment of Adult ALL according to protocols of the German Multicenter Study Group for Adult ALL (GMALL)." Hematol Oncol Clin North Am 14(6):1307-1325, ix.

4 Oriol, A., J. M. Ribera, J. Bergua, et al. 2008. "High-dose chemotherapy and immunotherapy in adult Burkitt lymphoma: comparison of results in human immunodeficiency virus-infected and noninfected patients." Cancer 113(1):117-125.

5 Intermesoli, T., A. Rambaldi, G. Rossi, et al. 2013. "High cure rates in Burkitt lymphoma and leukemia: a Northern Italy Leukemia Group study of the German short intensive rituximab-chemotherapy program." Haematologica 98(11):1718-1725.

History

Version 8

Date	Summary of changes
05/06/2023	Subcutaneous rituximab information removed from the following sections – treatment schedule, clinical information, administration, patient information. Increased to version 8.

Version 7

Date	Summary of changes
04/05/2023	Methotrexate target level updated. Version number changed to v.7

Version 6

Date	Summary of changes
23/08/2021	Protocol superseded due to unavailability of teniposide. This protocol has been replaced with ID 3929 GMALL 2002 block A (patients over 55 years).
20/01/2022	Interactions updated.
08/02/2022	PJP prophylaxis clinical information block updated.
11/11/2022	Reviewed electronically by the Haematology Reference Committee. Minor formatting changes. Rituximab PBS status changed to general schedule. Review in 2 years.

Version 5

Date	Summary of changes
16/04/2020	'Mesna dosing and administration' block added to clinical information. Version number changed to v.5

Version 4

Date	Summary of changes
09/03/2020	Biosimilar rituximab added to clinical information. Version number changed to v.4

Version 3

Date	Summary of changes
08/11/2016	Approved and published on eviQ.
31/05/2017	Transferred to new eviQ website. Version number change to v.2.
21/09/2018	Reviewed by Haematology Reference Committee with changes to teniposide drug status, review in 1 year: • Teniposide drug status updated. • Flag added to the top of the protocol to reflect global production cessation. Reference to subcutaneous rituximab added: • Link to subcutaneous rituximab document underneath the treatment schedule. • Clinical information block on subcutaneous rituximab. • Link to the subcutaneous rituximab document into administration section. • Injection-site reaction side effect. • Note about subcutaneous rituximab to the patient information. • Version number changed to v.3.
13/09/2019	Reviewed by Haematology Reference Committee, no changes made. Review in 5 years.
10/10/2019	Clinical information updated with PBS expanded indications for G-CSF.

First approved: 31 October 2016
Last reviewed: 11 November 2022
Review due: 31 December 2024
Superseded: 24 August 2021

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/1956
26 Nov 2023

Patient information - Burkitt lymphoma - GMALL 2002 block A (patients over 55 years)

Patient's name:

Your treatment

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

GMALL 2002 block A (patients over 55 years)			
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	**Rituximab** (*ri-TUX-i-mab*)	By a drip into a vein	**1st cycle:** about 4 to 6 hours **Cycles thereafter:** about 3 to 4 hours
2 to 6	**Dexamethasone** (*dex-a-METH-a-sone*)	Take orally ONCE a day in the morning with food on days 2 to 6 only.	
	Ifosfamide (*eye-FOS-fa-mide*)	By a drip into a vein	About 2 hours
	Mesna (*MES-na*)	By a drip into a vein	
	Mesna	Take orally at 2 hours and 6 hours after completion of each ifosfamide infusion on day 2 to 6 only.	
2	**Methotrexate** (m*eth-o-TREX-ate)*	By a drip into a vein	For 24 hours
	Methotrexate (intrathecal)	By injection into your spine	About 4 hours
3	**Calcium folinate (Leucovorin)** (loo-koe-VOR-in)	By a drip into a vein	About 5 minutes every 6 hours after methotrexate infusion
5 and 6	**Cytarabine** (*sye-TARE-a-been*)	By a drip into a vein	About 1 hour TWICE a day
	Teniposide (*ten-IP-oh-side*)	By a drip into a vein	About 1 hour
8	**Granulocyte Colony Stimulating Factor** (*G-CSF*)	By injection under the skin	About 5 minutes

Missed doses:

- **Dexamethasone:** if you forget to take your tablets or vomit your tablets, contact your treating team.
- **Mesna:** if vomiting occurs within 2 hours of taking oral mesna, repeat the dose.

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 38ºC 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

You will need to have a blood test before you start treatment and regularly throughout your treatment. 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.

Medications for blood pressure

Rituximab may lower your blood pressure. Tell your doctor if you are taking any blood pressure medications. Your doctor may advise you to temporarily stop your blood pressure medications before your rituximab infusions.

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.
- **Mesna**: you will be given a drug called mesna with this treatment. Mesna helps to protect your bladder from the chemotherapy. It can be given by mouth as a tablet or by injection through your drip. Your doctor or nurse will tell you how and when to take the mesna tablets.
- **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 will 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. Follow this link to read more information on how to give this injection.

- **Rituximab premedication:** before your treatment with rituximab you will need to take some tablets called a premedication to help prevent you from having a reaction to the rituximab.

Superseded treatments

This treatment is superseded meaning that better treatments have taken its place. Uncommonly superseded treatments are still used. Your doctor will explain why this treatment has been selected for you.

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)	
Bone pain after G-CSF injection	• You may have discomfort or a dull ache in your pelvis, back, arms or legs. • To reduce the pain, take paracetamol before each injection. • **Tell your doctor or nurse as soon as possible if your pain is not controlled.**
Brain swelling (encephalopathy)	• You may feel: ◦ dizzy ◦ sleepy ◦ confused or agitated. • You may also get: ◦ headaches ◦ loss of balance ◦ hallucinations ◦ seizure (fits). • These symptoms are caused by the drug ifosfamide. • If you are being treated as an outpatient, try to have someone stay at home with you during the days that you are having this medicine. • **Tell your doctor or nurse immediately, or go to the nearest hospital Emergency Department if you get any of the symptoms listed above.**
Flu-like symptoms	• You may get: ◦ a fever ◦ chills or sweats ◦ muscle and joint pain ◦ a cough ◦ headaches. • These symptoms are caused by the drug rituximab. • Tell your doctor or nurse **immediately** if you get any of the symptoms listed above.

Bladder irritation (haemorrhagic cystitis)	• You may get: ◦ blood in your urine, sometimes with blood clots ◦ pain or burning when you urinate ◦ the urge to urinate more than normal ◦ stomach or pelvic pain or discomfort. • When you go home, make sure you drink plenty of fluids (unless you are fluid restricted). • Empty your bladder often. • **Tell your doctor or nurse as soon as possible if you notice any blood in your urine.**
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** **While you are in hospital: Tell your doctor or nurse immediately.** **After you leave: 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.**
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.
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.

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.**
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.**
Appetite loss (anorexia)	• You may not feel like eating. • Try to avoid drinking fluids at meal times. • Try to eat small meals or snacks regularly throughout the day. • Try to eat food that is high in protein and calories. • If you are worried about how much food you can eat, or if you are losing weight, ask to speak to a dietitian.

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.**

Liver problems	• You may get:
	  ◦ yellowing of your skin or eyes
	  ◦ itchy skin
	  ◦ pain or tenderness in your stomach
	  ◦ nausea and vomiting
	  ◦ loss of appetite
	• You will have regular blood tests to check how well your liver is working.
	• **Tell your doctor or nurse as soon as possible if you notice that your urine is a dark colour, the whites of your eyes look yellow, or if you have stomach pain.**

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.**

Hand-foot syndrome (palmar-plantar erythrodysaesthesia)	• The palms of your hands and soles of your feet may become:
	  ◦ red and hot
	  ◦ swollen
	  ◦ painful and tender
	  ◦ blistered.
	• The skin in the area may also peel.
	• Moisturise your hands and feet daily with sorbolene or aqueous cream.
	• Keep your hands and feet clean and dry.
	• Avoid hot water, instead use lukewarm water to bathe.
	• Avoid direct sunlight.
	• Avoid unnecessary walking, jogging or exercise.
	• Wear cotton socks and avoid tight-fitting shoes.
	• **Tell your doctor or nurse as soon as possible if you notice any skin changes on your hands or feet.**

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

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

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.
Changes in the way your brain works [progressive multifocal leukoencephalopathy (PML)]	• This treatment can affect your central nervous system. This can be very serious. • **Tell your doctor or nurse immediately, or go to the nearest hospital Emergency Department if you get any of the following symptoms:** ◦ **trouble with your speech or vision** ◦ **confusion or memory loss** ◦ **changes in your personality** ◦ **weakness in your arms and legs** ◦ **poor balance or coordination** ◦ **fits (seizures).**
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.
- 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: 31 October 2016
Last reviewed: 11 November 2022
Review due: 31 December 2024
Superseded: 24 August 2021

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/1956
26 Nov 2023