Simulation Pack : Sepsis

An open access resource for clinical educators

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Bank **O**f i**N**dependently **U**seful **S**imulations

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

Contents of this educational package:

Simulation

IV adrenaline in septic shock
IV antibiotic choice in sepsis
Use of a sepsis pathway

Further Reading

Podcasts and Blog Posts
Online Videos
Journal Articles
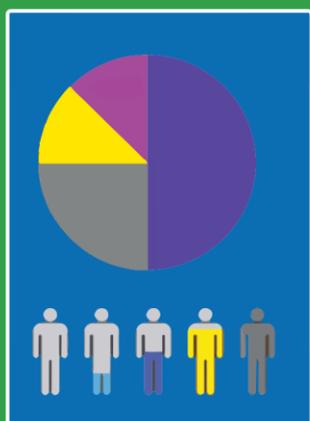
Infographic

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

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Introduction by Amanda Harley

Clinical Nurse Consultant : Statewide Paediatric Sepsis, Children's Health Queensland

"Sepsis has been identified as a priority in health in a recent declaration by the World Health Organisation (WHO), recognising sepsis represents a leading and partially preventable cause of paediatric mortality and morbidity. Sepsis is one of the leading causes of childhood mortality and morbidity.

Appropriate recognition and timely management of patients with severe infection and sepsis is a significant problem in Australian hospitals and in healthcare facilities around the world. Similar to polytrauma, acute myocardial infarction, or stroke, the speed and appropriateness of therapy administered in the initial hours after severe sepsis develops strongly influences outcome.

Poor sepsis outcomes are strongly correlated to delays in time to recognition and treatment: every hour delay in the administration of appropriate antibiotics leads to a >5% rise in mortality in patients with infection and increases the duration of organ failure and need for ICU support. Early recognition and rapid initiation of correct antimicrobial treatment can thus not only result in dramatic reduction of sepsis mortality but result in faster recovery, shortening the need for intensive care (ICU) bed days, which represents the largest cost factor.

Considerable work has been done across the globe to address the incidence of sepsis. But in contrast to other time critical diseases, community awareness and knowledge is low and consistent benchmarking and systematic quality improvement in the field of sepsis remains a challenge globally, representing a major risk to patients and society. It is time to change the trajectory of sepsis!

We would expect the key educational points for you to consider are:

- Early recognition inclusive of screening patients who could have sepsis is key, listen to parental concerns and their reasoning, trust your gut- look at the big picture not the individual pieces in front of you.
- It is okay for a patient to NOT have sepsis but ensure you ask the question, screen the patient and respond appropriately.
- Paediatric sepsis can present in a variety of different shapes and forms. Thorough, individual patient assessment is the key and using your clinical judgement to detect abnormalities where 'something is not right'. CEWT is not sepsis specific & a child can deteriorate in a matter of minutes- reassessment is key.
- Paediatric signs can often be explained- ie: Tachycardia due to crying, however do not be lured into a false sense of security. Beware of the persistent tachycardia and signs which may fall into the category of sepsis but are explained as other causes. Be concerned of the tachycardic child in the absence of fever.
- Manage patients early and use the resources available to you to assist- Paediatric sepsis does not happen often, but when it does time is life and early recognition and management saves lives.
- Peripheral sites are asked to screen the patient for sepsis, manage via the paediatric sepsis pathway and in conjunction with local hospital policy and escalate to RSQ early. Retrieval services would prefer to get a call early and not respond, then receive a call late, when it is too late."

Section I: Scenario Demographics

Scenario Title:	Sepsis
Date of Development:	May 2019
Last reviewed	April 2023
Target Learning Group:	Multiprofessional teams that look after paediatric patients

Section II: Scenario Developers

Scenario Developers:	Dr Sonia Twigg, Dr Benjamin Symon, Dr Ben Lawton, Ms Louise Dodson, Ms Tricia Pilotto
Reviewed by :	Ms Amanda Harley

Section III: Curriculum

Learning Goals & Objectives	
Educational Goal:	• Recognise and treat a child with sepsis according to your service's expectations
Skills Rehearsal:	• Safe prescription and administration of fluids and inotropes in paediatric sepsis
Systems Assessment:	• Identify presence/absence of an approved sepsis pathway within the department. • Identify systemic interventions that may optimise efficient antibiotic, fluid and inotrope administration.

Case Summary: Brief Summary of Case Progression and Major Events
This is a relatively simple scenario designed to rehearse a structured approach to septic shock. A 12 month old boy has presented to your service with a febrile illness. While he initially looked reasonably well in emergency he had no clear focus and as such he was admitted for overnight observation and to catch a urine specimen. Overnight he has developed petechiae and signs of septic shock. • Performance goals are to recognise sepsis and implement IV access, antibiotics, fluid boluses and inotropes within the first hour. The scenario was designed to embed use of the Queensland state-wide Paediatric Sepsis Pathway, however if your hospital is not in Queensland please substitute with your local services pathways and expectations.

Section IV: Equipment and Staffing

Scenario Cast	
Patient:	☐ Mannequin
Clinical Expert	Educator confident in guiding teams through peripheral inotrope and antibiotic administration
Confederate:	Bedside nurse hands over the patient to the resus team. She explains his parent had stepped outside to call the other parent.

Required Monitors	
☐ ECG Leads/Wires	
☐ NIBP Cuff	
☐ Pulse Oximeter	

Required Equipment		
☐ Gloves	☐ Nasal Prongs	☐ Infusion pump: Adrenaline
☐ Stethoscope	☐ Non-Rebreather Mask	☐ IV Antibiotics e.g. Cefotaxime
☐ IV Bags/Lines	☐ Bag Valve Mask	☐
☐ IV Push Medications	☐ ET Tubes	☐
☐ Intraosseous Set-up	☐ LMA	☐

Moulage
Petechiae on hands and feet (light)

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

Adapting the case to your location

Please feel free to change the details of this simulation to suit where you work.

For example, **if you are a ward based paediatric educator:**

- Patient was admitted to paeds for observation overnight after looking quite well in ED
- He has deteriorated in the early hours of the morning and this has been picked up on his routine observations.

If you are running a simulation in an emergency department:

- Patient was admitted to short stay overnight for observation after looking quite well initially
- He has deteriorated in the early hours of the morning and this has been picked up on his routine observations.

Section V : Scripts for actors

Handover by treating Nurse - At start of simulation

I: Hi. I'm the nurse treating Harry in the short stay / ward

S: I think he needs urgent assessment and management.

B: Harry is a 12m old boy brought in by his mother with fevers for 3 days, decreased oral intake and lethargy. They have seen their GP twice this week – his ears and throat were noted to be red. His mother had the flu last week.

He was seen here in ED and thought to have a viral illness. He has been observed overnight and has begun to deteriorate in the last few hours.

His mother was given the "Could this be sepsis?" information checklist and has called me this morning when she noticed he now has petechiae on this hands and feet and is more lethargic.

PMHx:
- Normal vaginal delivery at term
- Immunisations up to date
- Nil allergies

A: I am concerned Harry is deteriorating.

R: I think he needs antibiotics and fluids

Section VI : Scenario Progression

Scenario States			
State 1 : Recognition			
Patient State	**Patient Status**	**Learner Actions**	**Modifiers & Triggers to Move to Next State**
Rhythm: NSR **HR:** 180bpm **BP:** 65/45 **Cap refill:** 5s **RR:** 55/min **O₂ SAT**: 95%RA **T:** 38°C **BSL:** 4.6 **AVPU** = V **GCS:** 11 (E2 V3 M6)	Shocked and flat	☒ Identify potential sepsis ☒ Initiate screening tests as per local sepsis pathway ☒ Place monitoring; pulse oximetry, cardiac monitoring, BP, BSL ☒ ABCD assessment and examine patient ☒ Get IV access and take bloods. Consider IO if not successful after two attempts.	
State 2: Resuscitation Initiated			
Rhythm: NSR **HR:** 170bpm **BP:** 65/45 **Cap refill:** 4s **RR:** 60 **O₂ SAT**: 95% **T:** 38°C **BSL:** 4.6 **AVPU** = V **GCS:** 11 (E2 V3 M6)	Remains shocked	☒ Give fluid bolus ☒ Give antibiotics ☒ Scribe/team leader to work through bundle elements on pathway (if used in your hospital)	Facilitator tips: - Gradually improve heart rate, BP and cap refill if fluids given - Do not improve obs until fluid or inotropes administered

Advice if senior called for:

Hi, I'm the senior clinician on today.
Thanks for calling me, I agree this kid is in septic shock.
Let's focus on resuscitating him with fluid, antibiotics and preparing inotropes at present.
If we can treat his shock effectively he might not need intubation.

Can somebody grab the sepsis pathway? It's got a good guide to management in there.

State 3: Slight improvement with fluids			
Patient State	**Patient Status**	**Learner Actions**	**Modifiers & Triggers to Move to Next State**
Rhythm: NSR **HR:** 160bpm **BP:** 64/45 **Cap refill:** 4s **RR:** 50 **O₂ SAT**: 95%RA **T:** 38°C **BSL:** 4.6 **AVPU** = V **GCS:** 13 (E4 V3 M6) Opens eyes, cries and pushes away.	Remains in shock but improved GCS to 13 and cap refill to 4s.	☒ Give 2nd fluid bolus - continue to reassess patient and look for signs of shock resolution ☒ Start inotrope (adrenaline) infusion +/- push dose pressor adrenaline boluses. ☒ Call for help/ PICU consult or retrieval service as appropriate in local context. ☒ Consider 3rd fluid bolus ☒ Consider if intubation required.	<u>Modifiers</u> If adrenaline not commenced then patient should deteriorate slightly but at no point require emergent airway protection. If team intubates then patient should become more hemodynamically unstable during induction. <u>Triggers</u> 2nd fluid bolus + adrenaline.

State 4: Stabilisation			
Rhythm: NSR **HR:** 180 **BP:** 78/52 **Cap refill:** 3s **RR:** 50/min **O₂ SAT**: 97% **T:** 38°C **BSL:** 4.6 **AVPU** = A **GCS:** 14 (E4 V4 M6) Opens eyes, cries but consolable, pushes away.	Stabilises, alert, crying, improved colour.	☒ Preparation for transfer or retrieval ☒ Optimise patient for receiving team	<u>Facilitator tip:</u> - If appropriate fluids and inotropes have been started, construct a clear picture for participants that child is clinically improving

Close scenario with a prompt for a recap or handover

OK everyone, I think this would be a great point for a quick recap.
Can the team leader summarise the case for us?

Section VI: Supporting Documents, Laboratory Results, & Multimedia

- 1 -

Venous Blood Gas

	Results	Units	Normal Range
pH	7.10		**7.32 – 7.42**
pCO2	43	mmHg	**41 - 51**
pO2	35	mmHg	**25 - 40**
O2 Saturations	55	%	**40 - 70**
Bicarb	17	mmol/L	**22 - 33**
BE		mmol/L	**-3 - +3**
HCT			**0.3 - 0.42**
Hb	115	g/L	**105 - 135**
Na+	140	mmol/L	**135 - 145**
K+	4.6	mmol/L	**3.2 - 4.5**
Ca++ (ionised)	1.2	mmol/L	**1.15 – 1.35**
Glucose	3.6	mmol/L	**3.0 – 7.8**
Lactate	4.6	mmol/L	**0.7 – 2.5**

Section VII: Debriefing Guide

Objectives	
Educational Goal:	• Recognise and treat a child with sepsis
Skills Rehearsal:	• Safe prescription and administration of fluids and inotropes in paediatric sepsis
Systems Assessment:	• Identify presence/absence of an approved sepsis pathway within the department • Identify systemic interventions that may optimise efficient antibiotic, fluid and inotrope administration

Sample Questions for Debriefing

- Does your department have a system in place to aid detection of sepsis
- How did you come to the decision to initiate antibiotics/ fluid/ inotropes?
- Were there challenges with dose calculation and administration of the inotrope?
    - What guidelines are available in your service to aid administration of inotropes to a child? (It may be useful to demonstrate how to draw it up, or how to use a medication pump for this.)
- Who do you call for help for a child with septic shock?

Key Moments

- Recognition of sepsis
- Use or absence of a pathway
- Decision to give antibiotics and fluids
- Initiation of inotropes and how this is done.
- Escalation of care

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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 _____

Section IX : Resources for Participants before or after Simulation

Paediatric Sepsis
Queensland Emergency Guideline

How to use the Queensland
Paediatric Sepsis pathway

Paediatric Sepsis : The First Hour
Online video by Dr Simon Carley

Sepsis Information for Health
Professionals – CHQ Website

Children's Health Queensland Hospital and Health Service

Recognising paediatric sepsis

Detection early is challenging, but the paediatric sepsis pathway can aid recognition, escalation and management.

Listen to the concerns of parents, your team, and your gut.

Early signs are non specific.
Does an experienced person think they look sick?
Does something about the child not fit the diagnosis?

AT RISK

Age < 3 months | Immune Dysfunction | Indigenous Populations | Unvaccinated | Indwelling Devices
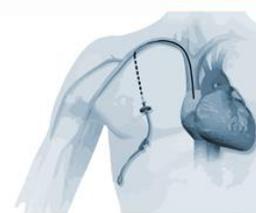
No test is 100% diagnostic for sepsis, but these are helpful :

TEST

Blood Culture helps later

Venous Gas including Lactate

FBC CRP Chem 20 if possible

Adjust further testing to suspected source...

Strongly consider :

TREAT

Early Antibiotics improves outcomes in sepsis

Fluids for Shock

Consider Inotropes can be safely started peripherally

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Section X : 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 Paediatric Sepsis.

Optimus CORE	Optimus PRIME	Optimus BONUS
Intravenous access	Fluids in shock	Recognition of Sepsis
Fluid prescription & rapid administration	Inotrope prescription and administration	Integration of a sepsis pathway
Recognition of the deteriorating patient	Resuscitation before Intubation	
Escalation of care		

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

Access to paediatric resources on: • Paediatric Sepsis Pathway • Prescribing Guidelines for Paediatric Inotropes • Paediatric Drug Doses	☐ ☐ ☐
Equipment Check: • Current Pump Programming Settings for Inotropes • Appropriate IV and Intraosseous Equipment for Paediatric Patients • Appropriate monitoring for Paediatric Patients • Specific locations for Paediatric Resuscitation	☐ ☐ ☐ ☐
Departmental Protocols for escalation of paediatric patients.	☐

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 :

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Dr Sonia from STORK is a paediatric emergency physician 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
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RACP PEM, MBBS, BAnim
Simulation Consultant and Paediatric Emergency Physician
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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'. He is faculty on the APLS Educational Skills Development Course and 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
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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.

What is OPTIMUS?

OPTIMUS is a suite of courses designed to create a complete paediatric life support training package.

It has been developed to address Queensland's training needs in paediatric critical care in line with the recommendations of NSQHS Standard 8 - recognising and responding to acute deterioration.

- **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 retrieval or escalation to an Intensive Care setting. It aims at contextualising seizure management, endotracheal intubation and inotrope administration.

- **PULSE** is a CPR refresher designed around the principles of Rapid Cycle Deliberate Practice

- **BONUS** is a standalone simulation with supportive educational material. It is one solution to skill and knowledge decay after courses are run.

The Optimus Curriculum is a spiral curriculum where the learning objectives for effective paediatric resuscitation are taught throughout our courses while providing opportunities for spaced practice, clinical contextualisation and quality improvement moments.

About BONUS Simulation Packages:

Optimus BONUS is a bank of useful simulations that are open access and available for free use. They are designed by STORK for Children's Health Queensland, but they have been used by paediatric educators around the world.

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
- Updates to paediatric protocols and guidelines

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.

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.

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