Optimus BONUS : Anaphylaxis

Queensland Government

OPTIMUS BONUS : Paediatric Anaphylaxis

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A copy of this simulation package is available online at : https://www.childrens.health.qld.gov.au/research/education/queensland-paediatric-emergency-care-education/optimus-bonus/

For more information contact:

Simulation Training Optimising Resuscitation for Kids (STORK) Unit, Queensland Children's Hospital, 501 Stanley St, South Brisbane QLD 4101, stork@health.qld.gov.au

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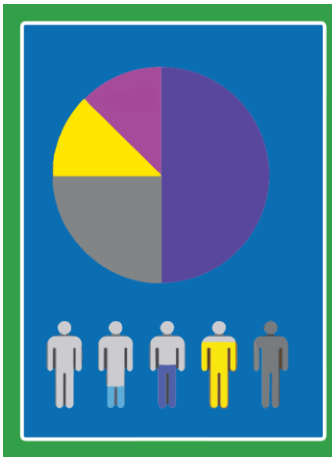
Contents of this educational package:

Simulation

Structured approach to anaphylaxis
Administrating adrenaline in anaphylaxis
Airway management



Infographic

For sharing in the weeks before or after your simulation via email or in poster format.

Further Reading

Podcasts and Blog Posts
Online Videos
Journal Articles

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Simulation

Introduction by Dr Jane Peake, MBBS FRACP DTM&H

Jane Peake did her general paediatric training at the Royal Children's Hospital in Brisbane before going overseas to train in immunology and allergy centres of excellence in the United Kingdom, France and Canada over several years. She returned to Brisbane 20 years ago and in 2008 established the first public paediatric immunology and allergy service in Queensland (Queensland Paediatric Immunology and Allergy Service). Jane's clinical and research special interests include primary immune deficiency, food allergy, anaphylaxis and severe eczema. She has numerous publications in these areas and is on a variety of state and national advisory boards and government committees. She is currently a director of the Australasian Society of Clinical Immunology and Allergy (ASCIA) which is the peak professional body of immunology and allergy in Australasia. Jane is an associate professor at the University of Queensland.

"Anaphylaxis is a potentially life-threatening severe allergic reaction. It is caused most commonly by foods in children, but other causes include insect stings, drugs and idiopathic. Data shows that there are increasing presentations of children to emergency departments with anaphylaxis. Worldwide prevalence of allergies is rising, and Australia has some of the highest rates of food allergies in the world. Current recommendations of early introduction of solids, including allergenic solids, is aimed at prevention of the development of food allergy. However, for some infants their initial exposure to a food may result in an anaphylactic reaction, meaning that we now have young babies and infants presenting with anaphylaxis to emergency departments.

Most important in the management of anaphylaxis is recognition. Cases may be missed if this diagnosis is not considered in patients presenting with sudden onset of acute severe respiratory or cardiovascular symptoms or in those who don't have any skin or gastrointestinal involvement.

Prompt treatment with adrenaline is then required once anaphylaxis is diagnosed. Multiple doses of intramuscular adrenaline may rarely be required in children. Intravenous infusions of adrenaline would extremely rarely be needed and must be used with care. In patients, especially infants, requiring multiple doses of adrenaline or an infusion, adrenaline overdose needs to be watched for.

Antihistamines as adjunct therapy can be given to alleviate symptoms such as itch but should not be given in the place of adrenaline for anaphylaxis and oral steroids are not useful in this setting. Following an episode of anaphylaxis, it is important that the patient is supplied with an adrenaline autoinjector, an anaphylaxis action plan and the family are educated regarding these and avoidance of the potential allergen. New patients should be referred to an allergist for assessment and confirmation of the cause."

Section I: Scenario Demographics

Scenario Title:	BONUS – Paediatric Anaphylaxis
Date of Development:	18/7/19
Target Learning Group:	Multidisciplinary Teams that look after Paediatric Patients

Section II: Scenario Developers

Scenario Developers:	Dr Sonia Twigg, Dr Benjamin Symon, Dr Ben Lawton, Ms Louise Dodson, Mrs Tricia Pilotto, Dr Caroline Ardilo Sarmiento
Reviewed by :	Dr Jane Peake

Section III: Curriculum

Learning Goals & Objectives	
Educational Goal:	• Structured approach to anaphylaxis management • Preparing for difficult intubation in a shocked paediatric patient
Skills Rehearsal:	• Adrenaline prescription and administration • Doses for IM and IV infusion in anaphylaxis
Systems Assessment:	• Departmental access to clinical guidelines, prescribing resources and action plans for paediatric anaphylaxis • Smart-pump software check for adrenaline infusion

Case Summary: Brief Summary of Case Progression and Major Events

- 6yo girl with known nut allergy is visiting a relative on the hospital ward and develops severe anaphylaxis after eating a piece of chocolate cake made with almond meal.
- The anaphylaxis is refractory to initial management and requires IV adrenaline infusion before stabilizing.
- She develops airway symptoms suggesting airway obstruction but these resolve once adrenaline infusion commenced.

Section IV: Equipment and Staffing

Scenario Cast	
Patient:	☐ Mannequin (appropriate size for 6 year old patient)
Clinical Expert	Senior Medical Officer competent at managing anaphylaxis in children. Can be called for help and advice at any point in the scenario.
Confederate:	Parent. Calls for help. Has anaphylaxis action plan. Offers to give epipen. Calm and caring.

Required Monitors	
☐ ECG Leads/Wires	☐ Temperature probes
☐ NIBP Cuff	☐ Defibrillator pads
☐ Pulse Oximeter	

Required Equipment		
☐ Gloves	☐ Oropharyngeal airways	☐ 14G non-safety IVC
☐ Stethoscope	☐ Nasopharyngeal airways	☐ Oxygen tubing + 3 way tap
☐ IV cannulation equipment	☐ Tongue depressor	☐ Syringes and 3 way taps
☐ Intraosseous set up	☐ Endotracheal cuffed tubes 5, 5.5, 6	☐ Adrenaline 1 in 1000
☐ IV bags and lines	☐ Paediatric Bougie	☐ Adrenaline 1 in 10 000
☐ Nasal Prongs	☐ Paediatric Stylet	☐ Nebuliser
☐ Non-Rebreather Mask	☐ LMAs	☐ Syringe labelled hydrocortisone
☐ Bag Valve Mask	☐ Scalpel	☐ Epipen demonstration syringe

Moulage

- Urticarial rash – over most of body
- 2x IVC with drainage bags attached. “No IV sticker” initially on both IVCs.

Approximate Timing							
Set-Up:	15 m	Prebrief :	10 mins	Scenario:	20 mins	Debriefing:	20 mins

Patient Profile and History			
Patient Name: Lilly		**Age:** 6 years old	**Weight:** 25kg
Gender: Female			
Chief Complaint: Anaphylaxis			
History of Presenting Illness: Was well. Visited grandmother in hospital and ate a piece of chocolate cake made with almond meal.			
Past Medical History:	Eczema Asthma	**Medications:** nil regular	**Immunisations:** Up to date.
Allergies: Nut allergy; almonds and cashews			
Social History: Lives with mother and 2 siblings			
Family History: Her mother has Asthma.			

Start of Simulation : Parent Script

At start of simulation : *"Help! My child is sick!"*

When help arrives :

> *"We were visiting a friend – Lilly ate a piece of chocolate cake and then started looking really sick and vomiting.*
>
> *She has a nut allergy. I think she's having an anaphylactic reaction. I have her action plan and epipen here with me. Should I give the epipen now?"*

If asked for further information on Lily's background :

Lily is 6 years old and was diagnosed with nut allergy at 1 year of age after developing hives after sucking on a nut. Skin prick testing with her immunologist has confirmed allergy to almonds and cashews. She has 2 epipen juniors, 1 of which is at school.

She has no other medical issues or allergies.
She is fully immunised and developmentally normal.

Section VI: Scenario Progression

<table>
<tr><th colspan="4">Scenario States</th></tr>
<tr><th colspan="4">State 1 : Initial Assessment</th></tr>
<tr><th>Patient State</th><th>Patient Status</th><th colspan="2">Learner Actions, Modifiers & Triggers to Move to Next State</th></tr>
<tr><td>Rhythm: NSR
HR: 180
BP: 75/50
Cap refill 1s
RR: 60
O₂ SAT: 95%RA
T: 37.2
BSL: 5.6
AVPU = Alert, distressed</td><td>Parent calls for help as per script.

Patient is distressed with urticaria, her throat is itchy and it’s hard to breathe, her tummy is sore, and she wants to vomit – retching and coughing noises.</td><td>☒ Call for Help/ Met call
☒ Apply oxygen via non-rebreather mask.
☒ Apply monitoring and take NIBP.
☒ Prescribe, Prepare and Administer dose of IM adrenaline 10mcg per kg (0.01ml/kg of adrenaline 1 in 1000) either via patient’s Epipen or Department’s supply.</td><td><u>Modifiers</u>

<u>Triggers</u>
5 minutes, has done required actions or team arrives</td></tr>
<tr><th colspan="4">State 2 : Administration of IM adrenaline x 2</th></tr>
<tr><td>Rhythm: NSR
HR: 180
BP: 75/50
Cap refill 1s
RR: 60
O₂ SAT: 95%RA
T: 37.2
BSL: 5.6
AVPU = Alert</td><td>Medical Emergency Team arrives.

Patient remains distressed, coughing, nauseated and itchy.</td><td>☒ State the patient is having anaphylaxis
☒ Prescribe, Prepare and Administer second dose of IM adrenaline 10mcg per kg (0.01ml/kg of adrenaline 1 in 1000)
☒ Allocate team roles
☒ ABCD assessment of patient
☒ IV access</td><td><u>Modifiers</u>

<u>Triggers</u>
5 minutes or has done required actions.</td></tr>
</table>

Scenario States

State 3 : Airway at risk

Rhythm: NSR **HR:** 185 **BP:** 70/45 **Cap refill** 1s **RR:** 60 **O_2 SAT**: 94% **T:** 37.2 **BSL:** 5.6 **AVPU** = Voice, becoming drowsy	Patient says she can't breathe and then becomes drowsy and difficult to rouse. Stridor is heard.	☒ Recognise deteriorating airway. ☒ Support airway with positioning, manoeuvres, consider adjuncts. ☒ Anticipate and Plan for potential intubation ☒ Prepare for a difficult airway; ☒ Get help, Difficult airway equipment ☒ Prescribe and Prepare IV Adrenaline ☒ Consider 2nd IV access ☒ Draw up adrenaline infusion and/or push dose pressor doses of adrenaline.	Modifiers If team does not recognise need for 2nd IM dose of adrenaline, make this clearly necessary by increasing HR to 190 and BP to 65/40. Triggers 5 minutes or tasks done.

State 4 : Severe anaphylactic shock requiring infusion of adrenaline

Rhythm: 190 **HR:** 190 **BP:** 65/40 **Cap refill** 1s **RR:** 30 **O_2 SAT**: 92% **T:** 37.2 **BSL**: 5.6 **AVPU** = Unresponsive	Patient now unconscious with stridor.	☒ Start Adrenaline Infusion ☒ Consider nebulized adrenaline ☒ Team prepares to intubate. ☒ Arrest doses of adrenaline prepared.	Modifiers Once adrenaline infusion commenced, BP improves to 75/50 and HR decreases to 180, SaO2 improves to 95%, wheeze and stridor resolves. Triggers 5 minutes or tasks done.

Section VII: Supporting Documents, Laboratory Results, & Multimedia

Venous Blood Gas Result : Early in Scenario (Minimal Resp Compromise)

	Results	Units	Normal Range
pH	7.45		**7.32 – 7.42**
pCO2	35	mmHg	**41 - 51**
pO2	30	mmHg	**25 - 40**
O2 Saturations	50	%	**40 - 70**
Bicarb	25	mmol/L	**22 - 33**
BE	0	mmol/L	**-3 - +3**
HCT			**0.3 - 0.42**
Hb	115	g/L	**105 - 135**
Na+	137	mmol/L	**135 - 145**
K+	4	mmol/L	**3.2 - 4.5**
Ca++ (ionised)	1.25	mmol/L	**1.15 – 1.35**
Glucose	5	mmol/L	**3.0 – 7.8**
Lactate	0.9	mmol/L	**0.7 – 2.5**

Venous Blood Gas Result : Late in Scenario (Resp Compromise and Shock)

	Results	Units	Normal Range
pH	7.25		**7.32 – 7.42**
pCO2	55	mmHg	**41 - 51**
pO2	30	mmHg	**25 - 40**
O2 Saturations	50	%	**40 - 70**
Bicarb	25	mmol/L	**22 - 33**
BE	0	mmol/L	**-3 - +3**
HCT			**0.3 - 0.42**
Hb	115	g/L	**105 - 135**
Na+	137	mmol/L	**135 - 145**
K+	4	mmol/L	**3.2 - 4.5**
Ca++ (ionised)	1.25	mmol/L	**1.15 – 1.35**
Glucose	5	mmol/L	**3.0 – 7.8**
Lactate	1.5	mmol/L	**0.7 – 2.5**

ascia
australasian society of clinical immunology and allergy
www.allergy.org.au

ACTION PLAN FOR Anaphylaxis

For use with adrenaline (epinephrine) autoinjectors

Name: Lilly

Date of birth: 14th August

Confirmed allergens:
Nut allergy : Almonds and Cashews

Family/emergency contact name(s):
Maryanne

Work Ph: 07 3139 6789
Home Ph:
Mobile Ph: 0421063907

Plan prepared by medical or nurse practitioner:
Dr Sonia Stork

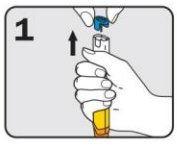
I hereby authorise medications specified on this plan to be administered according to the plan

Signed:

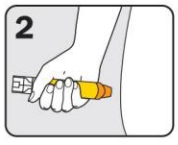
Date:

Action Plan due for review – date:

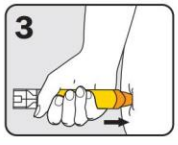
How to give EpiPen® adrenaline (epinephrine) autoinjectors



Form fist around EpiPen® and PULL OFF BLUE SAFETY RELEASE



Hold leg still and PLACE ORANGE END against outer mid-thigh (with or without clothing)



PUSH DOWN HARD until a click is heard or felt and hold in place for 3 seconds

REMOVE EpiPen®

EpiPen® is prescribed for children over 20kg and adults. EpiPen®Jr is prescribed for children 10-20kg

SIGNS OF MILD TO MODERATE ALLERGIC REACTION

- Swelling of lips, face, eyes
- Hives or welts
- Tingling mouth
- Abdominal pain, vomiting (these are signs of anaphylaxis for insect allergy)

ACTION FOR MILD TO MODERATE ALLERGIC REACTION

- For insect allergy - flick out sting if visible
- For tick allergy ☐ seek medical help or ☐ freeze tick and let it drop off
- Stay with person and call for help
- Locate adrenaline autoinjector
- Give other medications (if prescribed). Cetirizine 5mg
- Phone family/emergency contact

Mild to moderate allergic reactions (such as hives or swelling) may not always occur before anaphylaxis

WATCH FOR ANY ONE OF THE FOLLOWING SIGNS OF ANAPHYLAXIS (SEVERE ALLERGIC REACTION)

- **Difficult/noisy breathing**
- **Swelling of tongue**
- **Swelling/tightness in throat**
- **Wheeze or persistent cough**
- **Difficulty talking and/or hoarse voice**
- **Persistent dizziness or collapse**
- **Pale and floppy (young children)**

ACTION FOR ANAPHYLAXIS

1 Lay person flat - do NOT allow them to stand or walk
- **If unconscious, place in recovery position**
- **If breathing is difficult allow them to sit**

2 Give adrenaline autoinjector

3 Phone ambulance - 000 (AU) or 111 (NZ)

4 Phone family/emergency contact

5 Further adrenaline doses may be given if no response after 5 minutes

6 Transfer person to hospital for at least 4 hours of observation

If in doubt give adrenaline autoinjector

Commence CPR at any time if person is unresponsive and not breathing normally

ALWAYS give adrenaline autoinjector FIRST, and then asthma reliever puffer if someone with known asthma and allergy to food, insects or medication has SUDDEN BREATHING DIFFICULTY (including wheeze, persistent cough or hoarse voice) even if there are no skin symptoms

Asthma reliever medication prescribed: ☐ Y ☑ N

- *If adrenaline is accidentally injected (e.g. into a thumb) phone your local poisons information centre.*
- *Continue to follow this action plan for the person with the allergic reaction.*

© ASCIA 2018 This plan was developed as a medical document that can only be completed and signed by the patient's medical or nurse practitioner and cannot be altered without their permission

Section VIII: Debriefing Guide

Objectives	
Educational Goal:	• Structured approach to anaphylaxis management • Preparing for difficult intubation in a shocked paediatric patient
Skills Rehearsal:	• Adrenaline prescription and administration • Doses for IM, IV push dose pressor, IV infusion and arrest
Systems Assessment:	• Departmental access to clinical guidelines, prescribing resources and action plans for paediatric anaphylaxis • Smart-pump software check for paediatric adrenaline infusion

Sample Questions for Debriefing

- Can anyone outline the structured approach to managing paediatric anaphylaxis?
- Does your service use a protocol for management of anaphylaxis?
  - What resources do we need to implement that weren't accessed?
- What challenges came up when preparing and prescribing multiple adrenaline doses?
  - Do you have any drug dosing references that can help with prescribing or drawing up adrenaline?
- What airway difficulties were predicted with this patient?
  - How can we optimise management of that in your hospital?
- What was it like forming a team so quickly?
  - What strategies made the team work better together?
  - What made it harder?
  - What could you do to improve this next time?

Key Moments

- Calling for help early
- Giving IM adrenaline
- Anticipating deterioration and preparing adrenaline infusion
- Supporting airway
- Preparing for a difficult intubation
- Starting adrenaline infusion

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ANAPHYLAXIS in KIDS

Clinical Features :

Respiratory (one or more) :

- Difficulty /Noisy Breathing
- Swelling of Tongue
- Swelling / Tightness in Throat
- Difficulty Talking or Hoarse Voice
- Wheeze or Persistent Cough

AND OR

Cardiovascular (one or more) :

- loss of consciousness
- collapse
- pallor and floppiness
- hypotension

May also involve other systems such as the skin or gastrointestinal tract.

How to prepare IM dose

1st Line : IM Adrenaline into thigh

10 microg/kg (max 0.5 mg)
which is 0.01 mL/kg of undiluted 1 : 1000
Repeat IM Adrenaline if needed

2nd Line : IV Adrenaline Infusion

If smart pump available
1 mL of 1 : 1000 in 50 mL NS 0.9%
Start at 0.1 microg/kg/min

If no smart pump available
1 mL of 1 : 1000 in 50 mL of NS 0.9%
Start at 0.3 mL/kg/hr
which is 0.1 microg/kg/min

How to prepare IV infusion

For detailed management consult your guidelines :

Children's Health Qld
Clinical Guideline
on Anaphylaxis

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Queensland Government

Resources for Anaphylaxis Simulation Participants

Children's Health Queensland
Allergy & Anaphylaxis Guideline

Ascia anaphylaxis eTraining
for health professionals.

Anaphylaxis Action Plans
Provider and Parent Information

Allergy for the Acute Care Physician
Video from Dr Dominic Cincotta

Blog on paediatric anaphylaxis
Ped EM morsels by Dr Sean Fox

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 ….

OPTIMUS CORE	OPTIMUS PRIME	OPTIMUS BONUS
Assess the deteriorating child	Manage the child in shock	Manage anaphylaxis
Basic airway support	Team based approach to paediatric airway management	Prepare for a difficult intubation
Prepare arrest dose adrenaline	Prepare Adrenaline Infusions	Administer adrenaline in multiple routes
Escalation of care		Effective team convergence

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

Access to paediatric resources on : • Anaphylaxis • Adrenaline dosing	☐ ☐
Equipment Check : • Adrenaline vials of different concentrations • Infusion pump guardrails for paediatric adrenaline infusion • Paediatric difficult airway equipment	☐ ☐ ☐
Departmental Protocols for : • Anaphylaxis and Anaphylaxis Action Plans • Adrenaline infusions • Systems response to anticipated difficult paediatric airway	☐ ☐ ☐

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 Creators :

Dr Sonia Twigg : Primary Author
@LankyTwig
FACEM, MBBS, BA, BSc
Fellow, STORK (Simulation Training Optimising Resuscitation for Kids)
Queensland Children's Hospital

Dr Sonia from STORK is an emergency physician doing subspecialty training in Paediatric Emergency Medicine and works at the Queensland Children's Hospital as a fellow in the emergency department and for the STORK simulation team.
She is part of the ALIEM faculty incubator program for 2019-2020 and facilitated the 2019 Health Workforce Queensland workshops for GPs on Paediatric Emergency Medicine. Sonia is interested in critical care, medical education and ultrasound. She is passionate about fun, creativity and innovation in education.

Dr Ben Symon : Consultant Supervisor, Infographics and Editor
@symon_ben
RACP PEM, MBBS, BAnim
Simulation Consultant and Paediatric Emergency Physician
Queensland Children's Hospital and The Prince Charles Hospital

Dr Symon is a PEM Physician and Simulation enthusiast with a passion for translating clinical and educational research to front line health care workers. He is co-producer of the podcast 'Simulcast' and facilitates the Simulcast Online Journal Club, an online journal club for simulation educators throughout the world. He is faculty on the APLS Educational Skills Development Course and has recently been invited to join as international faculty for the Master Debriefer Course by the Debriefing Academy. His original degree in Animation has proved surprisingly useful in his career in medical education.

Dr Carolina Ardila : eLearning and Multimedia
@caroelearning
MBBS, MPH(TH), GradDipHlthMgt

Dr Ardila is a medical doctor from Colombia with an award winning skill set in eLearning development. Carolina has been working on eLearning for the last 4 years at the Royal Brisbane and Women's Hospital and Children's Health Queensland. During these years she has developed extensive knowledge in designing, developing and implementing engaging courses and launching award winning paediatric eLearning. She has a special interest in emergency and neonatology and in her spare time loves making videos and improving her animation and drawing skills.

Ms Louise Dodson : Adrenaline Preparation Videos
BHlthSc**,** GradCertClinSim

Louise has been a Simulation Leader since establishing the Simulation Program for the Royal Children's Hospital in Brisbane over 10 years ago. She co-created the original OPTIMUS CORE course in 2013 to improve paediatric resuscitation training throughout Queensland.
The course has been delivered to more than 5000 health care professionals throughout Queensland since that time. Louise has a background in paediatric emergency nursing and tries to keep her left foot in clinically. She has also completed a grad cert in simulation and clinical education.

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 .

Resources for participants

1. Fox, Sean. Anaphylaxis. PEDEM morsels. October 2014. Available at: https://pedemmorsels.com/anaphylaxis/

2. Cincotta D, Allergy for the Acute Care Physician. PAC 2015. APLS Australia. Available at: https://vimeo.com/157230397

3. ASCIA Action Plans, Treatment Plans and Checklists. May 2019. Available at: https://www.allergy.org.au/hp/ascia-plans-action-and-treatment

4. Allergy and Anaphylaxis – Emergency Management in Children. Children's Health Queensland Paediatric Emergency Guidelines. June 2019. Available at: https://childrens.health.qld.gov.au/guideline-allergy-anaphylaxis-emergency-management-in-children/

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1. ASCIA guidelines. Acute Management of Anaphylaxis. 2018. Available at: https://www.allergy.org.au/hp/papers/acute-management-of-anaphylaxis-guidelines

2. Greenhawt M, Gupta R, Meadows A et al. Guiding principles for the recognition, diagnosis and management of infants with anaphylaxis: An expert panel consensus. Journal of Allergy and Clinical Immunology in Practice. 2017, 7 (4): 1148-1156.

3. Horeczko, Tim. Anaphylaxis in Children. Pediatric Emergency Playbook. Sept 2018. Available at: https://pemplaybook.org/podcast/anaphylaxis-in-children/

4. Nunez J and Santillanes G. Anaphylaxis in pediatric patients; Early recognition and treatment are critical for best outcomes. Pediatric Emergency Medicine Practice. June 2019, 16 (6).

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

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