

Simulation Package: Snake Bite

An open access resource for clinical educators



Optimus
BONUS



Optimus

BONUS

Bank Of iNdependently Useful Simulations

Part of the Children's Health Queensland 'Optimus' curriculum.

Simulation Package: Snake Bite

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For more information contact:

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An electronic version of this document is available at <https://www.childrens.health.qld.gov.au/research/education/queensland-paediatric-emergency-care-education/optimus-bonus/>

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Contents of this educational package:



Simulation

1. Rehearse assessment of snake bite and administration of antivenom
2. Treat anaphylaxis to antivenom



Further Reading

Podcasts and Blog Posts
Online Videos
Journal Articles

Section I: Scenario Demographics

Scenario Title:	Snake bite
Target Learning Group:	Multidisciplinary teams that look after sick children

Section II: Scenario Developers

Scenario Developers:	Dr Fiona Brown
Reviewers:	Dr Ben Symon (PEM), Dr David Elliott (ACEM), Dr Katherine Isoardi (Toxicologist)

Section III: Curriculum

Learning Goals & Objectives

Educational Goal:	- Assess and manage a patient with snake bite envenomation - Identify and treat anaphylaxis to antivenom
Skills Rehearsal:	- Application of pressure bandage - Administration of antivenom - Administration of IM adrenaline
Systems Assessment:	- Identify where nearest antivenom is and how to administer - Departmental access to clinical guidelines for snake bite

Case Summary: Brief Summary of Case Progression and Major Events

A 10 year old boy was bitten by a snake whilst camping with his family.

- Ryder has 2 bite marks and complains of headache and nausea
- Blood tests show Partial VICC
- Clinical toxicologist advises to give one vial of monovalent tiger snake antivenom and one vial of monovalent brown snake antivenom
- Simulation can cease once antivenom administered, or you can proceed to the optional extension (see below).

Optional extension: Anaphylaxis to Antivenom

If suitable for your learner group, after initiation of antivenom, Ryder develops anaphylaxis requiring management with IM adrenaline and IV fluids, and pausing of the antivenom.

He stabilises post treatment.

Section IV: Equipment and Staffing

Scenario Cast

Patient:	☐ Mannequin – Sim junior or Simulated Patient
Clinical Expert	Facilitator familiar with your local snake bite guidelines
Confederate:	Parent

Required Equipment

If running this simulation In Situ, suggest using your authentic equipment if approved by your department. This will help diagnose any actual equipment / availability / layout issues.

☐ Airway Trolley	☐ Medication and Fluid chart	☐ Cannulation equipment
☐ Stethoscope	☐ CREDD book	☐ Pathology results
☐ Pressure bandage	☐ Fluids and IV pole	☐ Telephone
☐ Splint	☐ Simulated Medications - Monovalent tiger snake antivenom, monovalent brown snake antivenom, IM adrenaline	☐ Departmental snake bite guideline or CHQ statewide guideline

Moulage

Two puncture marks above left medial malleolus

Section V : Scripts

Start of Simulation: Parent Script



Hi, I'm Ryder's dad. He has been bitten by a snake!

We were all camping and Ryder must not have zipped the tent up properly because there was a snake in his tent this morning! He called for help, but in the commotion of getting out of the tent the snake has bitten his left ankle.

The bite happened about 30 mins ago and we brought him straight here. He has been complaining of an itch around his ankle and now a headache.

If asked for further information on Ryder's background/events:

- Nil past medical history, NKDA, Immunisations up to date
- The snake looked brown in colour. I think it could have been an eastern brown snake or death adder, but I'm no snake expert!

Section VI: Scenario Progression

Scenario States

State 1 : Initial Assessment

Patient State	Patient Status	Learner Actions, Modifiers & Triggers to Move to Next State	
Rhythm: Sinus HR: 108 BP: 100/62 Cap refill 2 secs RR: 22 O₂SAT: 99% on RA T: 37.4 AVPU = Alert, anxious BSL 5.6	Airway: Patent Breathing: Air entry bilaterally Circulation: Warm peripherally, strong pulses Disability: Alert, complaining of headache Exposure: Bite marks left ankle, nil other injuries	☒ Primary survey ☒ Applies pressure bandage and splints lower limb ☒ Establishes IV access and takes bloods for FBC/Chem20/Coags/D-dimer/CK ☒ Access guideline	<u>Modifiers</u> - If calls poisons immediately, advice as below and prompt for PBI <u>Triggers</u> - Move to next stage once pressure bandage applied and IV access established - Explain to team that we will move forward a little in time, with the bloods now back

Advice if poisons called immediately:



Hello. This is from the Toxicology service
 It sounds like you have a stable patient with non-specific symptoms post a snake bite.
 Make sure you immobilise the limb with a pressure bandage, take bloods including Coags, CK, FBC, U&Es and D-dimer and then contact me back with the results and I can offer further advice.
 If there is any clinical deterioration, please call sooner.

If your service has no critical care facilities or antivenom, he would need to be transferred urgently to a place with antivenom.

State 2 : Blood results return

Patient State	Patient Status	Learner Actions	Modifiers & Triggers to Move to Next State
Rhythm: Sinus HR: 105 BP: 104/58 Cap refill 2 secs RR: 22 O₂ SAT: 100% on room air T: 37.4 AVPU = Alert	ABCDE as above Complains of headache and nausea No neurotoxicity/ no ptosis/diplopia/blurred vision	☒ Reassessment ☒ Interpret VICC blood results ☒ Contacts poisons for further advice ☒ Administer anti venom	<u>Modifiers</u> - Give blood results - Advice as per clinical toxicologist for two antivenoms <u>Triggers</u> - You can end scenario once antivenom given and handover to paediatric team - OR continue scenario – move to next stage once anti venom given

Advice from poisons when blood results return:

Based on the blood test results, you have a patient with partial venom induced consumption coagulopathy who also has some systemic symptoms.

This child requires antivenom.

As we don't know the type of snake, I would recommend one vial of monovalent tiger snake antivenom and one vial of monovalent brown snake antivenom.

Full vials need to be given, this is not a weight-based dosing medication.

Please ensure the child is in a resus setting and fully monitored and don't remove the pressure bandage until the antivenom has been commenced. He'll need ongoing blood tests as per the protocol after this.

End simulation here and debrief, OR, continue to state 3 to explore anaphylaxis to antivenom (optional).

State 3 : (OPTIONAL EXTENSION) Anaphylaxis to anti-venom

Patient State	Patient Status	Learner Actions	Modifiers & Triggers to Move to Next State
Rhythm: Sinus HR: 128 BP: 75/50 Cap refill <2 secs RR: 26 O₂ SAT 96% on RA T: 37.6 AVPU = Alert, distressed	Ryder distressed, complains throat feels itchy and abdominal pain New global urticarial rash	☒ Reassessment ☒ Identifies anaphylaxis ☒ Stops antivenom ☒ Applies NRB oxygen ☒ Administers IM adrenaline ☒ Gives fluid bolus	<u>Modifiers</u> - If not recognising change in clinical picture – nurse prompts new rash <u>Triggers</u> - Scenario ends when IM adrenaline given and re-assessment started - Patient BP stabilises and respiratory distress improves

Advice from poisons if called about anaphylaxis:

In antivenom anaphylaxis you should:

- Stop the infusion
- Lie the patient flat
- Commence high flow oxygen
- Support airway and ventilation
- Treat hypotension with 20mL/kg Saline boluses
- Treat signs of anaphylaxis with IM Adrenaline 0.01mg/kg
- Start adrenaline infusion
- If hypotension resolves with fluid boluses or adrenaline, antivenom can be restarted at a slower rate (over 1 hour)

Section VII: Supporting Documents, Laboratory Results, & Multimedia

	Results	Units	Normal Range
Hb	145	g/L	120 - 160
WCC	14.0	x10 ⁹ /L	4.5 - 13.0
Plats	120	x10 ⁹ /L	150 - 400
Hct	0.4		0.36 - 0.46
MCH	28	pg	25 - 33
RCC	5.0	x10 ¹² /L	4.1 - 5.1
MCV	85	fL	77 - 95
Neuts	12.0	x10 ⁹ /L	1.5 – 8.0
Lymph	0.5	x10 ⁹ /L	1.1 - 4.5
Mono	0.2	x10 ⁹ /L	0.2 – 1.0
Eosin	0.5	x10 ⁹ /L	<0.81
Baso	0.1	x10 ⁹ /L	<0.21

	Results	Units	Normal Range
INR	2.6	ratio	0.8 – 1.1
PT	25	secs	12 - 25
APTT	60	secs	25 - 37
Fib	1.1	g/L	2.2 – 4.3
D-dimer	5.5	mg/L	<0.5

	Results	Units	Normal Range
Na	135	mmol/L	135 - 145
K	5.4	mmol/L	3.5 – 5.2
Cl	100	mmol/L	95 - 110
HCO3	28	mmol/L	22 - 32
Urea	7.5	mmol/L	3.5 – 8.0
Creat	90	umol/L	50 - 100
Prot	60	g/L	60 – 80
Alb	35	g/L	33 - 48
Glob	28	g/L	20 - 35
Bili (tot.)	30	umol/L	22 - 32
Bili (conj.)	8	umol/L	<10
ALP	200	U/L	50 - 220
GGT	45	U/L	5 - 50
ALT	55	U/L	< 51
AST	50	U/L	< 36
LDH	390	U/L	120 - 250
Ca	1.9	mmol/L	2.1 – 2.6
Phos	1.00	mmol/L	0.75 – 1.65
Mg	0.88	mmol/L	0.7 – 1.1
CK	500	U/L	55 - 170

Section VIII: Debriefing Guide

Objectives

Educational Goal:	- To assess and manage a patient with envenomation from snake bite - Identification and management of anaphylaxis to antivenom
Skills Rehearsal:	- Application of pressure bandage - Administration of antivenom - Administration of IM adrenaline
Systems Assessment:	- Identify where nearest antivenom is and how to administer - Departmental access to clinical guidelines for snake bite

Sample Questions for Debriefing

This case was a child with envenomation from snake bite. He subsequently developed anaphylaxis from antivenom, with allergic reactions occurring in between 6-22% of patients who have antivenom administered.

We used this case to highlight recognising and responding to an acutely unwell patient, the use of CHQ guidelines and to practice prescribing, drawing up and administering medications which we may not be familiar with.

- What resources do you have available to help you manage this case? (CHQ protocols/ flow chart).
- The patient had some very non-specific symptoms of headache and nausea when he arrived. What other signs or symptoms of envenomation do you know about or expect?
- What challenges were identified when obtaining or preparing anti-venom?
- What potential complications could arise or could we prepare for when administering antivenom? Were you aware that there is a 'management of antivenom anaphylaxis' flowchart within the snake bite CHQ guideline? How might this have helped?

Diagnostic Report of In Situ Simulation

Simulation can provide important data about unrecognised latent safety threats within your service. This form is provided to prompt recording of any Quality and Safety / Systems issues that need escalation within your department.

It is **not** to be used as a recording of personal performance management or to violate candidates' confidentiality.

Category	Issue identified	Action recommended	Should be escalated to	Follow up date
Team				
Environment				
System				

Simulation Occurred on _____

Follow up date re : identified issues on _____

Resources for simulation participants



[Children's Health Queensland Guideline:
Emergency Management of Snake Bites](#)



[YouTube: How to bandage a snake bite
Queensland Health](#)



Queensland
Government

[First Aid Advice: Snake Bites](#)

Curriculum

This package is designed for **individuals** to refresh and retain the following skills learned in previous OPTIMUS courses as well as add new knowledge on specific conditions.

Optimus CORE	Optimus PRIME	Optimus BONUS
Assessment of the sick child	Recognition and management of clinical deterioration in a child	Utilising CHQ snake bite resources
Administration of a fluid bolus		Prescription and preparation of antivenom
Administration of adrenaline		

This package is designed to offer your **department** a systems level check regarding :

Access to paediatric resources on : - Snake bite (QCH) - Anaphylaxis (CHQ) - Drug calculations (CREDD book)	☐ ☐ ☐
Equipment Check : Antivenom (monovalent tiger snake antivenom and monovalent brown snake antivenom)	☐ ☐
Departmental Protocols for: Snake bite pathway	☐

If you would like any assistance obtaining access or advice for any of the above issues, please contact stork@health.qld.gov.au

About the Author :



Dr Fiona Brown

Simulation Fellow, STORK (Simulation Training Optimising Resuscitation for Kids) Queensland Children's Hospital

Fiona is a doctor who has a keen interest in medical education and simulation. After starting her educational career as a simulation fellow in the UK, she swapped rainy England for a warmer climate and has been very grateful to work with the STORK team, delivering paediatric education around Queensland. She is currently studying Emergency Medicine.

About the BONUS Project :

The [OPTIMUS BONUS project](#) is a bank of useful scenarios that are open access and available for free use. It has been designed by the Simulation Training Optimising Resuscitation for Kids team for Children's Health Queensland.

We aim to use the packages to provide :

- Spaced repetition to reinforce learning objectives from CORE and PRIME
- Connections to high quality, up to date paediatric resources for health professionals
- Quality and Safety checks for local hospitals regarding paediatric clinical guidelines, resources and equipment

The scenarios have been designed in response to :

- Paediatric coronial investigations in Queensland, Australia.
- Clinical skills issues revealed through In Situ Translational simulations in hospitals throughout Queensland.
- Quality and Safety Initiatives

About STORK

In 2014, Children's Health Queensland funded the 'Simulation Training Optimising Resuscitation for Kids' service. STORK is a paediatric education team focused on improving healthcare outcomes for children throughout the state.

STORK has developed a number of courses aimed at different phases of paediatric critical care :

- CORE is a course for first responders to a paediatric emergency, and teaches recognition of the deteriorating patient, Children's Early Warning Tools, and resuscitation competencies.
- PRIME is a course for mid phase responders who look after unwell patients while awaiting for retrieval or escalation to an Intensive Care. It aims at contextualising Seizure Management, Intubation and Inotrope Administration within host hospital's real clinical environments in order for healthcare teams to generate their own practice improvement strategies as well as link peripheral hospitals with high quality resources.
- BONUS was proposed as a solution to skill and knowledge decay after these courses are run.

If you would like to know more information about STORK or acquire copies of our resources, please contact us at stork@health.qld.gov.au .

References

This educational package has been reviewed by content experts and a Statewide Steering Group Review on behalf of Children's Health Queensland.

This Simulation Template has been adapted from the template from emsimcases.com, available at : <https://emsimcases.com/template/>

- How to bandage a snake bite, Queensland Health
<https://www.youtube.com/watch?v=qnOeiMa8mMc>
- St John's ambulance WA– How to treat a snake bite first aid Facts
<https://www.youtube.com/watch?v=ILkw4BXa7pQ>
- Australian Paramedical college - Snake bit first aid, Pressure immobilisation technique
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- Snake bite [published August 2020]. In: *eTG complete* [digital]. Melbourne: Therapeutic Guidelines Limited; 2021 March [https://tgldcdp.tg.org.au/viewTopic?topicfile=toxinology-snake-bite&guidelineName=Toxicology and Toxinology#toc_d1e754](https://tgldcdp.tg.org.au/viewTopic?topicfile=toxinology-snake-bite&guidelineName=Toxicology%20and%20Toxinology#toc_d1e754)