Nebulised medication for children during Covid 19 outbreak

Optimus BONUS

Queensland Government

Optimus BONUS : Nebulised drugs in Covid 19 outbreak

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For more information contact:

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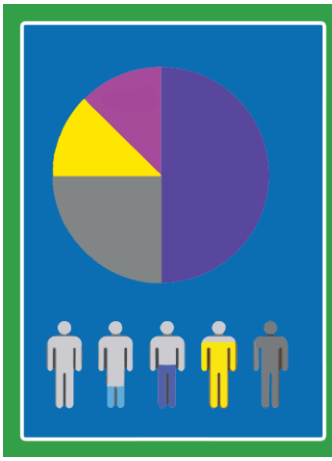
An electronic version of this document is available at https://www.childrens.health.qld.gov.au/research/education/queensland-paediatric-emergency-care-education/optimus-bonus/

Contents of this educational package:

Simulation

Inhaled medication use in Covid 19 outbreak



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 Ben Symon, 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' and facilitates the Simulcast Online Journal Club, an online journal club for simulation educators throughout the world.

This introduction is based on advice received from local experts in PICU, Paediatric Emergency and Infectious Diseases.

With the focus of international collaboration and guideline development on Covid 19 targeted heavily on the care of unwell adult patients, there is often uncertainty in mixed emergency departments regarding treatment of wheeze and croup in paediatric patients during an epidemic.

Questions have been raised regarding infection control precautions regarding the safe use of nebulised salbutamol and adrenaline.

In this simulation package we advocate for utilising low risk methods such as spacers and oral medication when appropriate, but argue that critical measures such as nebulised adrenaline in severe croup or nebulised salbutamol in severe asthma should not be withheld due to a theoretical risk of cross contamination.

At the time of writing, (16/3/20) particular points to note from current paediatric data on Covid 19 include :

- That "complications of COVID-19 appear to be milder among children compared with adults based on limited reports from China." [1]
- Beyond individual case reports, Covid 19 has not been associated with paediatric disease requiring intubation or non invasive ventilation.
- There is not international agreement regarding the safety of nebulised medication or its genuine risk for cross contamination, but that staff can be protected by PPE.

Therefore **we argue that withholding appropriate treatments for severe respiratory illness in children (ie asthma/croup) would be unethical**.

While evidence continues to evolve, our Queensland Paediatric ICU currently advocates :

- **Minimising unnecessary use of nebulisers for stable/well children**
- **Utilise airborne PPE and ideally a negative pressure room when delivering nebulised medication**
- **Not to routinely intubate a child to avoid use of humidified high flow, nebulised medication or non invasive ventilation.**

From an educational perspective, we aim to share this information as well as two scenarios designed to rehearse safe administration and PPE donning and doffing. We acknowledge that this information and advice will change over time.

A second package is in development regarding decisions about Humidified High Flow O2 and Intubation of children with Covid 19 risk factors.

This package is offered for free use but should be adapted to your local protocols.

Scenario 1 : Croup

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Scenario 1 : Croup

Section I: Scenario Demographics

Scenario Title:	Nebuliser use during Covid 19 Outbreak
Date of Development:	March 2020
Target Learning Group:	Multidisciplinary Teams that look after Paediatric Patients

Section II: Scenario Developers

Scenario Developers:	Dr Ben Symon
Reviewed by :	Dr Fiona Thomson, Dr Ben Lawton, Dr Jessica Mills, Ms Louise Dodson

Section III: Curriculum

Learning Goals & Objectives	
Educational Goal:	• Infection control precautions during covid 19 outbreak • Medication & respiratory support options for children with croup
Skills Rehearsal:	• Appropriate PPE use • Safe administration of nebulised drugs
Systems Assessment:	• Covid specific departmental protocols for nebulised drug administration

Case Summary: Brief Summary of Case Progression and Major Events

A 4 yr old child with croup presents to triage with her parent.

- There is a family member at home who has tested +ve for covid 19 with mild flu like symptoms and the family have been in self isolation.
- The child requires nebulised adrenaline due to severe stridor and distress with increased work of breathing.

This sim is designed to check how staff : triage, locate and treat croup according to your local Covid 19 infection control protocols.

Queensland health advice regarding nebulised drugs is summarised in our infographic.

Section IV: Equipment and Staffing

Scenario Cast	
Patient:	☐ Child size mannequin
Clinical Expert	Staff member aware of local infection control protocols specific to Covid 19
Confederate:	Parent (optional)

Required Equipment

We strongly recommend running these scenarios in your clinical environment to perform adequate systems testing of local equipment and protocols.

☐ Medications :	☐ Staff PPE as per your protocol
☐ Adrenaline 1:1000	☐ Nebuliser mask
☐ Budesonide	☐ Subnasal oxygen cannula
☐ Dexamethasone or Prednisone (according to local protocol)	☐ Spacer

Moulage

Nil

Approximate Timing

Set-Up:	5	Prebrief :	5	Scenario:	15	Debriefing:	15

Patient Profile and History			
Patient Name: Daisy		Age: 4	Weight: 20kg
Gender: F			
Chief Complaint: Croup			
History of Presenting Illness: Awoke with severe croup			
Past Medical History:	Recurrent croup	Medications: nil	Immunisations : up to date
Allergies: nil			
Social History: nil			
Family History: nil			

Section V : Scripts

Parent's Information about Child at Triage

(Please role play a calm but concerned parent wearing surgical mask)

This is my daughter Daisy.
She's had croup before but never this bad.
Previously she's had steroids for it but tonight she woke up struggling to breathe.
She had a runny nose for 24 hours and has the usual barky cough but I'm struggling to keep her calm.
She is making stridor and is very distressed.
My partner is at home and they have been diagnosed with Covid 19 last week. We have been in isolation but we came in to seek help.

(If asked)
She has no history beyond mild croup requiring steroids previously.
Her sister has a cold.
She is 20kg.

Section VI: Scenario Progression

Scenario States			
State 1 : Presentation to Triage			
Patient State	**Patient Status**	**Learner Actions, Modifiers & Triggers to Move to Next State**	
Rhythm: Sinus **HR:** 150 **BP:** 90/60 **Cap refill** 2s **RR:** 25 **O_2 SAT**: 92% **T:** 38 **AVPU** = A, distressed	Stridor Distressed Loud barky cough Moderate recession	☒ Triage patient ☒ Move to appropriate clinical area ▪ If possible in -ve pressure room. ☒ Staff don appropriate PPE	Child and parent arrive at triage. Parent is wearing a surgical mask. Informs triage of sudden onset croup tonight after 24 hrs of coryzal symptoms. Informs staff of stridor and distress. Informs triage of family member +ve for Covid 19. Allocate an educator to observe staff PPE procedures and potential barriers to rapid patient assessment.
State 2 : Assessment and administration of nebulised adrenaline			
Rhythm: Sinus **HR:** 150 **BP:** 90/60 **Cap refill** 2s **RR:** 25 **O_2 SAT**: 92% **T:** 38 **AVPU** = A, distressed	Stridor Distressed Loud barky cough Moderate recession	☒ Assess patient ☒ Identify severe croup ☒ Prescribe and administer nebulized adrenaline. ☒ Prescribe appropriate steroid as per your local croup protocols	Allocate an educator to observe staff PPE procedures and potential barriers to rapid patient assessment.
State 3 :			
Rhythm: sinus **HR:** 150 **BP:** 90/60 **Cap refill** 2s **RR:** 20 **O_2 SAT**: 99% **T:** 38 **AVPU** = A, calmer.	Stridor resolves Barky cough persists Work of breathing resolved	☒ Determine patient disposition ☒ Administer steroid	Patient stabilises post administration of adrenaline.

Section VIII: Debriefing Guide

Objectives	
Educational Goal:	• Infection control precautions during covid 19 outbreak • Medication & respiratory support options for children with croup
Skills Rehearsal:	• Appropriate PPE use • Safe administration of nebulised drugs
Systems Assessment:	• Covid specific departmental protocols for nebulised drug administration

Sample Questions for Debriefing

We have run this simulation to test safe administration of nebulised drugs in our department during the Covid 19 outbreak.

- Can we take some time to explore any issues that have come up during the scenario related to :
  - Staff PPE
  - Efficient prescription, preparation and administration of nebulised drugs
  - Patient location
- Is there any clarification staff would like regarding our policies for administration of adrenaline and salbutamol during the Covid 19 outbreak?
- How can we improve the care of patients with Covid 19 risk factors?
- Are there additional measures we can take to ensure our staff are safer from contamination?

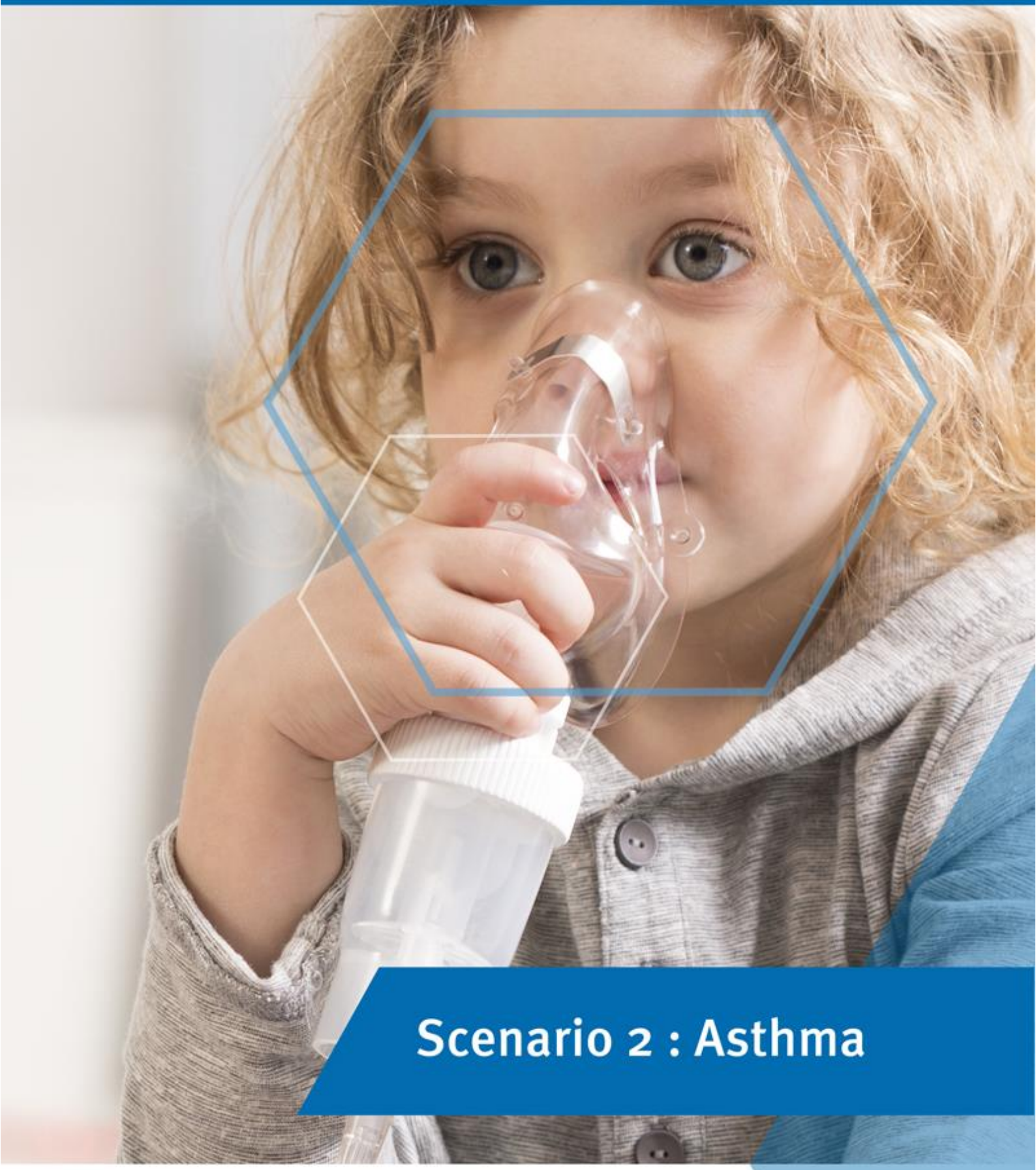
Key Moments

Decision making at triage regarding patient's location within department

Staff donning PPE

Drug preparation during nebulised adrenaline administration

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



Scenario 2 : Asthma

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Scenario 2 : Asthma

Section I: Scenario Demographics

Scenario Title:	Nebuliser use during Covid 19 Outbreak
Date of Development:	March 2020
Target Learning Group:	Multidisciplinary Teams that look after Paediatric Patients

Section II: Scenario Developers

Scenario Developers:	Dr Ben Symon
Reviewed by :	Dr Fiona Thomson, Dr Ben Lawton, Dr Jessica Mills, Ms Louise Dodson

Section III: Curriculum

Learning Goals & Objectives	
Educational Goal:	• Infection control precautions during covid 19 outbreak • Medication & respiratory support options for children with asthma and croup
Skills Rehearsal:	• Appropriate PPE use • Safe administration of nebulised drugs
Systems Assessment:	• Covid specific departmental protocols for nebulised drug administration • Covid specific departmental protocols for Humidified High Flow O2 administration

Case Summary: Brief Summary of Case Progression and Major Events

A 4 yr old girl presents with moderate - severe asthma.

- She has a family member positive for Covid 19, and they are all at home in isolation.
- She has had an URTI for 2 days.
- She requires safe administration of salbutamol in accordance with your local infection control guidelines.

The sim is designed to prompt training on safe aerosolised medication use in your service.

Section IV: Equipment and Staffing

Scenario Cast	
Patient:	☐ Child sized mannequin
Clinical Expert	Staff member aware of local infection control protocols specific to Covid 19
Confederate:	Parent (optional)

Required Equipment

We strongly recommend running these scenarios in your clinical environment to perform adequate systems testing of local equipment and protocols.

☐ Medications :		☐ Staff PPE as per your protocol
☐ Salbutamol	☐ Nebuliser mask	
☐ Ipratropium	☐ Subnasal oxygen cannula	
☐ Dexamethasone	☐ Spacer	
☐ Prednisone		

Moulage

Nil

Approximate Timing

Set-Up:	5	Prebrief :	5	Scenario:	15	Debriefing:	15

Patient Profile and History			
Patient Name: Daisy		Age: 4	Weight: 20kg
Gender: F			
Chief Complaint: Asthma			
History of Presenting Illness: Day 3 of viral URTI symptoms with increasing work of breathing today. 3 hourly salbutamol at home via spacer, but deteriorating. Family member has Covid 19.			
Past Medical History:	Asthma No previous PICU admission	Medications: Salbutamol	Immunisations : up to date
Allergies: nil			
Social History: nil			
Family History: 1 x parent at home has tested positive for Covid 19			

Section V : Scripts

Parent's Information about Child at Triage

(Please role play a calm but concerned parent wearing surgical mask)

This is my daughter Daisy.
We've driven in from home because she is having a severe asthma attack.
I've given 3 hourly salbutamol at home and oral prednisone 2mg/kg this morning as per her asthma plan, but in the last hour she has deteriorated.
My partner is at home with Covid 19. They are OK beyond some mild flu like symptoms and so far we've all been fine.

(If asked)
Daisy has no history beyond asthma requiring the occasional short stay admission.
Her immunisations are up to date.
She is 20kg

Section VI: Scenario Progression

Scenario States			
State 1 : Presentation to Triage			
Patient State	**Patient Status**	**Learner Actions, Modifiers & Triggers to Move to Next State**	
Rhythm: Sinus **HR:** 150 **BP:** 90/60 **Cap refill** 2s **RR:** 35 **O_2 SAT**: 88% **T:** 38 **AVPU** = A, distressed	Wheezy Moderate work of breathing. Talking in brief sentences. Mild rhinorrhoea. Moderate Intercostal recession and mild tracheal tug.	☒ Triage patient ☒ Move to appropriate clinical area ☒ Staff don appropriate PPE	Child and parent arrive at triage. Parent is wearing a surgical mask. Informs triage of worsening asthma symptoms last few hours. Informs triage of 3hrly (6 puffs) salbutamol today. Informs triage of positive family contact with Covid 19. Allocate an educator to observe staff PPE procedures and potential barriers to rapid patient assessment.
State 2 : Assessment and administration of salbutamol via spacer			
Rhythm: Sinus **HR:** 150 **BP:** 90/60 **Cap refill** 2s **RR:** 25 **O_2 SAT**: 88% **T:** 38 **AVPU** = A, distressed	Wheezy Moderate work of breathing. Talking in brief sentences. Mild rhinorrhoea. Moderate Intercostal recession and mild tracheal tug.	☒ Assess patient ☒ Identify moderate asthma ☒ Prescribe and administer bronchodilators via spacer. Consider addition of low flow subnasal O2.	Allocate an educator to observe staff PPE procedures and potential barriers to rapid patient assessment. Inform staff patient's clinical condition initially improves post administration of first dose of salbutamol via spacer.
State 3 : Deterioration post burst			
Rhythm: sinus **HR:** 170 **BP:** 90/60 **Cap refill** 2s **RR:** 45 **O_2 SAT**: 85% **T:** 38 **AVPU** = A.	Short of breath. Not talking. Poor bilateral air entry with faint end expiratory wheeze. Tripoding.	☒ Identify deterioration ☒ Administer salbutamol via nebulizer in accordance with local protocols. Our recommendation is with airborne PPE and ideally Negative Pressure Room if available.	Inform staff that burst has been completed, but 30 minutes post completion patient has deteriorated and is working much harder and is more hypoxic.

Scenario States			
State 4 : Ongoing management of severe asthma			
Patient State	**Patient Status**	**Learner Actions, Modifiers & Triggers to Move to Next State**	
Rhythm: Sinus **HR:** 180 **BP:** 90/60 **Cap refill** 2s **RR:** 35 **O_2 SAT**: 90% or 94% on O2 **T:** 38 **AVPU** = A, distressed	Stabilising on nebulised medication at higher frequency. Still working hard to breathe. Severe intercostal recession. No longer tripoding.	☒ Obtain IV Access and Venous gas ☒ Consider CXR ☒ Prescribe IV MgSO4 ☒ Prescribe IV Hydrocortisone	Observe any systems issues that occur due to patient's location , PPE use, etc.
State 5 : Disposition Planning			
Rhythm: Sinus **HR:** 140 **BP:** 90/60 **Cap refill** 2s **RR:** 30 **O_2 SAT**: 92% **T:** 38 **AVPU** = A, distressed	Stabilising on nebulised medication. Working less hard to breathe. Moderate intercostal recession. Talking in short sentences.	☒ Administer IV Hydrocortisone ☒ Administer IV MgSO4	Close scenario and discuss referral pathways once patient stabilised.

Section VII: Supporting Documents, Laboratory Results, & Multimedia

	Results	Units	Normal Range
pH	7.23		**7.32 – 7.42**
pCO2	55	mmHg	**41 - 51**
pO2	60	mmHg	**25 - 40**
O2 Saturations		%	**40 - 70**
Bicarb	18	mmol/L	**22 - 33**
BE		mmol/L	**-3 - +3**
HCT			**0.3 - 0.42**
Hb	140	g/L	**105 - 135**
Na+	137	mmol/L	**135 - 145**
K+	3	mmol/L	**3.2 - 4.5**
Ca++ (ionised)		mmol/L	**1.15 – 1.35**
Glucose	4.8	mmol/L	**3.0 – 7.8**
Lactate	2	mmol/L	**0.7 – 2.5**

Section VIII: Debriefing Guide

Objectives	
Educational Goal:	• Infection control precautions during covid 19 outbreak • Medication & respiratory support options for children with asthma
Skills Rehearsal:	• Appropriate PPE use • Safe administration of nebulised drugs
Systems Assessment:	• Covid specific departmental protocols for nebulised drug administration

Sample Questions for Debriefing

We have run this simulation to test safe administration of nebulised drugs in our department during the Covid 19 outbreak.

- Can we take some time to explore any issues that have come up during the scenario related to :
  - Staff PPE
  - Efficient prescription, preparation and administration of nebulised drugs
  - Patient location
- Is there any clarification staff would like regarding our policies for administration of adrenaline or salbutamol during the Covid 19 outbreak?
- How can we improve the care of patients with Covid 19 risk factors?
- Is there additional measures we can take to ensure our staff are safer from contamination?

Key Moments

Decision making at triage regarding patient's location within department

Staff equipping PPE

Drug preparation during nebulised adrenaline administration

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

Use of nebulisers for children during a Covid-19 outbreak

Follow local guidelines when available.
Contextualise advice to your patient's needs and your service.
Children are at low risk of Covid-19 complications but croup and asthma can be life threatening.
Don't withold nebs if needed clinically.

Asthma : Avoid Unnecessary Nebuliser Use

Mild Disease

Moderate Disease

+ Low Flow Subnasal O2

Extremis

Airborne PPE for staff
+ Neg pressure room if possible

Croup : Avoid Unnecessary Nebuliser Use

Mild Croup

Without significant stridor or work of breathing

Severe Croup

Nebulised Adrenaline
+
oral steroids

Airbone PPE for staff
+ Neg pressure room if possible

Advice is evolving. 15.3.2020
Created by STORK for CHQ

Queensland Government

Resources

Covid 19 and Children
What you need to know
Don't Forget the Bubbles

Donning and Doffing Video
St Mary's Imperial Hospital

CDC information for paediatric healthcare providers.

Curriculum

This package is designed to offer your **department** a systems level check regarding :	
Access to paediatric resources on : • Covid 19 • Croup and Asthma management protocols	☐ ☐
Equipment Check : • Staff PPE for nebulised drug use • Negative pressure room access in a resuscitation	☐ ☐
Departmental Protocols for : • Administration of nebulised medication for sick children during covid 19 outbreak.	☐
If you would like any assistance obtaining access or advice for any of the above issues, please contact stork@health.qld.gov.au	

Acknowledgments

About the Creators :

Dr Ben Symon : Consultant Supervisor, Infographics and Editor

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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 .

Acknowledgments

References

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

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

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3. Boast, A. and Munro, A., 2020. *COVID-19 And Children: What Do You Need To Know?*. [online] Don`t Forget The Bubbles. Available at: <https://dontforgetthebubbles.com/covid-19-children-need-know/> [Accessed 16 March 2020].