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Managing a high acuity child outside of a tertiary children's hospital

Key principles

June 2024

Intensive Care NSW



The information in this document should not replace a clinician's professional judgement.

Agency for Clinical Innovation

1 Reserve Road St Leonards NSW
2065 Locked Bag 2030, St Leonards
NSW 1590

Phone: +61 2 9464 4666 | Email: aci-info@health.nsw.gov.au | Web: aci.health.nsw.gov.au

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Title	Managing a high acuity child outside of a tertiary children's hospital: Key principles		
Published	June 2024		
Replaces	May 2024. Managing a high acuity child outside of a tertiary children's hospital: Key principles		
Revised	June 2024. Correction to Table 1. Correction to Figure 2.		
Next review	2029		
Produced by	Intensive Care NSW		
Preferred citation	NSW Agency for Clinical Innovation. Managing a high acuity child outside of a tertiary children's hospital: Key principles. Sydney: ACI; 2024		
TRIM ACI/D23/3132	SHPN (ACI) 240383	ISBN 978-1-76023-861-2	ACI_9763 [05/24]

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Summary

These key principles support clinicians and healthcare services to improve the management of a high acuity child in a non-tertiary paediatric hospital.

Why principles are needed

In NSW, there are three tertiary children's hospitals with a paediatric intensive care unit (PICU) and subspecialty paediatric services for children from birth to 16 years of age. Care for high acuity children outside of these tertiary centres is provided in different settings across NSW. This is influenced by the local context, including the physical location and availability of resources.

The principles are developed and implemented with the support of tertiary specialist centres to enable the child to be cared for closer to home, where safe and appropriate. The principles also allow for care until the child is transferred by retrieval to a tertiary centre.

Key principles

1. A local clinical pathway is used to identify and manage a high acuity child.
2. Appropriate local resources are identified to safely manage a high acuity child.
3. Care is provided in an appropriate location.
4. Clear escalation procedures are embedded in the local clinical pathway.
5. Governance structures and processes are established to support the management of a high acuity child.
6. A family-centred approach to care is used.

Background

The key principles were developed to assist clinicians in hospitals that don't have a paediatric intensive care on site to safely care for, and manage, a high acuity child. This may include paediatric patients awaiting retrieval to higher level care or who will remain as inpatients in the local facility, where appropriate.

The key principles should inform the development of a pathway by local health districts (LHDs) for managing a child requiring high acuity care in their facilities. The principles can be adapted to align with the availability of local resources.

Developing the principles

These principles were developed by the Agency for Clinical Innovation (ACI) Intensive Care NSW (ICNSW). An expert working group was convened to draft the principles, led by the Paediatric Intensive Care Advisory Group (PICAG). The principles should apply to the:

- management of a higher acuity child awaiting retrieval because the clinical requirements are beyond the service capability of the local facility
- ongoing management of a higher acuity child in a facility where there is appropriate service capability. However, depending on the clinical trajectory, the child may need to be transferred to another facility in the future.

Clinicians from the expert working group were recruited from each region of the Children's Healthcare Network. This included metropolitan and regional areas. Medical, nursing and allied health professions who have paediatric, emergency and intensive care experience were consulted.

A review was conducted of current published literature and existing guidelines from NSW LHDs. Additionally, a review of staff survey questionnaires, incident reports and serious adverse events was undertaken to identify themes related to this topic.

See [Appendix 1](#) for more details on the literature review and methods.

Definition

For the purposes of these principles, the child is aged under 16 years. This includes newborns and neonates who have presented from home. To be defined as high acuity, the child:

- is clinically unstable and deteriorating
- requires frequent observation from medical or nursing staff¹
- requires invasive monitoring
- requires intensive treatments.

Principle 1: A local clinical pathway

A local clinical pathway to identify and manage the high acuity child should be developed and implemented at all hospitals that have paediatric patients.

The pathway should include:

- criteria for when a child requires high acuity care
- clear identification of who is responsible for managing the care
- guidance on how and when to escalate care for a high acuity child
- a process to obtain consultation with a paediatric intensivist via the Newborn and Paediatric Emergency Transport Service (NETS) or affiliated PICU for advice and support
- other resources and support as required.

In general, a child will require high acuity care if they:

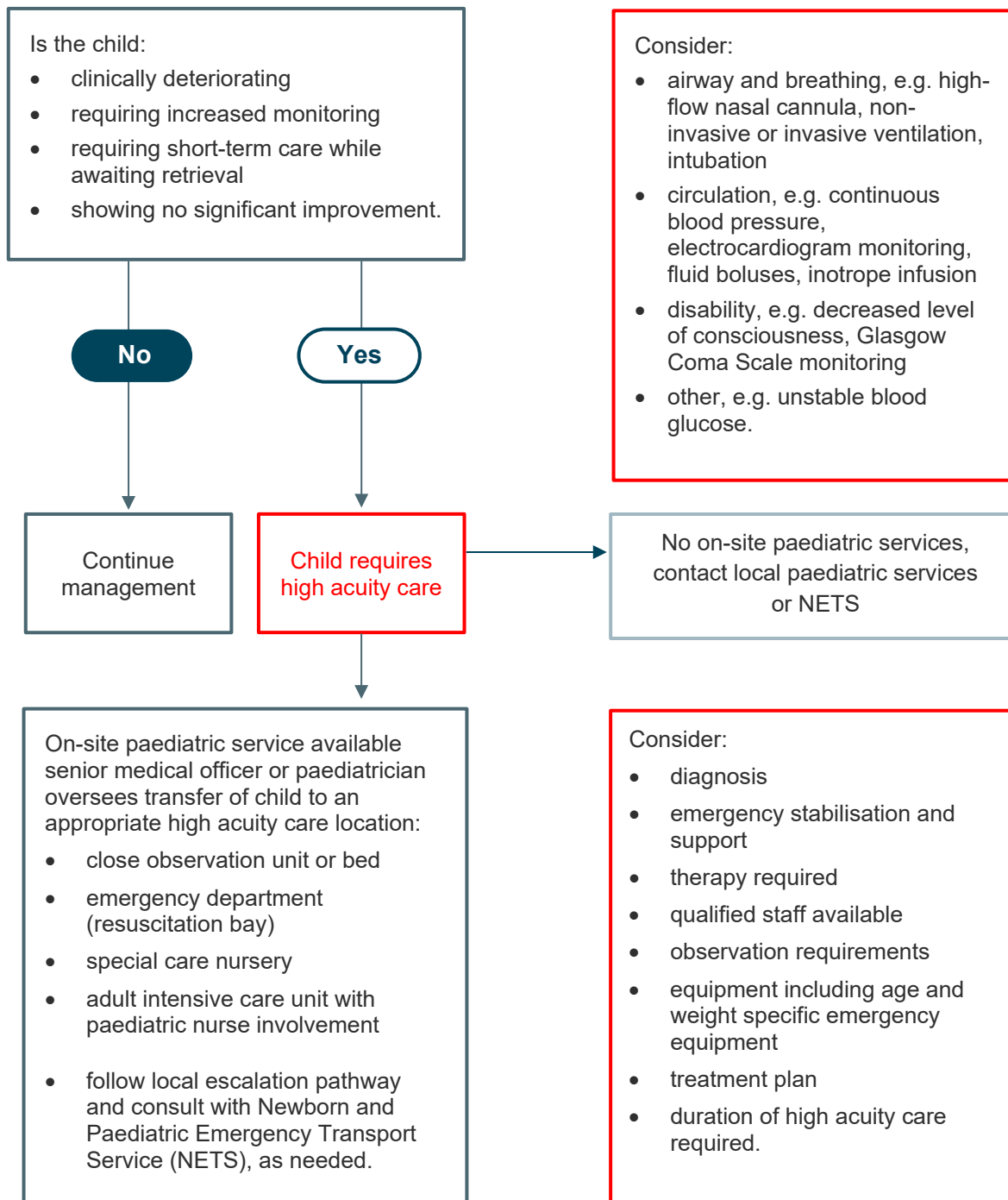
- show signs of clinical deterioration requiring increased level and frequency of monitoring (see Table 1)
- require support for ongoing care beyond local capabilities and resources, e.g. awaiting retrieval to a hospital with a higher level of care
- show no significant improvement with appropriate treatment.

The local clinical pathway should identify who is responsible for deciding when a child requires high acuity care in that facility. This should be a senior medical officer, e.g. an admitting medical officer (AMO) or senior member of the paediatric medical team or emergency department (ED) medical team, in conjunction with nursing staff. In facilities without medical cover, it may be the senior nurse who is responsible. The position responsible should be documented in the local pathway and communicated to key staff.

Table 1: Conditions or therapy where a child may require high acuity care

System	Examples of medical conditions or therapy
Airway and breathing	<ul style="list-style-type: none"> • Asthma that is partially responsive to intravenous medication • Croup requiring repeated doses of adrenaline • Worsening respiratory distress or oxygen requirement not responding to treatment • High flow nasal cannula 2L/kg/min with an increasing concentration of oxygen in the gas mixture (FiO₂) and not improving • Non-invasive ventilation, e.g. bubble continuous positive airway pressure (CPAP), bilevel positive airway pressure (BiPAP) • Intubation and invasive ventilation
Circulation	<ul style="list-style-type: none"> • Worsening vital signs as per standard paediatric observation chart (SPOC) not responding to treatment • No improvement to cardiovascular status despite 40mL/kg saline bolus • Frequent or continuous blood pressure monitoring • Need for arterial line • Vasopressor support • Continuous electrocardiograms (ECG) monitoring for arrhythmias
Disability	<ul style="list-style-type: none"> • Decreased level of consciousness or abnormal neurological findings • Acute behavioural disturbances • Frequent neurological observations
Other	<ul style="list-style-type: none"> • Unstable blood glucose levels, diabetic ketoacidosis (DKA) or electrolyte instability • Pain management requiring two or more infusions • Therapeutic infusions requiring invasive monitoring and management, e.g. insulin, magnesium, aminophylline

Figure 1: Criteria for requiring higher acuity care.



Principle 2: Local resources to safely manage the high acuity child

Facilities should consider the resources required to support a high acuity child, including workforce, equipment, documentation and education. These considerations should be reflected in the local clinical pathway (Principle 1).

Workforce

Workforce requirements will depend on the child's condition, level of staff experience and capability of the ward.

The AMO is responsible for the care of the patient. It is recommended that nurses with paediatric experience are involved in the care of a high acuity child. Staffing levels should be managed to maintain continuous visualisation and monitoring of the child. Medical ward rounds should occur daily if not more frequently, with a paediatrician on site in a base hospital or virtually, if at a rural site. Virtual care is supported for initial escalation and stabilisation of the child requiring higher acuity care. A paediatrician should be on site if longer periods of higher acuity care are needed.

The local clinical pathway should outline the activation and approval processes to trigger additional or alternative staffing, including surge capability. This is usually for a short period of time until the child improves or retrieval has occurred. This activation should be in conjunction with early referral to retrieval services.

Table 2: General workforce principles relating to the management of a high acuity child

Nursing	Medical	Allied health
<ul style="list-style-type: none"> It is recommended that nurses with paediatric experience are in the ward, available to respond in case the child deteriorates. Nurses must have the appropriate skills, experience, and qualifications for the clinical environment where they provide patient care. The number and skill level of nursing staff required to provide care should be based on the number and acuity of the patients within each ward, unit and department within a clinical service. Nurses should remain in the immediate vicinity and in visual contact with the child. 	<ul style="list-style-type: none"> An AMO responsible for the care of the patient should be clearly identified. This may be a paediatrician or local general practitioner in an area without a paediatrician on site. The AMO (or delegate) should liaise with ICU, retrieval or NETS, general paediatrics, anaesthetics, and ED physicians and make the PICU or neonatal intensive care unit (NICU) referral where required. A paediatrician should be available on site, on call 	<ul style="list-style-type: none"> Relevant allied health services, e.g. pharmacy, social work and physiotherapy, should be identified and easily accessed as required.

Nursing	Medical	Allied health
<ul style="list-style-type: none"> Nurses should not be used in any other area or expected to care for any other patients. Increased or surge nursing staff levels may be required where the child is managed in the paediatric ward or ED. Consider the use of an intensive care nurse and paediatric nurse for a child in an adult intensive care unit (ICU), or an ICU registered nurse with paediatric experience. If it is not appropriate to move the child, consider bringing necessary staff to where the child is located. 	<p>or virtually, who is directly involved in the child's care. If on call, suggest they review the child in person.</p> <ul style="list-style-type: none"> If there is no paediatrician at the hospital, contact a regional paediatrician through NETS. Other specialists may be required depending on the location of the child and their clinical condition, e.g. deterioration. 	

Equipment

Specific paediatric equipment for the management of a high acuity child must be maintained and readily accessible. Staff should receive education and training for this equipment, including medications. Equipment packs should be checked as per the hospital policy.

An appropriate paediatric bedspace should be available for a high acuity child, which includes:

- a paediatric safe bed in close proximity to the nurses' station²
- isolation power supply and essential power supply
- the ability to provide continuous monitoring of electrocardiogram (ECG), oxygen saturation, blood pressure and, for intubated patients, end tidal CO₂ monitoring
- access to medical services panel with outlets for oxygen, air and suction
- access to a computer on wheels with virtual care technology or the camera overbed system (see the ACI virtual care resources)
- access to the paediatric emergency trolley (known as a Broselow Trolley) which holds standardised equipment. This is recommended as the minimum equipment for the management of paediatric patients and is outlined in [Appendix 2](#).
- together with the paediatric emergency trolley, additional equipment should be stored in areas where high acuity children will be managed. This additional equipment is outlined in [Appendix 3](#).

Documentation

The following documents should be available where a high acuity child is being managed:

- patient management plan (reviewed daily)
- paediatric resuscitation chart
- standard paediatric observation chart (SPOC)
- paediatric fluid balance chart
- paediatric fluid order chart
- paediatric medication chart.

These documents should be electronically accessible or stored in a folder located wherever the high acuity child is being managed for easy access.

A clinical calculator specific to the child's weight should also be available for medication administration, e.g. [NETS clinical calculator](#).

Education

Relevant education and training should be provided to staff who care for high acuity children.

Examples of available education and training pathways for developing and maintaining skills to manage high acuity children from novice to expert are outlined in Table 3 and [Appendix 4](#). It is up to the LHD to determine the pathway its staff requires.

Table 3: Recommended education and training pathway for managing high acuity children

Level of experience	Skills	Available resources
Novice	Recognition of the deteriorating child	<ul style="list-style-type: none"> • Between the Flags – Deteriorating Patient Learning Pathway – Paediatric patients, My Health Learning • Resus4Kids, My Health Learning
Novice	Paediatric education for emergency department	<ul style="list-style-type: none"> • Skills in Paediatric (SkiP), My Health Learning
Novice	Paediatric medication safety	<ul style="list-style-type: none"> • Fundamentals of Paediatric Medication Safety, My Health Learning • Administering Oral Medications 0-6 years, My Health Learning • Paediatric SkiP: Medication prescribing
Intermediate	Paediatric resuscitation	<ul style="list-style-type: none"> • Paediatric Life Support, (PLS) • Advanced Paediatric Life Support (APLS) • Recognised PLS courses, e.g. LHD Paediatric Advanced Life Support course
Intermediate	Management of critically unwell child pre- and post-resuscitation phase, first 24 hours	<ul style="list-style-type: none"> • Paediatric BASIC
Intermediate	Paediatric specific critical care skills	<ul style="list-style-type: none"> • Paediatric Critical Care Outreach education program - John Hunter Hospital PICU
Intermediate	Other educational opportunities	<ul style="list-style-type: none"> • Facilitate visits to local PICU to attend rounds • Access PICU procedures and guidelines • Paediatric simulation courses - at Sydney Children's Hospital Network and John Hunter Hospital • Consider local simulation for the management of the deteriorating paediatric patient
Expert	Tertiary or post-graduate qualifications	<ul style="list-style-type: none"> • Paediatric critical care • Graduate certificate in paediatric nursing

Principle 3: Appropriate location of care

Appropriate locations of care for a high acuity child include:

- paediatric ward
- close observation unit or bed (COU/B), for example, within a paediatric ward, ED or operating theatre. See [Appendix 5](#) for clinical conditions suitable to be managed in a paediatric COU/B
- special care nursery for infants less than three months old (for facilities that accept older infants who present from home)
- emergency department
- adult intensive care unit or operating theatre.

The severity of the child's condition and the relevant hospital service capabilities will determine the location of care (see the [NSW Paediatric service capability guideline](#)). Any decision made to move a high acuity child needs to be a collaborative approach with the family of the child (Principle 6), treating team and relevant key stakeholders within the hospital. For example, a child on a paediatric ward who requires an increased level of support may be moved to a COU/B, ED or an adult intensive care unit if a COU/B is not available or not the appropriate location for this child (see Table 4 for more information).

The decision about the best location to manage a high acuity child should consider:

- diagnosis, provisional or definitive
- ability to provide emergency stabilisation and support prior to transfer (if transfer is required)
- type of therapy required, e.g. non-invasive or invasive ventilation
- available medical and nursing staff with relevant knowledge and skills
- observation type and frequency
- equipment required
- treatment plan including hydration, nutrition and fluid balance
- hospital escalation of care plan
- estimated date of discharge.^{2, 3}

**To access advice for management or retrieval of the high acuity child,
call NETS on 1300 362 500.**

Table 4: Location of care for a high acuity child

Paediatric ward	Close observation unit or bed ³	Special care nursery or neonatal intensive care unit	Emergency department	Adult intensive care unit
Level of care				
General ward care	Intermediate (between general ward care and intensive care)	Intermediate care for infants, generally less than four weeks but can be up to three months or older in some locations	Emergency or resuscitation bay	Intensive for critically ill patients
When				
<ul style="list-style-type: none"> • Awaiting retrieval • On admission • Postoperatively • Post ED 	<ul style="list-style-type: none"> • Awaiting retrieval • Existing, complex co-morbidities, high developmental and psychological needs that require closer observation • Tests and further imaging required that are not available with general ward care • Children with complex needs may require a higher level of observation 	<ul style="list-style-type: none"> • Awaiting retrieval • Sepsis at birth requiring septic work up • Respiratory distress requires bubble continuous positive airway pressure (CPAP) • Dehydration • Bilious vomiting 	<ul style="list-style-type: none"> • Awaiting retrieval • Non-invasive or invasive ventilation • Resuscitation • Inotropes 	<ul style="list-style-type: none"> • Awaiting retrieval • Unexpected, prolonged stay in adult ICU due to logistical issues • Medical or surgical diagnosis with expected short length of stay • Size or age of child approaching adult measurements • Experience of adult team relevant to diagnosis

Paediatric ward	Close observation unit or bed ³	Special care nursery or neonatal intensive care unit	Emergency department	Adult intensive care unit
Staffing				
<ul style="list-style-type: none"> • Nurse with paediatric experience to care for the child • AMO availability 	<ul style="list-style-type: none"> • Paediatric nurse with experience to care for the child in the area • AMO availability • The number and skill level of nursing staff required to provide care should be based on the number and acuity of the patients within each ward, unit, and department within a clinical service with forward planning for the oncoming shifts • Access to medical staff with training in paediatrics • Senior medical staff on site and available to attend and deliver acute assessment and resuscitation if required 	<ul style="list-style-type: none"> • Staff experienced in the care of neonates including non-invasive ventilation • Paediatrician available for face-to-face consult 	<ul style="list-style-type: none"> • Initial resuscitation and stabilisation from ED and paediatric teams able to intubate and cannulate • Remote support: <ul style="list-style-type: none"> - NETS - tertiary PICU 	<ul style="list-style-type: none"> • Staff experience in critical care including invasive and non-invasive ventilation • At least one staff member that has paediatric ICU or paediatric experience in the unit. This may be a staff member from the paediatric ward or an ICU nurse with paediatric experience • An ideal model would be an ICU nurse and a paediatric nurse jointly caring for the patient • Paediatrician should continue to care for the child while in an adult ICU with assistance from the intensivist
Additional resources				
Allied health staff	Allied health staff	Allied health staff	Medical and nursing support while waiting for retrieval team	Allied health staff

Virtual care

Virtual care can be used to support the management of a high acuity child including:

- consultation, assessment and advice
- use of the Critical Care Overbed Network
- coordination and collaboration with specialised services
- communication with family, including consent
- engaging interpreters and other support services, e.g. social workers
- transfer of care
- virtual paediatric ICU ward rounds where available.

Virtual care needs should be locally determined. Resources for clinicians and their patients on setting up and using virtual care are available from the [ACI virtual care website](#).

Principle 4: Clear escalation procedures

Facilities should have a documented local escalation procedure for managing the deterioration of a high acuity child following local clinical emergency response systems (CERS) response. The paediatrician and AMO managing the child's care at the referring hospital should be notified and involved in the escalation process. See Figure 2 and [Appendix 6](#).

A high acuity child may need to be transferred to a facility that can provide a higher level of care when the local facility is unable to meet the care needs of the child. Those needs may include:

- increasing requirements for invasive monitoring, necessary equipment and treatment measures
- increasing requirements for resuscitation fluid and centrally accessed medications
- subspeciality consultation
- imaging.

The escalation procedure should include the following steps.

1. Notification

When a high acuity child is deteriorating, notify these clinicians:

- Paediatrician caring for the child
- Admitting medical officer
- Nurse in charge of where the child is located, or the afterhours nurse manager
- Intensivist and ICU registrar if transferred to ICU
- Emergency physician or senior ED doctor (for high acuity child in ED)

2. Clinical review (yellow zone)

If a child's observations enter the Between the Flags yellow zone or other local criteria, a clinical review must be undertaken by the clinical team responsible for the child's care within 30 minutes of notification of concern from nursing staff.

The nurse in charge of where the child is located, or the afterhours nurse manager, should allocate experienced nursing staff to the child. This may include allocating one nurse to one child and/or staff competent in use of ventilation and invasive monitoring.

3. Rapid response (red zone)

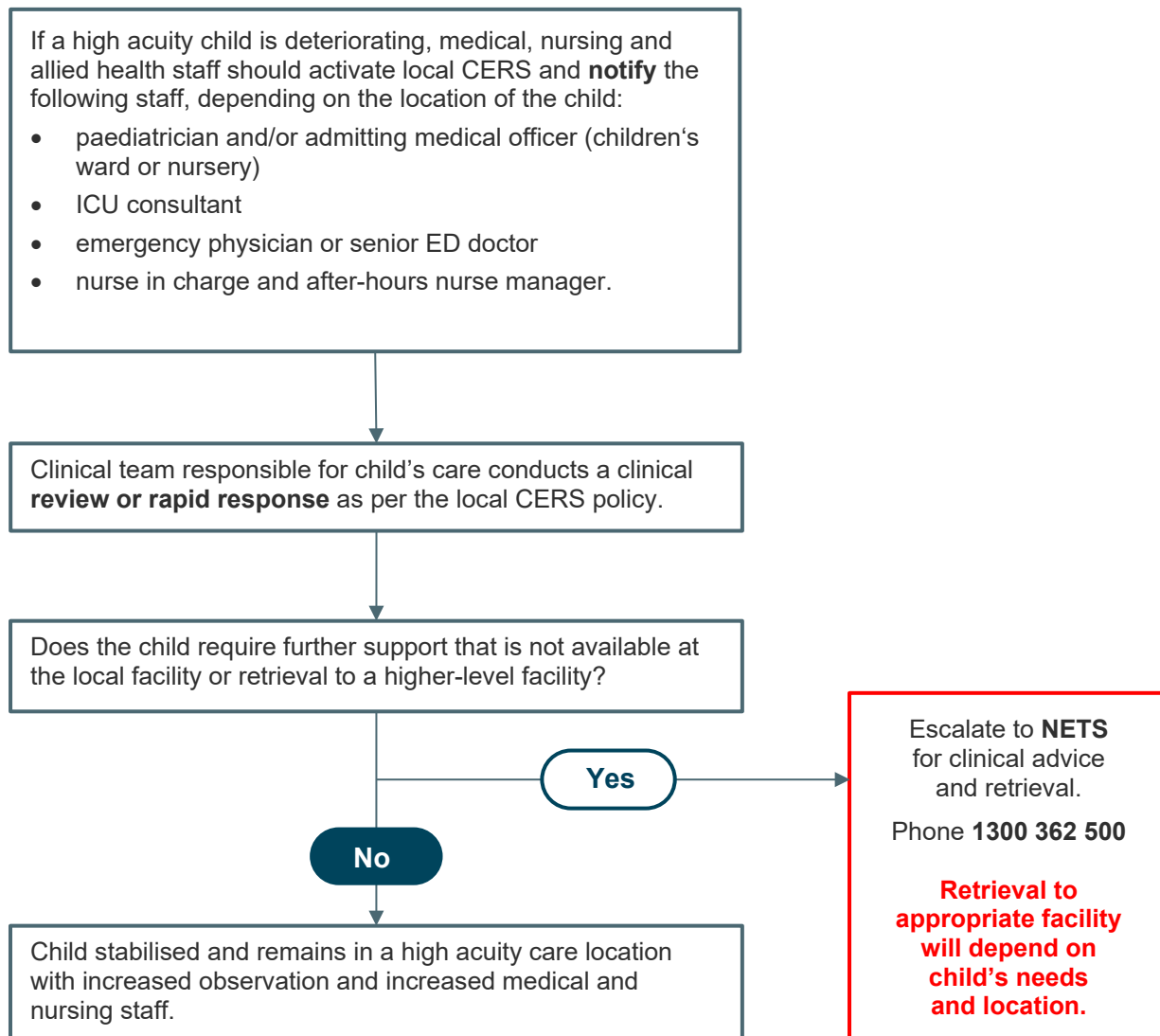
If a child's observations enter the Between the Flags red zone, activate a rapid response. There must be a clear description and role allocation in the Rapid Response team and the appropriate clinician must be contacted when a child meets the rapid response criteria.

4. Advice and referral

The local treating team can escalate to NETS at any time if it requires clinical advice due to a high acuity child's condition or specialist services not being available at the local hospital. NETS or the paediatrician caring for the child will arrange transfer to a higher-level service, if required. Determining the need for transfer is a joint responsibility between the transferring and receiving hospitals.⁴

All health facilities in NSW must have CERS that meet the requirements of the NSW Health policy directive *Recognition and management of patients who are deteriorating*.⁵

Figure 2: Escalation procedure for deteriorating high acuity child



Principle 5: Governance considerations

Local sites should establish and implement governance structures and processes to support management of a high acuity child.

The following governance structures and processes should be implemented at each site:

- Clinical criteria for local management
- Established links developed with higher acuity facilities for guidance and support
- Escalation and transfer procedures and resources
- Identification of the AMO and other staff involved in the management of the high acuity child
- Minimum daily paediatrician or AMO and nursing ward round (using virtual care if required)
- A process to ensure medical and nursing handover occurs at the time of transfer if the child is transferred to another facility
- Supervision and training for medical and nursing staff caring for children
- Guidance and sharing of paediatric policies and procedures for the management of specific paediatric conditions
- Availability of virtual care including the Critical Care Overbed Network
- Regular documented morbidity and mortality or safety and quality meetings with a clear process to involve the LHD, local PICU and NETS to assist in case review
- Facilitated multidisciplinary clinical debriefing where required

Care of a high acuity child remains the responsibility of the referring hospital medical team until care is transferred to the higher-level service and/or retrieval team.

Principle 6: Family-centred care

Effective communication between clinical staff and parents or carers is essential for effective management of a high acuity child. A family-centred care approach is where the child's parents or carers are encouraged to participate in the care of the child. They are included in the decision making process with the clinical team to meet the needs of the child within the hospital setting.²

Consideration should be given to:

- providing adequate, relevant, timely and age-appropriate information
- minimising separation of children from their parents and carers unless clinically indicated or other reasons, e.g. child protection
- always allowing access for authorised parents and carers if clinically appropriate
- social worker support should be sought for the parents and carers
- providing facilities for at least one parent or carer to stay at the bedside or in reasonable proximity
- notifying and encouraging parents and carers to be present when the child is transferred
- respecting individual characteristics, beliefs, culture and context of the child and their parents and carers
- having processes in place to provide culturally appropriate care for Aboriginal children and their parents and carers if they are required to be transferred off Country to receive definitive care
- making the REACH system available and communicating this to parents and carers (REACH stands for Recognise, Engage, Act, Call, Help is on its way. It helps parents and carers to escalate their concerns with staff about worrying changes in a patient's condition)
- facilitating shared decision-making.³

Step down and return transfer process⁴

The step-down process or decision to transfer a child back to a local hospital requires:

- the support and preparation for the child and parents and carers
- consideration of the level of care and service delivery required for the child
- consideration of return to care closer to home
- the availability of appropriate staffing and resources to provide the necessary care for the child. This may include planned specific upskilling and preparation of staff to receive a child with ongoing chronic care requirements
- the availability of appropriate resources to transfer the child
- medical and nursing handover of care to be communicated and documented at time of transfer.

Appendix 1: Methods

Search strategy

Structured research questions			
1. Managing a paediatric patient in an adult hospital			
2. Deteriorating child outside of a children's hospital			
P	Population (of interest)	Paediatric patients outside of a children's hospital	
I	Intervention		
C	Control (group)		P
O	Outcome (measured)		

Databases	PubMed, Medline, Cochrane, Google, Embase, Emcare, Google Scholar		
Key words/terms:	<p>intensive care, critical care, adult intensive care unit, paediatric (under 16 years of age), diagnoses (expecting trauma, metabolic conditions, single organ failure, dialysis, renal), outcomes (length of stay, mortality, functional), mortality, length of stay, transfers characteristics, deteriorating child, outside children's hospital.</p> <p>Other search terms included:</p> <p>PubMed search terms included ("close observation"[Title/Abstract] OR "high dependency"[Title/Abstract] OR "observation unit*"[Title/Abstract]) AND (paediatric*[Title/Abstract] OR pediatric*[Title/Abstract] OR "child*"[Title/Abstract] OR "infant*"[Title/Abstract]) AND (inpatient*[Title/Abstract] OR hospital*[Title/Abstract]) AND ((english[Filter]))</p>		
Publication years:	2012-2022		
Other search filters:	Meshing of terms, and combined searches included in strategy		
English language only	P		
Adult	N/A	Paediatric	319

Appendix 2: Broselow™ style paediatric resuscitation trolley minimum equipment list

This lists the minimum equipment recommended to be immediately available on a paediatric resuscitation trolley (Broselow™ style) for all infants, children and small adults. It aims to facilitate best practice during resuscitation attempts.

Side of trolley
Self-inflating bag-valve-mask (BVM): "child" with size 1-2 clear face mask
Self-inflating BVM: "adult" with size 4-5 clear face mask
Portable oxygen cylinder with flow meter and tap attached to side
Suction available with tubing and paediatric yankeur sucker
Sharps bin
Paediatric stethoscope
Broselow™ Paediatric Emergency Tape (2019 version)
On top of trolley
Resuscitation charts and paediatric advanced life support algorithms (e.g. ANZCOR 2023)
NETS Clinical Calculator (optional) calculator.nets.org.au/ClinCalcMenu.php
Defibrillator or known location of defibrillator
Location of Difficult Airway Tray or Trolley
Top drawer 1
Drug dosage handbooks or resources, e.g. <i>Frank Shann Drug Doses</i> (2017) or <i>Monash Paediatric Emergency Medication Book</i> (2018 Ed 2)
Pharmacy pack – see facility recommended resuscitation medication and fluid list
Drug labels
Calculator
Laryngoscope handle
Laryngoscope blades: straight size 0, 1, 2, 3 and curved sizes 1, 2, 3
Paediatric cuff manometer OR AG Cuffill device for cuffed endotracheal tubes
Magill's forceps – neonatal and paediatric
Endotracheal tube (ETT) introducers size small and medium

Lubricating jelly
Adhesive tape: ½ inch and 1 inch brown Leukoplast tape
White cotton (trache) tape: 1 metre length
Paediatric Colorimetric CO ₂ detector 1kg-15kg Adult Colorimetric CO ₂ detector >15kg
Hydrocolloid dressing: 1 sheet
Pen torch
Tongue depressor x 1
Scissors
pH indicator strips (0.5 increments)
Bottom drawer OR Drawer 2
Needle thoracocentesis pack: 14G, 16G cannulae, 3-way tap, 20mL syringe, Opsite dressing x 2, alcohol wipes
ECG dots
*5% glucose 250mL x1
*10% glucose 1L x 1
*0.9% sodium chloride 1L x 1
Burette/pump giving set x 1
Transfusion pump set x 1
Syringes: Luer lock 50mL x 2
3-way tap x 2
Drawing up needles (blunt 18g) x 20
Batteries for laryngoscopes. Spare AA and C batteries
Oxygen saturation probes: infant and child
Tourniquet
Defibrillation pads: paediatric size and adult size x 1 each

Intraosseous pack (sealed)
Alcohol swabs x 6
Intraosseous needle or EZ IO drill with various sized needles: pink x 2, blue x 2, yellow x 2
3-way tap x 2
Syringe: 50mL (Luer lock) x 1
Syringe: 20mL (Luer lock) x1
Syringe: 5mL (Luer lock) x1
Drawer 2 Infant less than 10kg
Endotracheal tube pack (sealed)
ETT uncuffed x 1 each sizes 2.5, 3.0, 3.5, 4.0
Paediatric cuffed ETT 3.0, 3.5 x 1 each
ETT suction catheters: 6 FG x1, 8 FG x1
Loose in pink/red drawer
Clear face masks sizes 00, 0, 1
Oropharyngeal airway 00 and 0 (40mm - 60mm)
Tongue depressor
LMA Supreme Airway OR i-gel®, size 1 and 1.5
ETT suction catheter size 6FG x 1, 8FG x1
Umbilical catheter placement kit (optional)
Umbilical catheter single lumen 3.5 FG (optional)
Intravenous (IV) cannulation pack (sealed)
22G, 24G cannulae x 1 each
Extension tube x 1
Paediatric Tegaderm
Alcohol wipes x 2
3-way tap x 2
Syringes: 3mL, 5mL x 1 each
0.9% sodium chloride 10mL x 1
Neonatal arm board x 1, Infant arm board x 1

Gastric tube insertion pack (sealed)
8FG gastric tube
20mL syringe
Free drainage bag or container
Drawer 3 – small child 10 to 11kg
Endotracheal tube pack (sealed)
ETT uncuffed tube size 4.0 x 1
Paediatric cuffed ETT 3.5 x 1 and 2.5 mL syringe
ETT suction catheter 6FG x1, 8FG x 1
Loose in drawer 3
Clear face mask size 2
Oropharyngeal airway 1 (70mm)
Tongue depressor
LMA Supreme Airway OR i-gel®, size 2
Suction catheter size 6FG x 1, 8FG x 1
IV cannulation pack (sealed)
22G, 24G cannulae x 1 each
Extension tube x 2
Paediatric Tegaderm
Syringes: 3mL, 5mL and 10mL x 1 each
0.9% sodium chloride amp 10mL x 1
3-way tap x 1
Infant arm board x 1
Gastric tube insertion pack (sealed)
8FG gastric tube
20mL syringe
Free drainage bag or container

Drawer 4 – small child 12 to 15kg
Endotracheal tube pack (sealed)
ETT uncuffed size 4.5 x 1
Paediatric cuffed ETT 4.0 x1 and 5mL syringe
ETT suction catheter 8FG x 1
Loose in drawer
Clear face mask size 2
Oropharyngeal airway: size 1 (70mm)
Tongue depressor
LMA Supreme Airway OR i-gel®, size 2
Suction catheter size 8FG x 1
IV cannulation pack (sealed)
24G, 22G, 20G cannula x 1 each
Extension tube x 1
Paediatric Tegaderm
Syringes: 3mL, 5mL, 10mL x 1 each
0.9% sodium chloride 10mL amp x 1
3-way tap x 1
Infant arm board x 1
Gastric tube insertion pack (sealed)
10FG gastric tube
50mL catheter tip syringe
Free drainage bag or container
Drawer 5 – child 16 to 18kg
Endotracheal tube pack (sealed)
Paediatric ETT cuffed tube size 4.5
ETT suction catheter 8FG x 1
5mL syringe x 1

Loose in drawer
Oropharyngeal airway size 1 (70mm)
Clear face masks sizes 2 and 3
Tongue depressor
LMA Supreme Airway OR i-gel®, size 2
Suction catheter size 8FG x 1, 10FG x 1
IV cannulation pack (sealed)
22G, 20G, 18G cannula x 1
Extension tube x 1
Paediatric Tegaderm
Syringes: 3mL, 5mL, 10mL x 1 each
0.9% sodium chloride 10mL amp x 1
3-way tap x 1
Paediatric arm board x 1
Oro or nasogastric insertion pack (sealed)
10 FG gastric tube
50mL catheter tip syringe
Free drainage bag or container
Drawer 6 – child 19 to 23kg
Endotracheal tube pack (sealed)
Paediatric ETT cuffed tubes size 5.0, 5.5
ETT suction catheter 10FG x 1
Syringe 10mL x 1
Loose in drawer
Clear face masks sizes 2 and 3
Oropharyngeal airway size 2 (80-90mm)
Tongue depressor
LMA Supreme Airway OR i-gel®, size 2.5
Suction catheter size 8FG x 1, 10FG x 1

IV cannulation pack (sealed)
22G, 20G, 18G cannula x 1 each
Paediatric Tegaderm
Syringes: 3mL, 5mL, 10mL x 1 each
0.9% sodium chloride 10mL amp x 1
3-way tap x 1
Extension tube x 1
Paediatric arm board x 1
Gastric tube insertion pack (sealed)
10 FG gastric tube
50mL catheter tip syringe
Free drainage bag or container
Drawer 7 – small adult 24 to 28kg
Endotracheal tube pack (sealed)
Paediatric ETT cuffed tube size 5.5, 6.0
ETT suction catheter 10FG
Syringe 10mL x 1
Loose in drawer
Clear face mask size 3
Oropharyngeal airway size 3 (80-90mm)
Tongue depressor
LMA Supreme Airway OR i-gel®, size 2.5
Suction catheter size 10FG x 1, 12FG x1
IV cannulation pack (sealed)
22G, 20G, 18G cannula x 1 each
Extension tube x 1
Paediatric Tegaderm
Syringes: 3mL, 5mL, 10mL x 1 each
0.9% sodium chloride 10mL amp x 1

3-way tap x 1
Paediatric arm board x 1
Gastric tube insertion pack (sealed)
12FG, 14FG gastric tubes
Syringe 50mL catheter tip
Free drainage bag or container
Drawer 8 – small adult 30 to 40kg
ETT cuffed tubes size 6.5, 7.0
ETT suction catheter 12G x 1
Syringe 10mL x 1
Loose in drawer
Clear face mask size 4
Oropharyngeal airway size 3 (80-90mm)
Tongue depressor
LMA Supreme Airway OR i-gel®, size 3
Suction catheter size 12FG x 1
IV cannulation pack (sealed)
20G, 18G, 16G cannula x 1 each
Extension tube x 1
Paediatric Tegaderm
Syringes: 3mL, 5mL, 10mL x 1 each
0.9% sodium chloride 10mL amp x 1
3-way tap x 1
Paediatric arm board x 1
Gastric tube insertion pack (sealed)
12FG, 14FG gastric tubes x 1 each
Syringe 50mL catheter tip
Free drainage bag or container

Orange* text: Signifies item must be immediately available in department

Grey text: Signifies optional item – to be determined by local health districts (LHD) for each facility

Additional items for consideration by LHD sites

- 20% mannitol 500mL IV bag x 1
- 3% sodium chloride 1000mL IV bag x 1
- Nasopharyngeal airways

ETT cuff inflation and cuff pressure measurement

Where cuffed ETTs are used and the cuff is inflated, cuff pressure should be measured and maintained between 5 and 15cm H₂O, or in older children, up to 20cm H₂O.

There are two devices that can be used:

- paediatric cuff manometer – [NETS Guideline](#)
- [AG Cuffill device](#) – syringe for cuff inflation that incorporates digital cuff measurement.

For information on how to use these devices, please use the links above to access detailed information.

Appendix 3: Additional equipment for management of high acuity children

Airway and breathing	<ul style="list-style-type: none"> • Positive end-expiratory pressure (PEEP) valve for the self-inflating bag • Low flow infant and paediatric nasal prongs • High flow infant and paediatric nasal prongs • High flow device • Paediatric nebuliser masks • Spacer for metered dose inhalers • Nasopharyngeal airways • Ventilator with paediatric mode • Ventilator circuits (paediatrics and adults) • Non-invasive ventilation masks and straps • Video laryngoscope • Device to measure endotracheal tube (ETT) cuff pressures (see below)
Circulation	<ul style="list-style-type: none"> • Paediatric cannulation packs with various sizes of cannulas • Peripherally inserted central catheter (PICC) line catheters • Central venous catheter sizes 4-8.5 Fr • Arterial line and paediatric arm boards • Guidewire to fit size 24g intravenous (IV) cannula
Other	<ul style="list-style-type: none"> • Wide bore nasogastric tube (sizes 6, 8, 10, 12) • Indwelling urinary catheters (size 6, 8, 10, 12) • Syringe drivers and pumps and giving sets • 3-way taps • Pathology tubes and blood gas syringes • i-STAT testing device • Access to blood gas machine • Thermometers • Scales for weight nappies • Access to ultrasound machine to assist with venous access
Fluids and medications	<ul style="list-style-type: none"> • Paediatric fluids as per The Royal Children's Hospital Melbourne paediatric intravenous fluid guideline • 20% mannitol 500ml IV bag x 1 • 3% sodium chloride 1000ml IV bag x 1

Additional equipment required

- ETT cuff inflation and cuff pressure measurement – where cuffed ETTs are used, the cuff should be inflated and cuff pressure should be maintained between 5-15cmH₂O or, in children over 12 years, consider pressure up to 20cmH₂O
- Paediatric cuff manometer – [NETS Guideline](#)
- [AG Cuffill device](#) – syringe for cuff inflation that incorporates digital cuff measurement

For information on how to use these devices, please use the links above to access detailed information.

Appendix 4: Paediatric-specific critical care education

Paediatric BASIC Course

Delivery: Face to face

Duration: Two days

Audience: Targeted

Content: Covering essential and fundamental aspects of paediatric critical care. The aim of the course is the implementation of principles of ongoing management of the critically ill child post-resuscitation and stabilisation phase.

Topics include:

- airway management
- acute respiratory failure
- mechanical ventilation
- haemodynamic monitoring
- management of shock
- severe sepsis
- interpretation of arterial blood gases
- transport of critically ill patients
- severe trauma
- neurological emergencies
- oliguria and acute renal failure
- cardiopulmonary resuscitation
- arrhythmias
- nutrition
- sedation and analgesia
- venous thromboembolic disease
- stress ulceration
- cardiovascular and respiratory physiology
- metabolic and electrolyte disturbances
- ongoing care of the critically ill patient.

Workshops on:

- mechanical ventilation
- airway management
- resuscitation
- paediatric trauma
- vascular and intraosseous access.

Paediatric Critical Care Outreach Education Program (John Hunter Hospital Paediatric Intensive Care Unit)

Delivery: Face to face

Duration: 8 hours

Audience: Targeted (medical, nursing and allied health staff in paediatric ward, emergency department and intensive care unit)

Content: A multidisciplinary collaborative education day aimed at rural and regional sites within the Children's Healthcare Network Northern. Focus on the management of the paediatric patient awaiting critical care transfer to higher level facility; the paediatric patient requiring short-term higher acuity management; and the complex paediatric patient starting palliative and supportive therapy.

Program:

- Lecture
- Skills stations include:
 - airway
 - non-invasive ventilation
 - invasive ventilation
 - simulation.
- Panel discussion

Paediatric simulation courses

Delivery: Face to face

Duration: 8 hours

Audience: Targeted

Content: These courses provide scenario-based team training on paediatric emergencies within the paediatric ICU or during a rapid response call.

- Sydney Children's Hospital Network – Kids Simulation Australia courses support health professionals to improve their knowledge and skills in caring for neonatal and paediatric patients across the state.
- [Hunter New England Simulation Centre](#) – offers a wide range of simulation training addressing clinical and non-clinical challenges, as well as instructor training and development programs.

Advanced Paediatric Life Support (APLS)

Delivery: Face to face plus pre-course preparation

Duration: Three days, plus 10 hours preparation

Audience: Targeted

Content: The Advanced Paediatric Life Support course is suitable for doctors, nurses and paramedics looking to increase their confidence and clinical skills in paediatric acute care. It is designed for graduates with a minimum of two years' experience.

The course covers the following topics and areas:

1. Life support
 - Basic life support
 - Advanced support of the airway and ventilation
 - Cardiac arrest management and defibrillation
2. Diagnosis and management of the seriously ill child
 - Breathing difficulties
 - Shock
 - Abnormal pulse rate and rhythm
 - Decreased conscious level
 - Convulsing child
3. Diagnosis and management of the seriously injured child
 - Chest injury
 - Abdominal injury
 - Head trauma
 - Spinal injury
 - Burns and scalds
 - Drowning
4. Practical procedures
 - Airway and breathing
 - Circulation
 - Trauma
 - Interpreting trauma X-rays
 - Stabilisation and transfer
5. Further topics
 - Fluid and electrolyte management
 - Acid-base balance
 - Pain management
 - Septic child
 - Neurological assessment

Rounds at local paediatric intensive care unit (PICU)

Arrange with respective PICUs

PICU guidelines and procedures

Guidelines are available at a network level and from each PICU site. It is recommended you add links to the main guideline page at each facility

Modified from Murrumbidgee Local Health District.

Appendix 5: Suggested clinical conditions suitable for a paediatric close observation unit or bed admission

Systems	Clinical conditions
Airway	<ul style="list-style-type: none"> • Stridor at rest, moderate to severe croup requiring two doses of adrenaline • Anticipated difficult upper airway, e.g. patient known to facility with congenital abnormality
Breathing	<ul style="list-style-type: none"> • Acute asthma requiring continuous or more frequently than one hourly intermittent nebulised bronchodilator/metered dose inhalation • Unstable bronchiolitis, requiring increasing oxygen • Slow or difficult recovery from anaesthesia • On high levels or increasing levels of supplemental oxygen not improving with escalation of oxygen therapy
Circulation	<ul style="list-style-type: none"> • Electrolyte instability with frequent investigations and therapeutic interventions that require monitoring • Postoperative bleeding requiring more frequent observation than standard ward care • Non-routine intravenous (IV) transfusions requiring close and less than two hourly observation and monitoring • Suspected septicaemia requiring more frequent observations and hourly interventions • IV fluid resuscitation requiring two or more fluid boluses
Disability	<ul style="list-style-type: none"> • Severe pain (diagnosis known) • Head injury requiring initially hourly neurological observations • Increased monitoring related to ingested substances • Agitated or behaviourally disturbed children • High nursing care needs in relation to extreme disability and concurrent acute illness • Ongoing or recent convulsions requiring interventions and frequent observations and assessment
Other	<ul style="list-style-type: none"> • Increased observations and interventions based on clinical deterioration and following a rapid response call • Hypoglycaemia with hourly blood glucose and ketone monitoring • Diabetic ketoacidosis with insulin infusion • Clinical judgement, previous paediatric admissions and meeting developmental needs should be considered when deciding if the child older than 16 years is suitable • Transfers back from tertiary PICU or Level 4 and 5 paediatric units. Return transfer process followed • Awaiting transfer by Newborn and Paediatric Emergency Transport Service to tertiary PICU or Level 4 and 5 paediatric units

Appendix 6: Escalation checklist for a deteriorating child

Action	Completed
Local clinical pathway activated	
<p>If the child is in the emergency department:</p> <ul style="list-style-type: none"> Medical officer (or most senior clinician if no medical officer is available) contacts emergency department Fellowship of Australasian College Emergency Medicine, on-call paediatrician or admitting medical officer (AMO) <p>If the child is on the children's ward:</p> <ul style="list-style-type: none"> Medical officer or nursing team leader activates Rapid Response team and contacts AMO plus on-call paediatrician (if patient not admitted under paediatrics) 	
Determine AMO or most senior clinician responsible	
Contact Newborn and Paediatric Emergency Transport Service (NETS) for early discussion, advice and/or retrieval on 1300 362 500. The conference call with NETS ensures all relevant clinicians are involved in the plan of care and clinical decision making, including need for transfer or retrieval	
Consultant-to-consultant communication for other speciality referral, e.g. intensive care, surgery	
AMO to remain on site with the deteriorating child	
Nurse unit manager or nursing team leader of the clinical area to allocate experienced nursing staff to the child	
Care of the child should be managed in conjunction with the admitting team, medical staff, nursing staff, paediatrician, NETS or paediatric intensive care unit	
<p>Confirm child's condition</p> <p>a. Improving or stabilising</p> <ul style="list-style-type: none"> admit or remain in ward consider close observation unit (COU) bed, if available transfer to higher level paediatric service <p>b. Improving, but not well enough for paediatric ward</p> <ul style="list-style-type: none"> admit to COU bed or intensive care unit with a definitive plan <p>c. Not improving or deteriorating</p> <ul style="list-style-type: none"> retrieval to a higher-level facility if retrieval team is delayed, the child may need to move to another area within the hospital that can provide a higher level of care 	

Modified from Mid North Coast LHD Paediatric Critical Care Pathway, 2018

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Glossary

AMO	Admitting medical officer
CPAP	Continuous positive airway pressure
COU/B	Close observation unit/bed
ED	Emergency department
ETT	Endotracheal tube
ICNSW	Intensive Care NSW
IV	Intravenous
cmH2O	Centimetre of water as a measured pressure
LHD	Local health district
NETS	Newborn and Paediatric Emergency Transport Service
PICAG	Paediatric intensive care advisory group
PICU	Paediatric intensive care unit
SCHN	Sydney Children's Hospital Network
SKIP	Skills in paediatric
SPOC	Standard Paediatric Observation Charts

Acknowledgements

The ACI acknowledges the contributions of the expert working group members in the development of these key principles.

Dr Corrine Balit	Co-Chair Paediatric Intensive Care Advisory Group	Director John Hunter Hospital Paediatric Intensive Care Unit (PICU)
Vicky Smith	Co-Chair Paediatric Intensive Care Advisory Group	Clinical Nurse Consultant, Sydney Children's Hospital Randwick Paediatric Intensive Care Unit
Dr Lee Tam Teo	Paediatric Intensivist	John Hunter Hospital PICU
Natalie Duns	Nurse Manager	John Hunter Hospital Intensive Care Unit and PICU
Dr Matthew O'Meara	NSW Chief Paediatrician	Paediatric Emergency Physician, Sydney Children's Hospital Network
Close observation unit/bed working group		
Higher acuity child working group		