Optimus BONUS :
Paediatric Stroke

Queensland
Government

OPTIMUS BONUS : Stroke

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/

Disclaimer:

Contents of this educational package:

Simulation

Paediatric Stroke Guideline
Neuroimaging Pathways
Thrombolysis
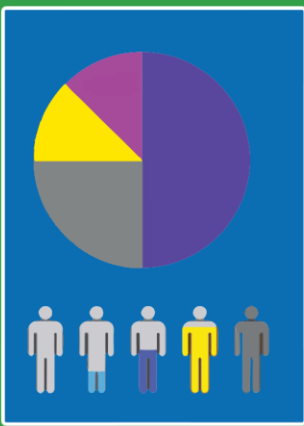
Infographic

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 Natalie Deuble, PEM Physician

Dr Natalie Deuble is a Paediatric Emergency Physician working at Queensland Children's Hospital. She is passionate about systems that enable emergency departments to be supported to care for patients.

Dr Deuble has been involved in paediatric guideline authorship and governance and was heavily involved with development of the Queensland Paediatric Stroke Pathway.

When she grows up she'd like to be a photographer.

"Time is Brain. Children presenting to hospital with stroke-like symptoms need to be treated as an emergency.

Arterial ischaemic stroke (AIS) is a time-critical neurological emergency and outcomes strongly depend on time to initiation of appropriate management. Historically, in-hospital delays to diagnosis, are the most significant barrier to children receiving appropriate care. Many clinicians are not aware that children can suffer stroke or that there are options for treatment.

A rapid coordinated medical response (Stroke Code) and the associated clinical pathways are crucial steps in process improvement. These allow timely diagnosis, access to reperfusion therapies, standardised neuroprotective care and prevention of recurrent stroke.

The financial, physical and emotional aspects of lifelong disability impact on the individual, their family and the community for decades. We have a crucial window of time to change this outcome. We hope that this teaching will make you more confident to manage paediatric stroke and benefit our children of the future."

Section I: Scenario Demographics

Scenario Title:	Optimus BONUS : Paediatric Stroke
Date of Development:	May 2020
Target Learning Group:	Multidisciplinary Teams that look after Paediatric Patients

Section II: Scenario Developers

Scenario Developers:	Dr Natalie Deuble, Dr Michaela Waak, Dr Ben Symon, Ms Louise Sparkes, Dr Adriane Sinclair

Section III: Curriculum

Learning Goals & Objectives	
Educational Goal:	• Structured approach to the assessment and investigation of paediatric stroke & stroke mimics ("brain attacks")
Skills Rehearsal:	• Administration of thrombolysis
Systems Assessment:	• Access to paediatric stroke guidelines, pathways and protocols

Case Summary: Brief Summary of Case Progression and Major Events

This case is designed to familiarise your department with assessment and care of a paediatric stroke or stroke mimics (these are referred to in some literature as "brain attacks").
 	
 The patient is a previously well 8 year old girl with an evolving left Middle Cerebral Artery stroke. She develops agitation and hemiplegia with aphasia at school, and is brought to your service by the ambulance service. **Throughout this document you will find references to the Queensland Paediatric Stroke Pathway. If you are not in Queensland, please contextualise the simulation to your service and protocols.**
 	
 The goal of the simulation is to :
 	
 • Recognise a possible stroke or stroke mimic
 • Activate the appropriate stroke CODE for your hospital
 • Negotiate appropriate neuroimaging available at your hospital
 • Administer thrombolysis after obtaining appropriate consent and assessing for contraindications
 • Escalate care as appropriate for your service
 	
 For Queensland healthcare professionals we want to emphasise the importance of early involvement of RSQ, who will :
     o Assist with appropriate neuroimaging negotiation and decisions
 	
     o Patch in the paediatric neurologist to assist you with :
 	
         ▪ Guidance about eligibility and contraindications (the neurologist will perform PEDNIHSS scoring as part of this process)
         ▪ Help with consent (the paediatric neurologist in most cases will take the responsibility for consent)

Section IV: Equipment and Staffing

Scenario Cast	
Patient:	☐ Low fidelity mannequin with capability to lift and move between beds OR ☐ Simulated Patient / Young actor willing to comply with neurological exam. (Consider strapping a simulated IV line attached to a drainage bag to the simulated patient to allow the team to give thrombolytic.)
Clinical Expert	Healthcare professional familiar with your hospital's stroke pathway and radiology systems
Confederate:	Parent who can be guided through consent process Paramedic to provide handover

Required Monitors	
☐ Standard monitoring	☐

Required Equipment		
☐Specific Drugs :	☐ Simulated monitor	☐ MRI appropriate ECG dots
☐ Alteplase	☐ Drainage bag for mannequin	☐
☐	☐ Cannulation equipment	☐
☐	☐ Bag Valve Mask	☐
☐	☐ Oxygen	☐

Moulage
Utilise attached images of the patient's face to show the treating team her facial asymmetry.

Approximate Timing							
Set-Up:	5m	Prebrief :	10	Scenario:	20	Debriefing:	30

Optional ways to use this simulation

This simulation can be used in a number of ways :

- **A large, multidisciplinary 'In Situ' simulation involving the teams who would respond to a code stroke in your hospital.**
  - This would be a useful way to educate a team about new processes within your service, and to identify potential systems interventions for more efficient or safer access to neuroimaging.
  - It may be useful to record the time it takes to obtain imaging, prepare patient, etc.

- **A simple single team simulation in an emergency room or simulation lab** where the patient never moves but you pause the sim and inform the team that neuroimaging has been successfully arranged.
  - This would still be a useful way to educate individuals on the assessment of paediatric stroke.

Your patient can be either a mannequin or a 'Simulated Patient' (i.e. an actor)

- If using a mannequin, simply inform the team of their neurological examination findings.

- If you have a co-operative older child willing to comply with an exam, you could utilise them as a simulated patient and inform the simulation participants of the findings of their neuro exam.
  - *If using a real patient, explicit safety strategies and participant orientation will need to be used ensuring the child is not accidentally cannulated or given medication. A confederate should be assigned to ensuring the child is safe during the entire sim.*

Section V: Scripts

Handover by Paramedic

"This is Olivia Harris. She is a previously well 8 year old, 30kg girl and we're concerned she might be having a stroke or hemiplegic migraine.

Her teacher called us because she developed acute agitation and confusion 1 hour ago. They report she was agitated, falling over, and not walking properly.

On our arrival she was agitated and restless.
Her obs on arrival were a temp of 36.6, HR 95, BP 80/50.
Her neurological assessment is : GCS 14 (E4,V4,M6). PEARL 3mm. BGL was 8. She has a dense hemiplegia involving weakness of her RIGHT upper and lower limbs. She has RIGHT sided facial weakness.
She has remained mildly agitated but we've haven't needed to give sedation.

The school says she has no medical problems, no allergies and is fully immunised. Her mother/father is here with her.

Parent's Role in Simulation

When interacting with health professionals in the simulation please be appropriately concerned about your daughter but not melodramatic. You understand she is in safe hands and want to give the team all the information they need to help her.
Olivia would like you to be near her as much as possible, and you can help the team keep her calm.
Any suggestion you should leave the resuscitation room should be calmly declined until Olivia is ready for MRI.

Olivia has never been to hospital, has no allergies, is fully immunised and has been doing well at school.

You can see that one side of her face is clearly abnormal, and this was not the case before school drop off today. She had seemed completely normal at breakfast and was looking forward to seeing her friends.

When informed of stroke as a potential diagnosis, express appropriate surprise given she is so young, and ask how children get strokes and what the treatment is.

You are keen for any medication that will help her recover better, and are happy to consent to thrombolysis if the team ask for your consent.

She is 30kg.

Neurologist / Expert Advice :

If called for advice prior to scanning, advise clinical exam is suggestive of a L) MCA stroke and to institute your hospital's stroke protocol.

If the hospital does not have a stroke protocol, advise rapid investigation with :

- o MRI/MRA or CT/CTA Brain (whichever can be facilitated at your service with preference for MRI/MRA)
- o Bloods (FBC, Chem20, Coagulation studies, Clottable fibrinogen, Group and Save)
- o Implement neuroprotective strategies :
    - o Observations: Continuous ECG, PR, Sats, 15 minutely BP and neurological observations
    - o Head of bed flat (if tolerated and no signs of raised ICP)
    - o Target BP within normal range for age – treat hypotension with fluid +/- inotropes
    - o Measure BGL and actively treat hypoglycaemia <5mmol/L
    - o Treat temperatures of >37°C with antipyretics
    - o Continually monitor patient for any signs of seizure activity and aggressively treat seizures

Once scan has been facilitated :

- o Phone and inform team leader that MRI demonstrates LEFT MCA infarct with thrombus amenable to intravenous thrombolysis.
- o Problem solve with the team the most appropriate location and team to administer thrombolysis.

If the Sim is being run in Queensland, Australia :

- o Advise that you will explain the process and consent the family to thrombolysis via phone link.

- o The patient should be prescribed Alteplase as per the CHQ Guideline Acute Arterial Ischaemic Stroke : Appendix 5.

    - o For this 30kg patient that will mean :
        - Syringe 1 : 2.7mg of alteplase given as a push over 1 minute.
        - Syringe 2 : 24.3mg of alteplase infused over 59 minutes.
- o Advise it should be given in the safest place for the patient to receive close monitoring in your hospital.
- o Advise the patient should come to PICU, however the retrieval team would advocate a local team brings the patient to PICU to speed process (if this is possible within your region).

Section VI: Scenario Progression

Scenario States			
State 1 : Paramedic Handover			
Patient State	**Patient Status**	**Learner Actions, Modifiers & Triggers to Move to Next State**	

Rhythm: Sinus
HR: 95
BP: 80/55
Cap refill < 2s
RR: 20
O₂ SAT: 100%
T: 36.6
AVPU = V
GCS = 14 (E4V4M6)
BGL 8
	A – Patent
	B – Normal
	C – Normal
	D – Responding to voice. GCS 14 (E4V4M6). PEARL 3mm. RIGHT Upper and Lower limb weakness, RIGHT sided reflexes brisk, RIGHT visual neglect. Aphasia. RIGHT facial weakness.
	
	E – No injuries or bruising.
		☐ Primary assessment and monitoring
		   o Show team picture of patient's face.
		☐ Neurological Examination
		
		   o Identify possible stroke
		   o Consider stroke scoring
		
		☐ Initial Investigations :
		   o Blood tests : FBC, Chem20, Coagulation studies, Clottable fibrinogen, Group and Save
			<u>Triggers</u>
			
			Tasks complete

State 2 : Code STROKE			

Rhythm: Sinus
HR: 95
BP: 80/55
Cap refill < 2s
RR: 20
O₂ SAT: 100%
T: 36.6
AVPU = V
GCS = 14 (E4V4M6)
BGL 8
	Examination unchanged.	☐ Initiate local stroke protocol (ie Code STROKE)
		
		☐ Arrange urgent neuroimaging :
		
		   o MRI Brain Angiogram
		   o CTA (if MRI unavailable in your service)
		
		☐ Prepare patient for Neuroimaging
		
		   o IV Access x 2
		   o MRI Checklist
		   o Apply MRI Compatible ECG dots
		   o Consider neuroprotective measures
		
		☐ Complete essential paperwork
		   o MRI checklist child and parent
			<u>Triggers</u>
			
			Preparation for scan complete
			
			At this time, pause scenario and inform team the MRI was completed successfully. Patient is now back in the department and radiologist is currently reviewing scans.

Scenario States

State 3 : Scan Results phoned through

Patient State	Patient Status	Learner Actions, Modifiers & Triggers to Move to Next State	
Rhythm: Sinus **HR:** 95 **BP:** 80/55 **Cap refill** < 2s **RR:** 20 **O₂ SAT**: 100% **T:** 36.6 **AVPU** = V **GCS = 14** (E4V4M6) **BGL** 8	Examination unchanged. Radiologist/ Paediatric Neurologist phones with results : • **Advise as per neurologist script.** Inform team that the Neurologist has obtained consent to proceed with thrombolysis.	☐ Inform parent of scan results ☐ Assess for contraindications to thrombolysis ☐ Prepare for thrombolysis or transfer to ICU *(whichever is appropriate for your service)* ☐ *Inform team that the Neurologist has obtained consentvia phone link to proceed with thrombolysis.*	<u>Triggers</u>

State 4 : Thrombolysis

Patient State	Patient Status	Learner Actions, Modifiers & Triggers to Move to Next State	
Rhythm: Sinus **HR:** 95 **BP:** 80/55 **Cap refill** < 2s **RR:** 20 **O₂ SAT**: 100% **T:** 36.6 **AVPU** = V **GCS = 14** (E4V4M6) **BGL** 8	Examination unchanged.	☐ Safely prepare and administer thrombolysis ☐ OR ☐ Handover patient to appropriate team for your service	<u>Triggers</u> End simulation after handover or thrombolysis.

Section VII: Supporting Documents, Laboratory Results, & Multimedia

Venous Gas

	Results	Units	Normal Range
pH	7.35		7.32 – 7.42
pCO2	40	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	0.4		0.3 - 0.42
Hb	125	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

Image of Patient's Face to Show Participants

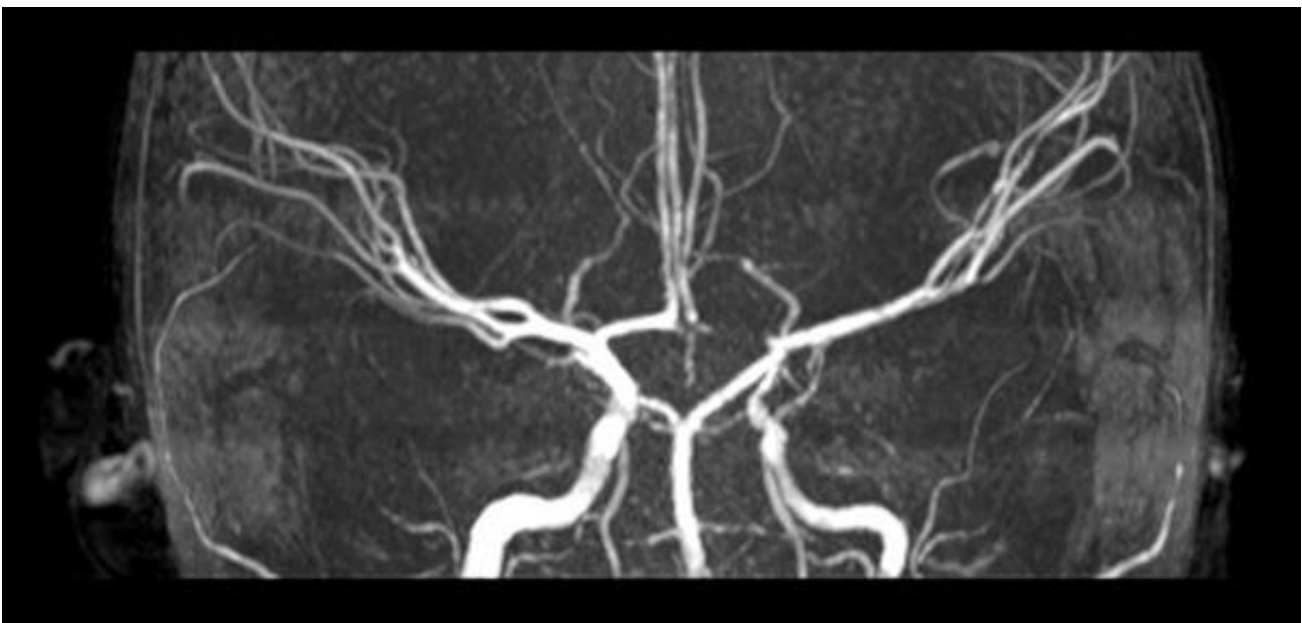**Image provided with written parental consent and is not for redistribution**
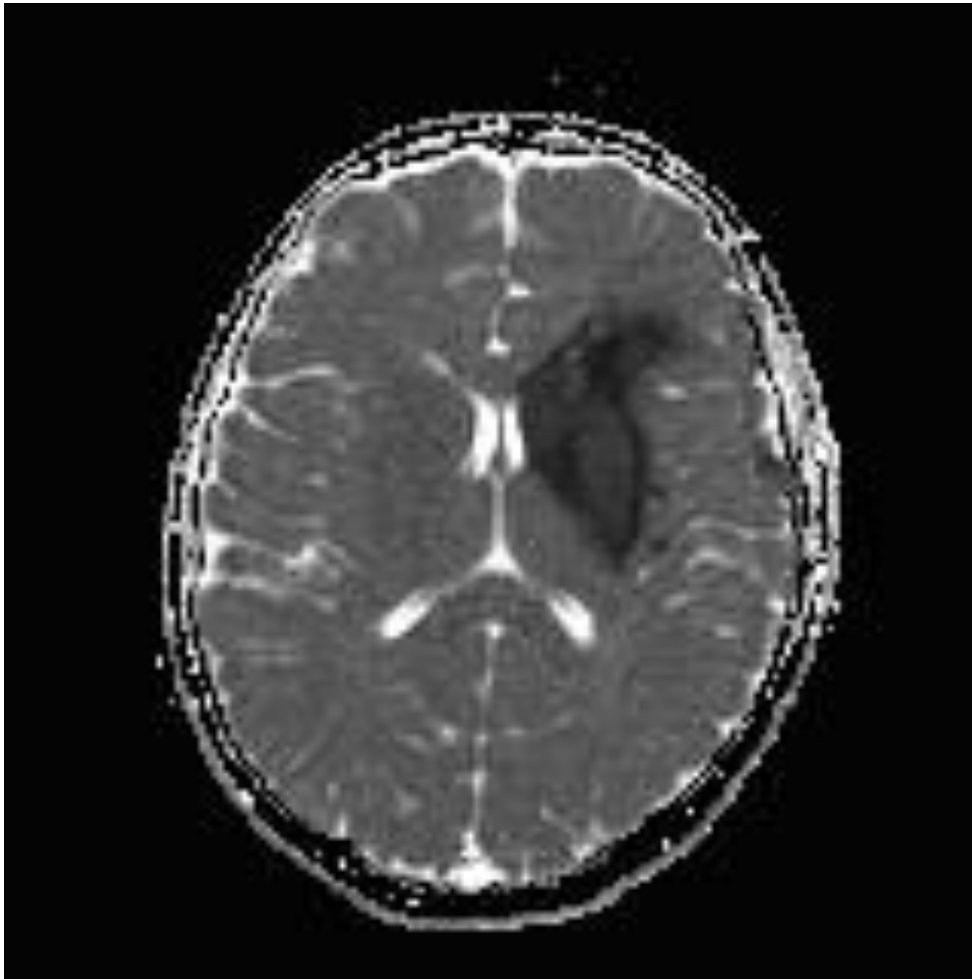

Image of Patient's Face to Show Participants

Image provided with written parental consent and is not for redistribution

Neuroimaging

o Verbal report from radiology : Scan demonstrates LEFT MCA territory infarct with thrombus amenable to intravenous thrombolysis

Section VIII: Debriefing Guide

Objectives	
Educational Goal:	o Structured approach to the assessment and investigation of paediatric stroke
Skills Rehearsal:	o Administration of thrombolysis
Systems Assessment:	o Access to paediatric stroke guidelines, pathways and protocols

Sample Questions for Debriefing

We've just rehearsed our local response to a potential paediatric stroke. This was a case of an 8 year old girl with a L) Middle Cerebral Artery ischaemic stroke. She received…….

I would like to discuss the approach to a child with neurological weakness in our setting.
- What were your thoughts about this girl's differential diagnosis during the Sim?
  - o How did you refine the diagnosis?
  - o What did you find challenging about the assessment?

I would like to explore our hospital's response to paediatric stroke.

- Were there unexpected issues that came up using the stroke pathway in our setting?
- Rapid, safe imaging of this patient was essential to accurate diagnosis and consideration of thrombolysis. Is there anything we can change about our systems or environment that would have made the process faster or safer?

Given how rare paediatric stroke is, it will be helpful to know where resources on paediatric stroke are available. I'd like to take a few moments to explain where to find them…

- Are there additional locations we should store this pathway?

Key Moments

- o Identification of diagnosis as potential stroke
- o Activating stroke protocol
- o Preparation time for neuroimaging
- o Thrombolysis decision making

Complete our participant survey and receive a training certificate!
Scan this QR code with your phone :

Strokes can happen in kids

They're rare, but they do occur.
Because they're rare diagnosis can be delayed.

Consider activating CODE STROKE in children with sudden :

- Focal weakness
- Visual disturbances
- Speech and language disturbances
- Limb incoordination or ataxia

- Altered mental status
- Sudden headache
- Signs of raised ICP
- Seizures with additional neurological symptoms

The Qld Paediatric Stroke Guideline is available via QPEC

GUIDELINE

SCAN ME

TEST

FBC
+
Group
& Save

U&Es
LFTs

Coags
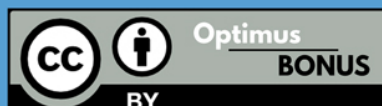+
Clottable
Fibrinogen

SCAN

MRA is preferable to CTA whenever possible.

CALL

In Queensland the on call paediatric neurologist from Queensland Children's Hospital can review the scans, provide advice, and will prescribe & consent for thrombolysis if indicated.
Contact them via your retrieval service.

Queensland Government

Resources for Simulation Participants

Acute Arterial Stroke
CHQ Clinical Guideline

Triage of Acute Arterial Stroke
CHQ Clinical Guideline

The Diagnosis and Acute Management of Childhood Stroke
National Guideline 2017

Curriculum

This package is designed to offer your **department** a systems level check regarding :	
Access to paediatric resources on : • Stroke management • Neurological examination in children	☐ ☐
Equipment Check : • Access to Alteplase in your service • Neurological examination equipment in your department	☐ ☐
Departmental Protocols for : • Paediatric Stroke • Escalation of critically unwell children • Sedation for neuroimaging • Thrombolysis in children	☐ ☐ ☐ ☐
If you would like any assistance obtaining access or advice for any of the above issues, please contact	

About the Creators :

Dr Natalie Deuble : Primary Author of the Simulation
RACP PEM, MBBS
Paediatric Emergency Physician at Queensland Children's Hospital

Dr Natalie Deuble is a Paediatric Emergency Physician working at Queensland Children's Hospital. She is passionate about systems that enable emergency departments to be supported to care for patients.   Dr Deuble has been involved in paediatric guideline authorship and governance and was heavily involved with development of the Queensland Paediatric Stroke Pathway. When she grows up she'd like to be a photographer.

Dr Michaela Waak : Second Author of the Simulation
MD/PhD, FRACP, FRACP Neurology, Queensland Children's Hospital

Dr Waak is internationally one of the few paediatric specialists with fellowships in paediatrics, neurology and paediatric intensive care including paediatric retrieval medicine and has obtained these degrees in different international settings. Since arriving in Brisbane in 2012 she has implemented significant improvements in the care of children through audits and guideline developments including an EEG pathway and paediatric code stroke process. She is CIA on projects investigating the impact of an interdisciplinary educational program for paediatric neurocritical care. She is also inaugural faculty and manual author of the national education and training course in neurocritical care (Paediatric Neuro-critical Care: beyond BASIC), the first paediatric course of its kind.

Dr Ben Symon : Simulation Consultant, 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.

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. Patient images provided with documented parental permission.

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

1. Childrens.health.qld.gov.au. 2020. *Acute Arterial Ischaemic Stroke Management In Children : Clinical Guideline*. [online] Available at: <https://www.childrens.health.qld.gov.au/wp-content/uploads/PDF/guidelines/gdl-00734.pdf> [Accessed 23 April 2020].

2. Childrens.health.qld.gov.au. 2020. *Triage Of Children With Suspected Acute Arterial Ischaemic Stroke : Work Instruction*. [online] Available at: <https://www.childrens.health.qld.gov.au/wp-content/uploads/PDF/guidelines/CHQ-WI-00738.pdf> [Accessed 23 April 2020].

3. Australian Childhood Stroke Advisory Committee. Guideline for the diagnosis and acute management of childhood stroke – 2017 [online] Available at : <https://www.mcri.edu.au/sites/default/files/media/stroke_guidelines.pdf> [Accessed 23 April 2020].