Snakebite Management Guideline

1. Purpose

This guideline provides a general approach to WA Country Health Service (WACHS) staff regarding best practice management of all snakebite cases to ensure snakebite management is conducted systematically in rural practice at all sites.

Snakebite management with signs of envenomation should occur in conjunction with advice from WACHS Emergency Telehealth Service (ETS) (Ph: 1800 422 190) / clinical toxicologists via the WA Poisons Information Centre (WAPIC) (Ph: 13 11 26).

2. Guideline

Australia has a range of snake fauna, which includes snakes that are highly venomous. The six major categories of Australian snakes are the brown snakes, black snakes, death adder, tiger snakes, sea snakes and the taipans.[1] Monovalent antivenoms are available for each genus of venomous Australian snakes. Polyvalent antivenom (AV) is also available, and it contains the equivalent of one ampoule of brown, tiger, black, death adder and taipan AVs (N.B. it does not contain sea snake AV). It is estimated that there are between 500 to 3000 snakebites annually, out of which 200-500 cases require AV. Snakebites are potentially lethal, but deaths are rare and are minimized with timely first aid, supportive care and AV in selected cases. Snakebites occur commonly during the summer months.[2]

2.1 Snake Identification

Identification of snake genus on the basis of physical characteristics is unreliable even when performed by an expert herpetologist. As a result, all snakebites are assumed to be potentially lethal and require hospital admission for evaluation.

In the setting of confirmed systemic envenoming, selection of appropriate AV is achieved with the use of geographical area, and clinical and laboratory features of the envenoming.

2.2 Snake Venom Effects

Snake Venom can directly produce a number of different syndromes:
- neurotoxicity leading to a descending paralysis
- defibrinating coagulopathy (Venom induced consumptive coagulopathy - VICC)
- anticoagulant coagulopathy
- myolysis (major elevations in creatinine kinase – CK – may lead to renal failure).

Fewer than 10% of people presenting with suspected snakebite are envenomed.[2]

Complications from envenoming may be:
- bleeding
- ventilatory failure (from progressive paralysis)
- renal impairment / failure
- haemolysis and thrombocytopenia (thrombotic microangiopathic anaemia – TMA).

2.3 First Aid

Immobilise the bite site and the patient
- Splint the affected area for optimal immobilisation.

Pressure Bandage Immobilisation (PBI)
- Elasticated compression bandage (or crepe if unavailable) wound over the bite site and up and down the whole limb. Apply the same amount of pressure as one would for a sprained ankle.
- **Do not occlude the circulation** with the PBI and maintain awareness of potential limb ischemia / compartment syndrome with neurovascular monitoring. If there are signs or symptoms of limb ischaemia, loosen bandage and reassess. Continue to monitor and seek further advice if indicated.
- If the PBI applied prior to arrival is inadequate, apply additional bandages.
- **Remove PBI if**:
  - AV has been given (note: **after** discussion with ETS / clinical toxicologist) **OR**
  - full assessment including laboratory investigations demonstrates no objective evidence of envenomation (see Figure 1: Suspected snakebite summary flowchart).

2.4 Transportation to an appropriate medical facility

Following administration of first aid (pressure bandage immobilisation), the patient should be stabilised then transported to a hospital or health service with access to a doctor, either on site or via ETS.

Patients who have clinical features of envenomation may receive treatment with AV as part of their initial management on the advice of a clinical toxicologist or ETS prior to transfer to a facility with laboratory capability.

Patients should ultimately be transferred to a hospital that meets all the following criteria:

1. Doctor that is willing and able (with support) to manage snakebite.
2. Laboratory facilities able to be activated at all hours.
3. Adequate AV stocks.

On most occasions, this will occur without the need for administering AV prior.

2.5 Expert assistance with snakebite management

All cases of suspected snakebite should be discussed with a Fellow of the Australasian College for Emergency Medicine (FACEM), Clinical Toxicologist or ETS doctor.

Where there are symptoms or signs of potential envenomation consultation with a toxicologist can provide advice on management, logistics, transfer, and facilitate tertiary hospital care when appropriate. Advice can be obtained 24 hours a day by calling WAPIC on 13 11 26.



The ETS is available for hospitals with intermittent or no on-site medical cover. Contact ETS on Ph: 1800 422 190



The Acute Patient Transfer Coordination (APTC) provides front-line country clinicians with advice and support in transferring their patients, in a coordinated, efficient, safe and timely manner to an appropriate level of care. Contact the APTC on Ph: 1800 951 211

2.6 Approach to Snakebite

In Hospital:

See 2.3 for PBI and Figure 1: Suspected snakebite summary flowchart

1. Call for assistance.
2. Resuscitation if required.
3. All patients with a suspicion of snakebite must be admitted for clinical and biochemical assessment for work up of potential envenomation. Laboratory assessment requires onsite laboratory services.
4. Determine if the patient is envenomed:
   - **Clinical**: Sudden collapse, local effects (pain, swelling, bruising), systemic symptoms (nausea, vomiting, abdominal pain, headache), signs of neurotoxicity (ptosis, ophthalmoplegia, muscle weakness)
   - **Laboratory**: VICC, elevated d-dimer, anticoagulant coagulopathy, rhabdomyolysis, renal failure.

   Point of Care international normalised ratio (INR) equipment cannot be used for this assessment of coagulopathy.

   Clinical toxicologist advice should be sought for all patients who have clinical or biochemical signs and symptoms of envenomation call WAPIC on 13 11 26.
5. Assessment is performed serially (hourly) over at least 12 hours using the MR140S WACHS Snakebite Observation Chart and age appropriate observation and response chart.

   - Examination: Evidence of bleeding and/or neurological weakness (especially ptosis, ophthalmoplegia, facial and bulbar muscles); neurological examination should occur with initial bloods, then at 1, 6 and 12 hours post PBI removal.
   - Laboratory Tests: Performed on arrival and if normal then at one (1) hour following pressure bandage removal, then at 6 and 12 hours post PBI removal (timing may be discussed with a clinical toxicologist).

   Full Blood Picture (FBC), Urea, Creatinine and Electrolytes (U&E), Creatinine Kinase (CK), Coagulation profile (INR, aPTT, Fibrinogen) and D-dimer.

   For patients without signs of envenomation (non-envenomed arm of the flow chart), the 6 and 12 hour blood tests can be delayed and processed during daylight hours.
6. Determine the type(s) of AV required. This is based on geography, clinical and laboratory features after discussion with a clinical toxicologist. If the required monovalent AV is not available, polyvalent AV can be used instead (**EXCEPT** for sea snake envenomation).
7. Administer the dose of the required AV. PBI may be removed halfway through the AV infusion as advised, following discussion with ETS and/or clinical toxicologist:
   - Dilute in 500 mL sodium chloride 0.9%
   - Give intravenously over 30 minutes

- See Australian Injectable Drugs Handbook (AIDH – Antivenom, Snake) if a lesser volume of diluent is required (children/infants/fluid restricted)
- Brown snake, Tiger snake or polyvalent AV may be given as a rapid IV push if the patient is haemodynamically unstable or in cardiac arrest.
- Where **two** AV are being administered these may be added to the same bag for administration.
- AV should be administered in a location where anaphylaxis management and resuscitation is available.

8. Adjuvant supportive care and serial blood tests are required following AV until clinical and biochemical improvement occurs.

Side effects of antivenom[3]:

- usually mild reactions – erythema or urticaria
- anaphylaxis (incidence: limited data but may approach 10%).

Management of antivenom reactions[3]:

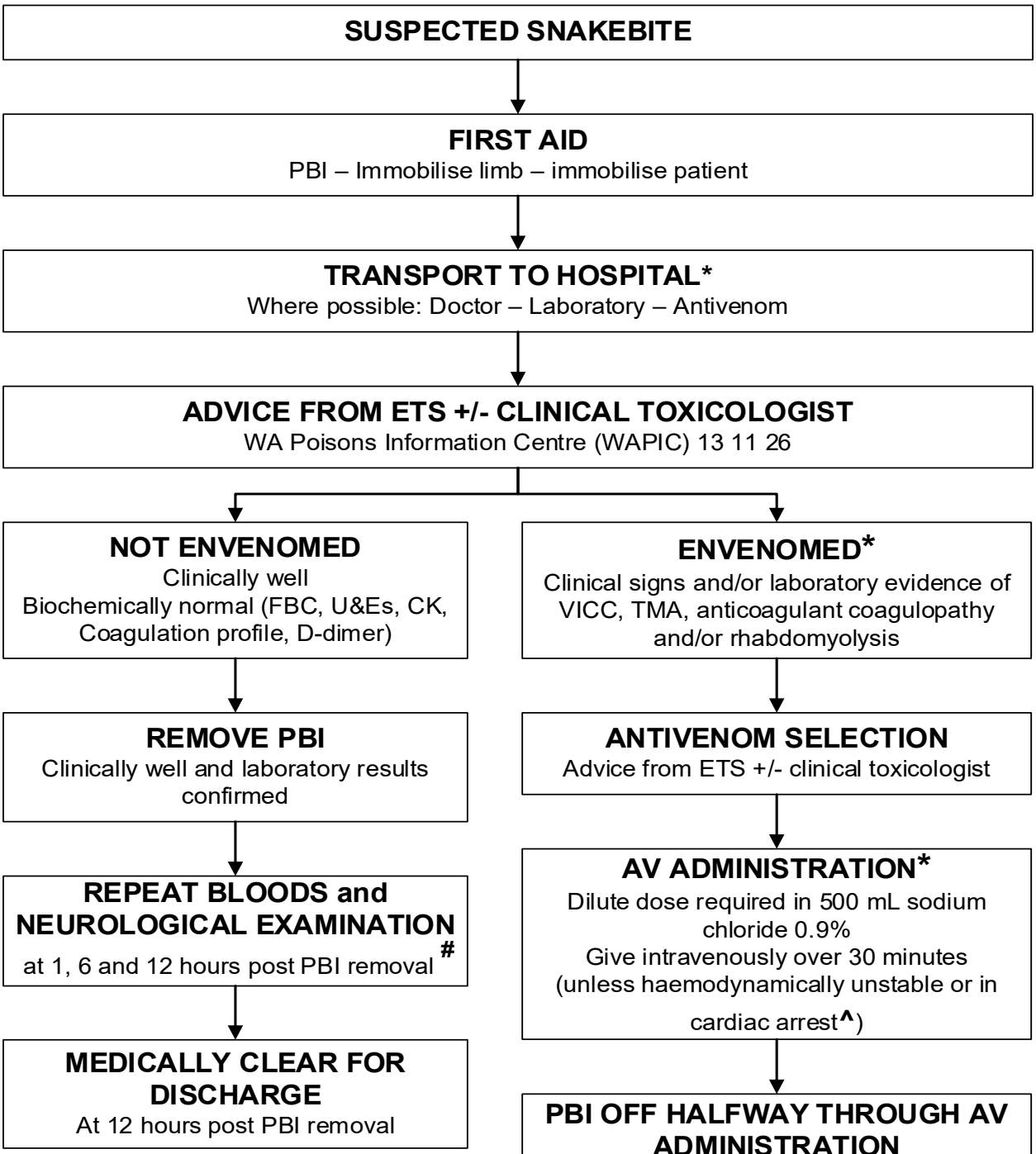
- Stop the AV infusion temporarily.
- High flow oxygen.
- Refer to ASCIA Guidelines – Acute management of Anaphylaxis (as per the WACHS Medication Prescribing and Administration Policy).
- Recommence AV infusion as soon as clinically possible at a slower rate, following discussion with a Clinical Toxicologist / ETS.

Complications:

Serum sickness[3]

- Warn all patients who have received AV about the possibility of delayed serum sickness and the need to seek medical attention should this occur.
- May occur 4 to 14 days[4] after AV administration, and is characterised by fever, rash, generalised lymphadenopathy and aching joints
- Treatment: for moderate to severe cases of serum sickness, use: prednisolone 0.5-1 mg/kg orally, daily for up to 7 days.[4]

Figure 1: Suspected snakebite summary flowchart



* Treatment with antivenom may occur at sites with ETS or senior medical support on the advice of toxicology or WAPIC prior to transport to hospitals with laboratory support. In certain circumstances the PBI may be removed halfway through, even if laboratory facilities are not available.

^ If the patient is haemodynamically unstable or in cardiac arrest, Brown snake, Tiger snake and polyvalent antivenom may be given as a rapid IV push.

The recommended timing of the 6 and 12 hour blood tests post PBI removal can be delayed in the **WELL** non-envenomed patient. The bloods can be held and processed during daylight hours.

3. Roles and Responsibilities

Medical and nursing staff are responsible for ensuring the following:

Pre-Hospital / Nursing Post:
- basic resuscitation and assessment of the patient[1]
- treatment of the snakebite patient according to the role of the hospital.

Transport:
- The **medical practitioners** at the site or the **ETS clinician** are responsible to ensure the patient is transported as soon as possible to a hospital which can provide definitive care (refer to sections 2.4 and 2.5).
- The **medical practitioner** is to ensure that the transfer is clinically safe, responsive, efficient and effectively coordinated in line with the WACHS Assessment and Management of Interhospital Patient Transfers Policy.
- **Nursing and medical staff** are to ensure all relevant documentation is completed and accompanies the patient to the next destination.

Hospital:
- Ensure that adequate supplies of antivAVenom are available according to the AV distribution list (see Appendix A).
- Ensure resuscitation equipment, elastic pressure bandages, splints and other supplies required are available.
- Ensure local staff are aware of this policy, location of the relevant AV and are trained to respond to a suspected snakebite.

Hospitals in WACHS with Pathology Services equipped to assess snakebite

Kimberley
- Broome Hospital
- Derby Hospital
- Kununurra Hospital

Pilbara
- Port Hedland Hospital
- Karratha Hospital

Midwest
- Carnarvon Hospital
- Geraldton Hospital

Wheatbelt
- Northam Hospital
- Narrogin Hospital

Goldfields
- Kalgoorlie Hospital
- Esperance Hospital

South West
- Bunbury Hospital
- Busselton Hospital
- Warren Hospital (Manjimup)
- Collie Hospital

Great Southern
- Albany Hospital
- Katanning Hospital

Note: all other hospitals, health services and nursing posts with ETS support have access to empiric AV appropriate for the local snake population that should be administered to symptomatic patients following the advice and support from the ETS and the clinical toxicologists.

General principles of empiric AV distribution:
South West and Great Southern region:
- Tiger and Brown AV

All other areas in WA except in the Kimberley and near Kalgoorlie:
- Brown and Black AV

Kimberley area and near Kalgoorlie where Taipans are found:
- Polyvalent AV

Coastal locations near main areas of fishing industry and tourism:
- Sea AV

Note:
The empiric AV stocks are based on the geographic distribution of the snakes most likely to cause early toxicity. Although Death Adders exist in most areas in WA, the AV was not included in the distribution. Bites are infrequent due to the nocturnal habits of death adders; envenomation is rare, and the onset of toxicity is slow. Death Adder envenomation can be managed with good supportive care pending transfer to a facility with AV stock.

All staff are required to comply with the directions in WACHS policies and procedures as per their roles and responsibilities. Guidelines are the recommended course of action for WACHS and staff are expected to use this information to guide practice. If staff are unsure which policies procedures and guidelines apply to their role or scope of practice, and/or are unsure of the application of directions they should consult their manager in the first instance.

4. Monitoring and Evaluation

A register is maintained for all snakebite envenomation cases and information taken from the time of snakebite up till discharge must be recorded. This register is maintained by the Australian Snakebite Project.

Standard stockholdings of AV (Appendix A) will be monitored and maintained as per standard WACHS medicines management procedures.

Managers of clinical areas, health sites and services are responsible for monitoring compliance with this guideline.

Any variance from this guideline should be under the guidance of a senior medical practitioner and reported by the nurse manager to the Regional Drug and Therapeutics Committee. This will prompt a review of the guideline.

Adverse events and clinical incidents relating to the prescribing and administration of snake AVs are to be reported and managed as per the WACHS Medication Prescribing and Administration Policy.

5. References

1. Armstrong J, Pascu O. Toxicology Handbook: Elsevier: 2022
2. Isbister G. Suspected snakebite: one year prospective study of emergency department presentations. EMerg Med (Fremantle) [internet] 2003 Apr [cited 2023 February 21];15(2):160-9. Available from 10.1046/j.1442-2026.2003.00434.x
3. Government of Western Australia: Child and Adolescent Health Service – Perth Children's Hospital. 2022 Mar. Snakebite Emergency Department Guidelines [Accessed: 23 February 2023]
4. Therapeutic Guidelines – Toxicology and Toxinology - Snake bite [Accessed: 23 February 2023]
5. Isbister G. Snakebite: A current approach to management. Australian Prescriber [internet] 2006 Oct [Accessed: 21 February 2023];29(5), p125-129. Available from 8773/austprescr.2006.078
6. Stewart C. Snakebite in Australia: first aid and envenomation management. Accid Emerg Nurs [internet] 2003 Apr [Accessed: 21 February 2023];11:106-111. Available from 10.1016/s0965-2302(02)00189-3
7. Isbister, G, Brown S, MacDonald E, White, J and Currie, B. Current use of Australian snake antivenins and frequency of immediate-type hypersensitivity reactions and anaphylaxis. Med J Aust [internet] 2008 Apr [Accessed: 21 February 2023];188(8):473-476. Available from 10.5694/j.1326-5377.2008.tb01721.x
8. Kerry Hoggett, Emergency Physician and Clinical Toxicologist, Royal Perth Hospital-Personal Communication, via email, 30th July 2024.

6. Definitions

Term	Definition
Antivenom	An antitoxin specific for an animal or insect venom (Stedman's Medical Dictionary 28th Ed. 2006)
Coagulopathy	Impairment of the bloods ability to clot
Envenoming	Clinical syndrome of systemic toxicity from venom
Hospital	Hospital or other health facility with emergency service capabilities
Neurotoxicity	In snakebite, the loss of function to nerves supplying muscles
Paralysis	Loss of power of a voluntary muscular contraction (Macquarie dictionary)

7. Document Summary

Coverage	WACHS Wide
Audience	All medical officers, nurses and midwives that work in WACHS Emergency Departments
Records Management	Non Clinical: Records Management Policy Clinical: Health Record Management Policy
Related Legislation	• *Medicines and Poisons Act 2014* (WA) • Medicines and Poisons Regulations 2016 (WA)
Related Mandatory Policies / Frameworks	• MP 0131/20 High Risk Medication Policy • Clinical Governance, Safety and Quality
Related WACHS Policy Documents	• Assessment and Management of Interhospital Patient Transfers Policy • Documentation Clinical Practice Standard • Medication Prescribing and Administration Policy
Other Related Documents	• ASCIA Guidelines – Acute management of Anaphylaxis
Related Forms	• MR140A Adult Observation and Response Chart (A-ORC) • MR140E Paediatric Acute Recognition and Response Observation Tool (PARROT <3 Months) • MR140F Paediatric Acute Recognition and Response Observation Tool (PARROT 3-12 Months) • MR140G Paediatric Acute Recognition and Response Observation Tool (PARROT 1-4 Years) • MR140H Paediatric Acute Recognition and Response Observation Tool (PARROT 5-11 Years) • MR140i Paediatric Acute Recognition and Response Observation Tool (PARROT 12+ Years) • MR140S WACHS Snakebite Observation Chart
Related Training Packages	Nil
Aboriginal Health Impact Statement Declaration (ISD)	ISD Record ID: 2025
National Safety and Quality Health Service (NSQHS) Standards	1.07, 1.27, 4.13, 8.04, 8.05, 8.06, 8.08, 8.09, 8.10, 8.11
Aged Care Quality Standards	Nil
Chief Psychiatrist's Standards for Clinical Care	Nil

8. Document Control

Version	Published date	Current from	Summary of changes
7.00	29 June 2023	29 June 2023	Updated to new template; clarification for pressure bandage immobilisation (PBI) removal during (AV) administration; reference to seek advice from ETS and/or toxicology regarding removal at sites without prolonged critical care capability; inclusion of APTC; Side effects of AV; Management of AV reactions; Complications (serum sickness); monitoring and evaluation; update of Appendix A
7.01	25 July 2023	29 June 2023	Appendix A minor changes following Toxicology advice: • added Narembeen Hospital • Jurien Bay NP stockholdings change
7.02	7 May 2024	29 June 2023	Changes following Toxicology advice: • addition of polyvalent AV information to the guideline introduction • removal of references to 'post bite'. These now refer to post removal of pressure bandage immobilisation (PBI). • neurological examination added to when initial bloods are taken and also at 6 and 12 hours post removal of PBI • flowchart and notes updated to reflect above changes and administration information has been added to the AV Administration box.
7.03	14 Nov 2024	29 June 2023	Minor amendments to: • Update to snakebite – in hospital section: Point 5: D-dimer removed from the bracket associated with coagulation profile and now sits independently; Figure 1: Suspected snakebite summary flowchart - D-dimer added to the 'non envenomed' box on the left of the flowchart • Contact information for WA Poisons Information Centre (WAPIC) confirmed as primary contact – other details removed as this should be the single point of contact • Appendix A amendment note added regarding death adder AV, its continued use until vials expire, then use of polyvalent AV going forward as death adder AV no longer needing to be stocked.

			• Appendix A updated to include stockholding information for sea snake AV, comment for anticipated removal of death adder AV and information on all AV stock availability for new WACHS sites

9. Approval

Policy Owner	Executive Director Clinical Excellence
Co-approver	Executive Director Nursing and Midwifery Services
Contact	WACHS Clinical Director Emergency Medicine
Business Unit	Clinical Excellence and Medical Services
EDRMS #	ED-CO-14-28944

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Appendix A: Standard stockholding of antivenoms in WACHS

This stock holding is the intended level. Due to delays in restocking, antivenom (AV) may be temporarily unavailable due to use or damaged from a cold chain breach.

This table is reflective of the expected combined stock (ED + Pharmacy) availability at each site.

**Following review from the WA Clinical Toxicology group, death adder AV will be replaced by polyvalent AV as current death adder AV stock is exhausted. Sites which already stock polyvalent AV will not be required to stock additional quantities to account for the removal of death adder AV[8].*

		Snake					
Region	**Hospital**	**Brown**	**Black**	**Tiger**	**Polyval**	**Death Add**	**Sea**
Goldfields	Kalgoorlie Hospital	4	4		3	2*	
Goldfields	Esperance Hospital	2	1	2	2	1*	
Goldfields	Eucla NP				1		
Goldfields	Kambalda Health Centre	1	1				
Goldfields	Laverton Hospital	1	1				
Goldfields	Leonora Hospital	1	1				
Goldfields	Menzies Health Centre	1	1				
Goldfields	Norseman Hospital	1	1				
Great Southern	Albany Hospital	4		4			1
Great Southern	Bremer Bay NP	1		1			
Great Southern	Denmark Hospital	1		1			
Great Southern	Gnowangerup Hospital	1		1			
Great Southern	Jerramungup NP	1		1			
Great Southern	Katanning Hospital	2		2	1	1*	
Great Southern	Kojonup Hospital	1		1			
Great Southern	Plantagenet Hospital	1		1			
Great Southern	Ravensthorpe Hospital	1		1			
Great Southern	Walpole Health Centre	1		1			
Kimberley	Broome Hospital	4	4		4	2*	1
Kimberley	Derby Hospital	2	2		1	1*	1
Kimberley	Fitzroy Cross Hospital	1			1		
Kimberley	Halls Creek Hospital	1			1		
Kimberley	Kununurra Hospital	2	2		2	1*	1
Kimberley	Wyndham Hospital	1			1		
Midwest	Geraldton Hospital	3	2		2	1*	1
Midwest	Abrolhos Island Health Centre	1	1				1
Midwest	Carnarvon Hospital	2	2		2	1*	1
Midwest	Coral Bay NP	1	1				1
Midwest	Cue	1	1				
Midwest	Dongara Hospital	1	1				1
Midwest	Eneabba Health Centre	1	1				
Midwest	Exmouth Hospital	2	2		1	1*	1
Midwest	Kalbarri NP	1	1				1
Midwest	Leeman Health Centre	1	1				1
Midwest	Meekatharra Hospital	1	1		1		
Midwest	Mingenew Health Centre	1	1				

Midwest	Morawa Hospital	1	1				
Midwest	Mt Magnet Health Centre	1	1				
Midwest	Northampton Hospital	1	1				
Midwest	North Midlands (Three Springs)	1	1				
Midwest	Shark Bay NP	1	1				1
Midwest	Yalgoo NP	1	1				
Pilbara	Port Hedland Hospital	4	4		2	2*	1
		Snake					
Region	**Hospital**	**Brown**	**Black**	**Tiger**	**Polyval**	**Death Add**	**Sea**
Pilbara	Karratha Health Campus	2	2		2	2*	1
Pilbara	Marble Bar NP	1	1				
Pilbara	Newman Hospital	2	1				
Pilbara	Nullagine NP	1	1				
Pilbara	Onslow Hospital	2	1				
Pilbara	Paraburdoo Hospital	1	1				
Pilbara	Roebourne Hospital	1	1				
Pilbara	Tom Price Hospital	2	1				
South West	Bunbury Hospital	4		4	4	1*	2
South West	Busselton Hospital	3		2	4		
South West	Augusta Hospital	1		1			
South West	Boyup Brook Hospital	1		1			
South West	Bridgetown Hospital	2		1			
South West	Collie Hospital	2		1			
South West	Donnybrook Hospital	1		1			
South West	Harvey Hospital	1		1			
South West	Margaret River Hospital	2		1			
South West	Nannup General Ward	1		1			
South West	Northcliffe NP	1		1			
South West	Pemberton Hospital	1		1			
South West	Warren Health Service (Manjimup)	1		1	2		
Wheatbelt	Narrogin Hospital	3	2	2	2	2*	
Wheatbelt	Northam Hospital	4	2	2	2	2*	1
Wheatbelt	Merredin Hospital	1	1		1	1*	
Wheatbelt	Moora Hospital	1	1				
Wheatbelt	Beverley MPS				1		
Wheatbelt	Boddington Hospital	1	1	1			
Wheatbelt	Bruce Rock Hospital	1	1				
Wheatbelt	Corrigin MPS	1	1				
Wheatbelt	Cunderdin NP	1	1				
Wheatbelt	Dalwallinu MPS	1	1				
Wheatbelt	Goomalling Hospital	1	1				
Wheatbelt	Jurien Bay NP				2		1
Wheatbelt	Kellerberrin Hospital	1	1				
Wheatbelt	Kondinin Hospital	1	1				
Wheatbelt	Kununoppin Hospital	1	1				
Wheatbelt	Lake Grace Health Centre	1	1				
Wheatbelt	Lancelin NP				1		1
Wheatbelt	Narembeen Hospital	1	1				
Wheatbelt	Pingelly Hospital	1	1				
Wheatbelt	Quairading Hospital	1	1				
Wheatbelt	Wagin Hospital	1	1				
Wheatbelt	Wongan Hills MPS	1	1				
Wheatbelt	York Hospital				1		
Wheatbelt	Beacon NP	1	1				
Wheatbelt	Bencubbin NP	1	1				
Wheatbelt	Hyden NP	1	1				