

Health monitoring

Guide for cyclophosphamide



Contents

Introduction	3
Cyclophosphamide	4
1. Health monitoring for cyclophosphamide under the WHS Regulations	4
2. Monitoring exposure to cyclophosphamide	5
Workplace exposure standard	5
Removal from work.....	5
Return to work	5
3. Final medical examination	6
4. Route of occupational exposure	6
5. Target organ/effect	6
6. Acute effects	7
7. Chronic effects	7
8. Carcinogenicity.....	7
9. GHS classification	7
Source documents.....	7
Health monitoring report – Cyclophosphamide.....	10
Section 1 – A copy of this section to be provided to the PCBU	10
Section 2 – This section to be retained by the registered medical practitioner	13

Introduction

This guide is intended to be read by a registered medical practitioner with experience in health monitoring who is engaged by person conducting a business or undertaking (PCBU) to carry out or supervise health monitoring. It provides practical guidance to registered medical practitioners about requirements under the work health and safety (WHS) laws for health monitoring.

This guide applies to all workplaces covered by the WHS Regulations where health monitoring is required.

How to use this guide

This guide includes references to the legal requirements under the WHS Act and WHS Regulations. These are included for convenience only and should not be relied on in place of the full text of the WHS Act or WHS Regulations.

The words 'must', 'requires' or 'mandatory' indicate a legal requirement exists that must be complied with. The word 'should' is used in this guide to indicate a recommended course of action, while 'may' is used to indicate an optional course of action.

This guide provides information for those registered medical practitioners engaged by a PCBU to carry out or supervise health monitoring for workers. This guidance should be read in conjunction with the following:

- *Health monitoring guide for registered medical practitioners*
- *Health monitoring guides for hazardous chemicals*
- *Health monitoring guide for workers*
- *Health monitoring guide for persons conducting business or undertakings (PCBUs).*

Health monitoring under the WHS Regulations

In certain circumstances, the model WHS Regulations place duties on a PCBU to provide health monitoring to workers. These requirements arise if the worker is carrying out work with hazardous chemicals including lead and asbestos. In addition, the work being carried out must be the kind of work specified in the WHS Regulations. A PCBU has the duty to determine if health monitoring is required.

The WHS Regulations prescribe that health monitoring is carried out by or supervised by a registered medical practitioner with experience in health monitoring.

Cyclophosphamide

Cyclophosphamide (CAS 50-18-0) is an antineoplastic medication used in chemotherapy and immunosuppressive therapy.

It is a synthetic, nitrogen, mustard-type alkylating agent. It is a fine white to off-white crystalline powder that is soluble in water and ethanol.

Common trade names for cyclophosphamide include Procytox[®], Cytosan[®], Neosar[®] and Cyclonex[®].

Work activities that may represent a high risk exposure

Under the Work Health and Safety (WHS) Regulations, cyclophosphamide is listed as a restricted carcinogen. It is restricted to therapeutic use in hospitals and oncological treatment facilities, and in manufacturing operations with authorisation from a relevant WHS regulator.

Workers may be exposed to cyclophosphamide during packaging, formulation, handling or administration of the drug, clean-up and disposal of chemotherapy drug waste, when assisting patients or when handling or cleaning linen.

Work-related exposure may occur in hospitals, medical practices, pharmacies, laboratories, veterinary clinics and research facilities. Workers at risk of exposure include pharmacists, medical practitioners, nurses and cleaners. Cyclophosphamide can also be used in the treatment of lymphoma in cats and dogs resulting in potential exposures for veterinarians, veterinary nurses and animal handlers.

Sources of non-occupational exposure

Cyclophosphamide is not a naturally occurring substance. However, family and friends of chemotherapy patients, hospital or veterinary volunteers and owners of pets undergoing treatment may be exposed at home post treatment.

1. Health monitoring for cyclophosphamide under the WHS Regulations

Collection of demographic, medical and occupational history
Urinary cyclophosphamide level

Health monitoring before starting work in a cyclophosphamide process

Health monitoring for cyclophosphamide may be required before the worker starts work so that changes to the worker's health can be detected.

Initial discussions about a health monitoring program should include:

- possible health effects from exposure to cyclophosphamide
- how to recognise and report symptoms, and
- what is involved in the health monitoring program, for example the frequency of testing and the tests that may be needed.

Specific reproductive health counselling should be considered for workers considering parenthood and women who are pregnant or breastfeeding.

During exposure to a cyclophosphamide process

2. Monitoring exposure to cyclophosphamide

Where workers have been exposed to cyclophosphamide, for example through accidental injection via needlestick injuries or spills or where symptoms of exposure are identified, the person conducting a business or undertaking (PCBU) may have duties to arrange a health monitoring appointment with the registered medical practitioner. A general medical examination should be carried out and should include counselling on the risks associated with cyclophosphamide exposure, including fertility risks.

There is no available evidence of any clear benefit from periodic medical examination. However biological monitoring can identify exposure by assessing the presence of cyclophosphamide in urine:

- end of shift urinary cyclophosphamide level.

The urine should be collected at the end of shift.

At present there is no biological exposure standard available for cyclophosphamide. However, the presence of cyclophosphamide in urine indicates exposure has occurred and health monitoring for possible biological effects would be warranted. An assessment of white blood cell counts may identify early effects of exposure.

Workplace exposure standard

There is no workplace exposure standard for cyclophosphamide.

Some workplaces conduct surface wipe testing for cyclophosphamide contamination. Results of these tests may be used as an indicator to undertake urinary testing to identify exposure.

Removal from work

Where a medical examination indicates the worker is displaying any symptoms of exposure that may be related to cyclophosphamide or where results of surface wipe testing or biological monitoring indicate exposure that may cause adverse health effects, the registered medical practitioner should consider recommending the worker be removed from cyclophosphamide-related work.

When removal from cyclophosphamide-related work is indicated the registered medical practitioner must provide the PCBU with the following recommendations:

- the worker should be removed from work with cyclophosphamide, and
- the PCBU should review control measures and carry out recommended remedial action.

The worker must be informed of the results of health monitoring.

Return to work

Should a worker be removed from cyclophosphamide-related work, they must not return until the registered medical practitioner has:

- assessed them as medically fit, and
- made a recommendation to the PCBU that the worker can return to remediated cyclophosphamide-related work.

This assessment should take into consideration the clinical condition of the worker, the worker's urinary cyclophosphamide levels and remediation of the circumstances that led to the symptoms if possible.

At termination of work in a cyclophosphamide process

3. Final medical examination

A final medical assessment should be carried out and include a general health and symptom questionnaire.

Workers with health conditions or continuing symptoms due to cyclophosphamide exposure (including liver, kidney, bladder or skin effects) should be advised to seek continuing medical examinations as organised by the registered medical practitioner supervising the health monitoring program.

A health monitoring report from the registered medical practitioner should be provided to the PCBU as soon as practicable after the completion of the monitoring program, and at regular intervals for longer term or ongoing health monitoring processes. The report must include:

- the name and date of birth of the worker
- the name and registration number of the registered medical practitioner
- the name and address of the PCBU who commissioned the health monitoring
- the date of the health monitoring
- any test results that indicate whether or not the worker has been exposed to a hazardous chemical
- any advice that test results indicate that the worker may have contracted an injury, illness or disease as a result of carrying out the work that triggered the requirement for health monitoring
- any recommendation that the PCBU take remedial measures, including whether the worker can continue to carry out the type of work that triggered the requirement for health monitoring, and
- whether medical counselling is required for the worker in relation to the work that triggered the requirement for health monitoring.

Potential health effects following exposure to cyclophosphamide

4. Route of occupational exposure

The primary route of cyclophosphamide exposure is via inhalation or skin and mucous membrane absorption.

In the medical or veterinary environment, exposures may occur via accidental ingestion (hand to mouth) or injection.

5. Target organ/effect

The target organs and potential effects of cyclophosphamide exposure include:

Table 1 Target organs and potential effects of cyclophosphamide exposure

Target organ	Effect
Central nervous system	<ul style="list-style-type: none"> • Nausea • Vomiting
Reproductive system	<ul style="list-style-type: none"> • Irregular menstrual cycles • Miscarriage • Infertility

Target organ	Effect
Skin	<ul style="list-style-type: none"> • Changes in skin colour (darkening) • Changes in nails • Rashes
Blood	<ul style="list-style-type: none"> • Bone marrow effects

6. Acute effects

Cyclophosphamide is cytotoxic. Acute health effects of cyclophosphamide exposure include:

- nausea and vomiting
- loss of appetite
- rashes
- stomach pain or upset
- diarrhoea
- a wound that will not heal
- skin and nail changes including contact dermatitis
- missed menstrual periods
- changes in skin colour (darkening) and nails, and
- liver and kidney damage.

7. Chronic effects

The chronic health effects of exposure to cyclophosphamide are well documented due to its use as a therapeutic drug. These have followed administration of cyclophosphamide at therapeutic doses sometimes for a prolonged period, and are unlikely to result from incidental workplace exposure.

Chronic health effects include changes to the blood, bladder, lungs, liver, kidneys and bone marrow.

Reproductive effects include irregular menstrual cycles, miscarriages and infertility.

8. Carcinogenicity

As cyclophosphamide is a cytotoxic drug, there is a risk of cancer following subchronic exposure.

9. GHS classification

Cyclophosphamide is a therapeutic and has not been classified according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) classification system in Australia. However, the Product Information for cyclophosphamide-containing therapeutic goods are available on the [Therapeutic Goods Administration](#) website.

Based on this information, cyclophosphamide is:

- genotoxic and mutagenic, both to somatic and germ cells
- a reproductive and embryofetal developmental toxicant, and
- a potential carcinogen.

Source documents

[Chemical analysis branch handbook, 9th Edition, Workplace and biological monitoring exposure analysis](#), WorkCover NSW (PDF 3.39MB).

Lauwerys, R.R. and Hoet, P. (2001) *Industrial Chemical Exposure Guidelines for Biological Monitoring*, 3rd Ed, Lewis Publishers, Boca Raton.

OHSAH; [Toxicology Profile Cyclophosphamide in the Health Care Industry](#) (PDF 462KB).

PubChem Open Chemistry Database, [Compound Summary for CID 2907 Cyclophosphamide](#).

Queensland Government (2017) Office of Industrial Relations; Workplace Health and Safety Queensland; [Guide for handling cytotoxic drugs and related waste](#) (PDF 1.59MB).

Safe Work Australia (2013) [Workplace Exposure Standards for Airborne Contaminants](#) (PDF 873KB).

Safe Work Australia; [Hazardous Chemicals Information System](#).

Virginia Commonwealth University; Office of Environmental Health and Safety (2009) [Cyclophosphamide: Safe working practices](#) (PDF 69KB).



Health monitoring report

Cyclophosphamide

This form contains confidential information and must not be disclosed to another person except in accordance with the Work Health and Safety Regulations or with consent of the worker

Health monitoring report – Cyclophosphamide

This health monitoring report is a confidential health record and must not be disclosed to another person except in accordance with the Work Health and Safety Regulations or with the consent of the worker.

There are two sections. Complete both sections and all questions as applicable.

Section 1 A copy of this section should be forwarded to the person conducting the business or undertaking (PCBU) who has engaged your services.

Section 2 may contain confidential health information. Information that is required to be given to the PCBU should be summarised in Section 1.

Section 1 – A copy of this section to be provided to the PCBU

Person conducting a business or undertaking

Company/organisation name: Click here to enter text.

Site address: Click here to enter text.

Suburb: Click here to enter text.

Postcode: Click here to enter text.

Site Tel: Click here to enter text.

Site Fax: Click here to enter text.

Contact Name: Click here to enter text.

Other businesses or undertakings engaging the worker
(include a separate section for each PCBU)

N/A

Company/organisation name: Click here to enter text.

Site address: Click here to enter text.

Suburb: Click here to enter text.

Postcode: Click here to enter text.

Site Tel: Click here to enter text.

Site Fax: Click here to enter text.

Contact Name: Click here to enter text.

Worker details (tick all relevant boxes)

Surname: Click here to enter text.

Given names: Click here to enter text.

Date of birth: Click here to enter a date.

Sex: Male Female

Address: Click here to enter text.

Suburb: Click here to enter text.

Postcode: Click here to enter text.

Current job: Click here to enter text.

Tel (H): Click here to enter text.

Mob: Click here to enter text.

Date started employment: Click here to enter a date.

Employment in cyclophosphamide risk work (tick all relevant boxes)
(information provided by the PCBU)

New to cyclophosphamide work

This form contains confidential information and must not be disclosed to another person except in accordance with the Work Health and Safety Regulations or with consent of the worker

- New worker but not new to cyclophosphamide work
- Current worker continuing in cyclophosphamide work

Worked with cyclophosphamide since: [Click here to enter a date.](#)

Risk assessment completed: Yes No

Work environment assessment (tick all relevant boxes)
(information provided by the PCBU)

Date of assessment: [Click here to enter a date.](#)

Exposure to cyclophosphamide

- Preparing oncology medications Administering oncology treatments
- Other (specify): [Click here to enter text.](#)

Other chemicals the worker may be exposed to: [Click here to enter text.](#)

Controls

Eye protection	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Emergency eye wash	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Wear gloves	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Respirator use	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Respirator type	Click here to enter text.	
Local exhaust ventilation	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Overalls/work clothing	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Laundering by employer	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Wash basins and showers (with hot and cold water)	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Other please specify		

Comments about health monitoring results

Biological monitoring results

Include/attach test results that indicate whether or not the worker has been exposed

Date	Tests performed	Recommended action or comment
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.

Comments about health monitoring results (for example any early indications or diagnosis of injury, illness or disease): [Click here to enter text.](#)

This form contains confidential information and must not be disclosed to another person except in accordance with the Work Health and Safety Regulations or with consent of the worker

Recommendations (by registered medical practitioner) (tick all relevant boxes)

Further/additional health monitoring for worker

- This is the final health monitoring report
- Repeat health assessment in [Click here to enter text.](#) month(s) / [Click here to enter text.](#) week(s)
- Counselling required
- Medical examination by registered medical practitioner. On [Click here to enter a date.](#)
- Referred to Medical Specialist (respiratory/dermatology/other). On [Click here to enter a date.](#)

Recommendations to PCBU

- The worker is suitable for work with cyclophosphamide
- Review workplace controls
- The worker should be removed from work with cyclophosphamide. On [Click here to enter a date.](#)
- The worker is fit to resume work. On [Click here to enter a date.](#)
- Biological monitoring results indicate unacceptably high exposure levels

Specialist's name: [Click here to enter text.](#)

Additional comments or recommendations: [Click here to enter text.](#)

Registered medical practitioner (responsible for supervising health monitoring)

Name: [Click here to enter text.](#)

Signature:

Date: [Click here to enter a date.](#)

Tel: [Click here to enter text.](#)

Fax: [Click here to enter text.](#)

Registration Number: [Click here to enter text.](#)

Medical Practice: [Click here to enter text.](#)

Address: [Click here to enter text.](#)

Suburb: [Click here to enter text.](#)

Postcode: [Click here to enter text.](#)

This form contains confidential information and must not be disclosed to another person except in accordance with the Work Health and Safety Regulations or with consent of the worker

Section 2 – This section to be retained by the registered medical practitioner

Person conducting a business or undertaking

Company/organisation name: Click here to enter text.

Site address: Click here to enter text.

Suburb: Click here to enter text.

Postcode: Click here to enter text.

Site Tel: Click here to enter text.

Site Fax: Click here to enter text.

Contact Name: Click here to enter text.

Other businesses or undertakings engaging the worker

N/A

Company/organisation name: Click here to enter text.

Site address: Click here to enter text.

Suburb: Click here to enter text.

Postcode: Click here to enter text.

Site Tel: Click here to enter text.

Site Fax: Click here to enter text.

Contact Name: Click here to enter text.

Worker details (tick all relevant boxes)

Surname: Click here to enter text.

Given names: Click here to enter text.

Date of birth: Click here to enter a date.

Sex: Male Female Pregnant/breastfeeding

Address: Click here to enter text.

Suburb: Click here to enter text.

Postcode: Click here to enter text.

Current job: Click here to enter text.

Tel (H): Click here to enter text.

Mob: Click here to enter text.

Date started employment: Click here to enter a date.

Past employment and exposure details (tick all relevant boxes)

Have you ever worked in any of the following jobs?

If you answered 'yes' to any of the questions, please advise if you experienced any symptoms such as cough or wheeze or asthma when working.

			Comments (all 'yes' answers)
Industries involving exposure to cyclophosphamide	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Have you ever personally been given cyclophosphamide for medical reasons	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Administration of cyclophosphamide	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.

This form contains confidential information and must not be disclosed to another person except in accordance with the Work Health and Safety Regulations or with consent of the worker

Comments (all 'yes' answers)

Manufacturing of chemicals, or pharmaceuticals	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Other (please specify)	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.

General health questionnaire (tick all relevant boxes)

Comments (all 'yes' answers)

Did you suffer any incapacity lasting two weeks or longer in the last two years	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Have you ever had any operations or accidents or been hospitalised for any reason	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Are you currently being treated by a doctor or other health professional for any illness or injury	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Are you currently receiving any medical treatment or taking any medications. Please detail.	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Do you currently smoke	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Do you practice personal hygiene at work, for example nail biting, frequency of hand washing, eating or smoking, clean shaven, shower and change into clean clothes at end of shift	<input type="checkbox"/> No	<input type="checkbox"/> Yes	

Specific health questions (tick all relevant boxes)

Do you have or have you ever had:			Comments (all 'yes' answers)
Loss of appetite	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Severe stomach pain or peptic ulcers	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Nausea and vomiting	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Kidney or bladder disease	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
A wound that is slow to heal	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Any menstrual difficulties	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Anaemia or other blood disorders	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Liver disease (including alcohol related or other hepatitis)	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Any changes to skin, bone or nails	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Skin disorders or dermatitis	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Any form of cancer	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.

This form contains confidential information and must not be disclosed to another person except in accordance with the Work Health and Safety Regulations or with consent of the worker

Do you have or have you ever had:			Comments (all 'yes' answers)
Any other significant health conditions	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.

General health assessment (if applicable)

Height: Click here to enter text. cm **Weight:** Click here to enter text. kg

BP: Click here to enter text. / Click here to enter text. mmHg

Urinalysis

Blood: Normal Abnormal

Protein: Click here to enter text.

Referred for further testing

Sugar: Click here to enter text.

No Yes

Respiratory system			Medical comments (for all abnormal)
Breathing normal and regular in character	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Click here to enter text.
Auscultation normal	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Click here to enter text.
Signs of past/present respiratory disease	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Skin			
Eczema, dermatitis or allergy	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Skin cancer or other abnormality	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Evidence of nail biting	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Other	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.

This form contains confidential information and must not be disclosed to another person except in accordance with the Work Health and Safety Regulations or with consent of the worker

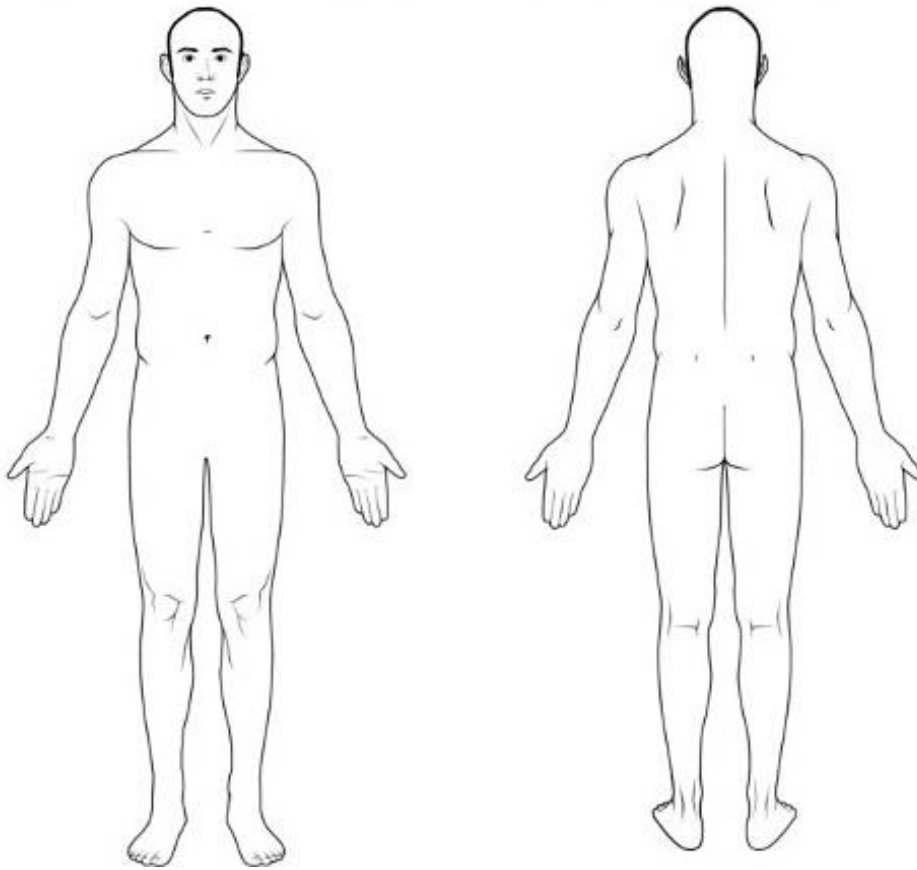


Figure 1 Template of the human body to indicate the location of abnormalities

Biological monitoring results

Include/attach at least the previous two test results (if available)

Date	Tests performed	Recommended action or comment
Click here to enter a date.	Click here to enter text.	Click here to enter text.
Click here to enter a date.	Click here to enter text.	Click here to enter text.
Click here to enter a date.	Click here to enter text.	Click here to enter text.
Click here to enter a date.	Click here to enter text.	Click here to enter text.

Other medical history, family medical history, current medication, comments, tests or recommendations (use separate sheet if necessary)

Click here to enter text.

Registered medical practitioner (responsible for supervising health monitoring)

Name: Click here to enter text.

Signature:

.....

This form contains confidential information and must not be disclosed to another person except in accordance with the Work Health and Safety Regulations or with consent of the worker

Date: Click here to enter a date.

Tel: Click here to enter text.

Fax: Click here to enter text.

Registration Number: Click here to enter text.

Medical Practice: Click here to enter text.

Address: Click here to enter text.

Suburb: Click here to enter text.

Postcode: Click here to enter text.