OPTIMUS BONUS: Sepsis
Contents of this educational package:

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

**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

**Fill out our online survey!**
Scan the QR code with your phone camera
“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 these other time critical diseases, the lack of benchmarking and systematic quality improvement in the field of sepsis in Queensland, and low community awareness and education, represents 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, 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.
- 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 according to 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

<table>
<thead>
<tr>
<th>Scenario Title:</th>
<th>BONUS - sepsis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Development:</td>
<td>May 2019</td>
</tr>
<tr>
<td>Target Learning Group:</td>
<td>Multidisciplinary Teams that look after Paediatric Patients</td>
</tr>
</tbody>
</table>

Section II: Scenario Developers

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

Section III: Curriculum

Learning Goals & Objectives

<table>
<thead>
<tr>
<th>Educational Goal:</th>
<th>• Recognise and treat a child with sepsis safely within an emergency department setting.</th>
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<tbody>
<tr>
<td>Skills Rehearsal:</td>
<td>• Safe prescription and administration of fluids and inotropes in paediatric sepsis.</td>
</tr>
<tr>
<td>Systems Assessment:</td>
<td>• Identify presence/absence of an approved sepsis pathway within the department.</td>
</tr>
<tr>
<td></td>
<td>• Identify systemic interventions that may optimise efficient antibiotic, fluid and inotrope administration.</td>
</tr>
</tbody>
</table>

Case Summary: Brief Summary of Case Progression and Major Events

A 12 month old boy has presented to your service with a febrile illness. He was screened for sepsis at presentation and a decision was made that sepsis was unlikely at the time. He was kept in an acute bay for a period of observation. His mother was given the “Could this be sepsis” parent information leaflet (if this is used in your hospital).

2 hours later in ED, he has developed petechiae and signs of septic shock.

• Performance goals are to recognise sepsis and implement early IV access, antibiotics, fluid boluses and inotropes within the first hour.

• If team manages patient appropriately then child will stabilize in step 4 and will not require intubation.

• If team does not resuscitate effectively then the patient will remain hemodynamically unstable.

The scenario was designed to support the introduction of the Queensland state-wide Paediatric Sepsis Pathway by Queensland Health.
### Scenario Cast

| Patient: | □ Mannequin |
| Clinical Expert | Retrieval OR PICU OR ED consultant depending on context - the person who the team calls for help. Guides team to initiate inotropic support (as well as ensure IV access, antibiotics, fluid boluses and use of a protocol if available). Guides team away from intubating before inotropic support - patient likely to become more hemodynamically unstable during induction. |
| 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
- □ Bag Valve Mask
- □ IV Bags/Lines
- □ ET Tubes
- □ IV Push Medications
- □ LMA
- □ Intraosseous Set-up

### Moulage

- Petechiae on hands and feet (light)

### Approximate Timing

- Set-Up: 10 mins
- Prebrief: 10 mins
- Scenario: 20 mins
- Debriefing: 20 mins
Section V : Handover

Handover: To read aloud at beginning of case

I: Hi. I’m the nurse in the acute area.

S: I brought Harry to resus for 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 for the last 2 hours. (If sepsis pathway in your hospital, he was screened for sepsis but this was thought unlikely and he was de-escalated from the pathway. His mother was given the “Could this be sepsis?” information leaflet.) His mother noticed he developed petechiae on this hands and feet and when I assessed, he seems more lethargic.

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

His mother has just stepped outside to call her partner. She will be back in about 15 minutes.

A: I am concerned Harry is deteriorating.

R: I thought it best I bring him to resus.
### Scenario States

#### State 1: Recognition

<table>
<thead>
<tr>
<th>Patient State</th>
<th>Patient Status</th>
<th>Learner Actions</th>
<th>Modifiers &amp; Triggers to Move to Next State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhythm: NSR  &lt;br&gt; HR: 180bpm  &lt;br&gt; BP: 68/48  &lt;br&gt; Cap refill: 5s  &lt;br&gt; RR: 55/min  &lt;br&gt; O₂ SAT: 95%RA  &lt;br&gt; T: 38°C  &lt;br&gt; BSL: 4.6  &lt;br&gt; AVPU = V  &lt;br&gt; GCS: 11 (E2 V3 M6)  &lt;br&gt; Cries and pushes people away.</td>
<td>Unwell</td>
<td>☑ Ask Could this be sepsis?  &lt;br&gt; ☑ Initiate screening as per sepsis pathway  &lt;br&gt; ☑ Place monitoring; pulse oximetry, cardiac monitoring, BP, BSL  &lt;br&gt; ☑ ABCD assessment and examine patient  &lt;br&gt; ☑ Get IV access and take bloods. Consider IO if not successful after two attempts.</td>
<td>Have done the required actions or 5 minutes passes, at which point move to State 2.</td>
</tr>
</tbody>
</table>

#### State 2: Deterioration

<table>
<thead>
<tr>
<th>Patient State</th>
<th>Patient Status</th>
<th>Learner Actions</th>
<th>Modifiers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhythm: NSR  &lt;br&gt; HR: 190bpm  &lt;br&gt; BP: 64/45  &lt;br&gt; Cap refill: 5s  &lt;br&gt; RR: 60  &lt;br&gt; O₂ SAT: 95%  &lt;br&gt; T: 38°C  &lt;br&gt; BSL: 4.6  &lt;br&gt; AVPU = V  &lt;br&gt; GCS: 11 (E2 V3 M6)  &lt;br&gt; Cries and pushes people away.</td>
<td>Deteriorates despite treatment in resus</td>
<td>☑ Give fluid bolus  &lt;br&gt; ☑ Give antibiotics  &lt;br&gt; ☑ Scribe/team leader to work through bundle elements on pathway (if used in your hospital)</td>
<td>If not given fluid or antibiotics then patient does not improve and slightly worsens.</td>
</tr>
</tbody>
</table>

5 minutes or tasks completed.
<table>
<thead>
<tr>
<th>Patient State</th>
<th>Patient Status</th>
<th>Learner Actions</th>
<th>Modifiers &amp; Triggers to Move to Next State</th>
</tr>
</thead>
</table>
| **State 3: Slight improvement** | 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 | modifier: If adrenaline not commenced then patient should deteriorate slightly but at no point require emergent airway protection.  
Trigger: 2nd fluid bolus + adrenaline. |
| Rhythm: NSR | HR: 180bpm | ☒ Start inotrope (adrenaline) infusion +/- push dose pressor adrenaline boluses. | If team intubates then patient should become more hemodynamically unstable during induction. |
| BP: 64/45 | BP: 78/52 | ☒ Call for help/ PICU consult or retrieval service as appropriate in local context. | Trigger: 2nd fluid bolus + adrenaline. |
| Cap refill: 4s | Cap refill: 3s | ☒ Consider 3rd fluid bolus | |
| RR: 50 | RR: 50/min | ☒ Consider if intubation required. | |
| O₂ SAT: 95%RA | O₂ SAT: 97% | | |
| T: 38°C | T: 38°C | | |
| BSL: 4.6 | BSL: 4.6 | | |
| AVPU = V | AVPU = A | | |
| GCS: 13 (E4 V3 M6) | GCS: 14 (E4 V4 M6) | | |
| Opens eyes, cries and pushes away. | Opens eyes, cries but consolable, pushes away. | | |

**State 4: Stabilisation**

| Rhythm: NSR | HR: 180 | ☒ Preparation for transfer or retrieval | Modifier: |
| BP: 78/52 | | ☒ realize no immediate need for intubation. | |
| Cap refill: 3s | RR: 50/min | | |
| O₂ SAT: 97% | O₂ SAT: 97% | | |
| T: 38°C | T: 38°C | | |
| BSL: 4.6 | BSL: 4.6 | | |
| AVPU = A | AVPU = A | | |
| GCS: 14 (E4 V4 M6) | GCS: 14 (E4 V4 M6) | | |
| Opens eyes, cries but consolable, pushes away. | Opens eyes, cries but consolable, pushes away. | | |

Scenario ceases after 20 minutes or once inotrope infusion/ push dose pressors commenced, and PICU or retrieval mentioned.
# Venous Blood Gas

<table>
<thead>
<tr>
<th></th>
<th>Results</th>
<th>Units</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.10</td>
<td>7.32 – 7.42</td>
<td></td>
</tr>
<tr>
<td>pCO2</td>
<td>56</td>
<td>mmHg</td>
<td>41 - 51</td>
</tr>
<tr>
<td>pO2</td>
<td>35</td>
<td>mmHg</td>
<td>25 - 40</td>
</tr>
<tr>
<td>O2 Saturations</td>
<td>55</td>
<td>%</td>
<td>40 - 70</td>
</tr>
<tr>
<td>Bicarb</td>
<td>17</td>
<td>mmol/L</td>
<td>22 - 33</td>
</tr>
<tr>
<td>BE</td>
<td></td>
<td>mmol/L</td>
<td>-3 - +3</td>
</tr>
<tr>
<td>HCT</td>
<td></td>
<td></td>
<td>0.3 - 0.42</td>
</tr>
<tr>
<td>Hb</td>
<td>115</td>
<td>g/L</td>
<td>105 - 135</td>
</tr>
<tr>
<td>Na+</td>
<td>140</td>
<td>mmol/L</td>
<td>135 - 145</td>
</tr>
<tr>
<td>K+</td>
<td>4.6</td>
<td>mmol/L</td>
<td>3.2 - 4.5</td>
</tr>
<tr>
<td>Ca++ (ionised)</td>
<td>1.2</td>
<td>mmol/L</td>
<td>1.15 – 1.35</td>
</tr>
<tr>
<td>Glucose</td>
<td>3.6</td>
<td>mmol/L</td>
<td>3.0 – 7.8</td>
</tr>
<tr>
<td>Lactate</td>
<td>4.6</td>
<td>mmol/L</td>
<td>0.7 – 2.5</td>
</tr>
</tbody>
</table>
Section VII: Debriefing Guide

Objectives

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| 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

Ask participants to complete our online survey!
Scan the QR code with their phone camera
SEPSIS in kids is tricky

There's no perfect early test, pathway or sign. Rare in children, but heartbreaking to miss.

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...

Treat:
- Early Antibiotics improves outcomes in sepsis
- Fluids for Shock
- Consider Inotropes can be safely started peripherally
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

Fluids in Paediatric Sepsis
Online video by Prof John Fraser
## 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.

<table>
<thead>
<tr>
<th>**OPTIMUS **</th>
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</thead>
<tbody>
<tr>
<td><strong>CORE</strong></td>
<td><strong>PRIME</strong></td>
<td><strong>BONUS</strong></td>
</tr>
<tr>
<td>Intravenous access</td>
<td>Fluids in shock</td>
<td>Recognition of Sepsis</td>
</tr>
<tr>
<td>Fluid prescription &amp; rapid administration</td>
<td>Inotrope prescription and administration</td>
<td>Management of Sepsis</td>
</tr>
<tr>
<td>Recognition of the deteriorating patient</td>
<td>Resuscitation before Intubation</td>
<td>Use of a sepsis pathway</td>
</tr>
<tr>
<td>Escalation of care</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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:

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 Debriefier 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.
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.

Resource links to email participants before the simulation.


References

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

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