CARE OF CRITICALLY UNWELL CHILDREN ON ADULT CRITICAL CARE UNITS

South West Critical Care and South West Paediatric Critical Care Operational Delivery Network Guidance

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Table of Contents

1.0 Background 2
2.0 Principles 2
3.0 Guidance 3
3.1. Decision to admit/transfer to ACCU 3
3.2. Admission to ACCU 4
4.0 Governance, Assurance and Learning 5
5.0 Training/Support 6
6.0 Feedback 6
7.0 Acknowledgements 6
8.0 References 6
9.1 Appendix 1: Management of ventilated children on Adult Critical Care Units 7
9.2 Appendix 2: Authorship and Consultation Schedule 8

1.0 Background

Demand on paediatric critical care units (PCCUs) is often high during the autumn and winter months. This pressure has been particularly noteworthy throughout November and into December 2022. This has been driven at least in part by seasonal illnesses, which are currently circulating at high enough levels to impact on usual service delivery. Further information on the pressures faced by PCCUs at this time may be found here.

In recognition of this pressure, the South West adult and paediatric critical care Operational Delivery Networks (ODNs) have produced this document to highlight the potential for the stabilisation and ongoing care of critically unwell children outside of PCCUs, which may be required if access to a PCCU is limited or delayed. In describing the processes and decision making around this situation, this document also aims to support adult critical care units (ACCUs) with their governance arrangements, if they are required to care for children in a manner outside of their normal operating practices.

The document aligns to relevant national standards and guidelines which are referenced throughout. The guidance aims to ensure best available care for paediatric patients without compromising the care of adult patients, when considering the current constraints on service provision.

2.0 Principles

A number of important principles underpin the publication of this document:

- That these guiding principles are underpinned by national standards of care published by both the Paediatric Critical Care Society (PCCS) and Intensive Care Society (ICS)/Faculty of Intensive Care Medicine (FICM).
- That this guidance reflects long-standing practice in which adult teams in most of the units in the SWCCN support the care of critically unwell children in the initial assessment, management and stabilisation phase, with advice and guidance from WATCh (Wales and West Acute Transport for Children Service).
- That usual processes of referral for critically unwell children should occur. Referral is usually performed by calling WATCh or by direct referral to the paediatric major trauma team leader at the Bristol Royal Hospital for Children.
- That pre-existing ethical and clinical decision-making models will continue to be applied unless extreme circumstances (OPEL 4/ CRITCON 4) dictate that paediatric demand exceeds supply, requiring urgent prioritisation and triage decisions.
- That the regional systems of care for adult and paediatric critical care are inherently different and that this must be taken into consideration during capacity discussions. Adult critical care capacity is mostly managed at a Trust- level, whereas paediatric critical care has a significantly smaller bed-stock across fewer Trusts in the UK, and is managed regionally.
- That the level 3 PCCU providers (paediatric intensive care units) will ensure that surge capacity and activity has already been enacted at the point at which an ACCU team is being asked to step outside of their normal operating practices in caring for a critically unwell child. This will include ensuring ward discharges out of PCCUs, redistributing/redeploying staff, using surge beds, enacting surge protocols, cancelling elective surgery and maximising use of agency staff where the limiting step is staffing.

- That ACCUs would be best placed to provide care for larger children (e.g. over 12 years of age, over 50kg) in the event that mutual aid is required. It is recognised that a surge in paediatric demand is most likely to be generated by a surge in respiratory viral illnesses, which will more severely affect infants, younger children, or older children with pre-existing conditions. However, opportunities to care for paediatric patients over the age of 12 or over 50kg in ACCUs should be explored in the event that support is required from ACCUs, as this would be preferable to ACCUs caring for infants or very small children. This may involve the transfer of an older or comparatively less complex child out of a PCCU, in order that the ACCU can care for an older or clinically less complex child.
- That each situation will be unique and complex, both clinically and non-clinically, and it is vital that a situational, individualised approach, with discussion between WATCh, and/or PCCU and ACCU is of paramount importance in understanding how best to care for **all** critically ill patients (adults and children). The optimal course of action can therefore only be decided on a case-by-case basis, following discussion between appropriate senior individuals.
- In the event that demand for both adult and paediatric critical care is overwhelmed, individual decisions should be taken based on the balance of risk, taking into account any pandemic specific guidance. Established formalised routes of escalation to Networks and NHS England should be used, which may prompt regional or national intervention.
- If treating paediatric patients on an ACCU is inevitable, regional coordination should ensure that ACCUs with co-located paediatric services are preferentially selected, to reduce risk and ensure that physical clinical reviews of these patients are undertaken by paediatric teams whilst the patient is on the ACCU.

3.0 Guidance

3.1. Decision to admit/transfer to ACCU

Throughout this process is it important that the care of ALL critically ill patients (adults and children) is considered. The ability of an ACCU to appropriately care for their adult patients should be balanced against the benefits and risks of admitting a child onto the ACCU. This balance should form part of the discussion around whether or not to admit to a child to the ACCU.

The legal, and indemnification details surrounding this decision, as well as guidance surrounding the ethical decision making is summarised in this document and we strongly encourage ACCU consultants, matrons and senior nursing staff to familiarise themselves with its contents: PCCS Guidance for when Resources are Constrained.

The circumstances under which a child will be admitted to and stay on an ACCU are as follows;

a) When, on balance of risks, it is in the best interests of the patient, given their clinical state and trajectory, their age, and the relative demands on the wider local, regional, and national paediatric intensive care bed stock, and in context of the demands on the local ACCU, to be admitted to ACCU. An appropriate example would be the child intubated for status epilepticus. As any of these factors change, the decision to admit, and retain the patient on the ACCU should be regularly revisited.

b) The case has been discussed with WATCh and

- There are no beds available in the level 3 PCCU in Bristol or
- The nearest (out of region) level 3 PCCU bed is too far away to justify the transfer involved when taken in context of the child's condition and projected requirements/trajectory or

- Retrieval is going to be considerably delayed, and Adult Critical Care represents an appropriate and adequate environment for continued care of the patient.

If transfer alone is the constraining factor, we encourage WATCh to engage in appropriate discussions with Retrieve, and if necessary guide ACCUs to contact SWASFT in order to ensure the best overall package of care (transport and critical care) for the child.

- The decision to admit/transfer a child under 16 years to an ACCU must be made with the agreement of the ACCU consultant and matron/nurse in charge and the consultant paediatrician in the referring centre.
- There must be appropriate conversations with WATCh, and in turn the Adult and Paediatric Critical Care Networks, to ensure they are sighted on the evolving situation within the Network. These conversations will be supported by the 'surge report' produced by WATCh on a daily basis, which should be sent to the South West Critical Care ODN (for adults) in the event that children are being cared for on ACCUs.
- It is important that the decision to admit and retain a child on an ACCU is reviewed continuously by the ACCU team, in conjunction with WATCh and/or the PCCU. The appropriateness of continuing to care for a child in an ACCU may change dependent on clinical factors (the child's condition), staffing factors (the competence and ability of staff to care for the child) or logistical factors (new capacity in a PCCU or a lack of capacity in the ACCU in question).
- Every effort should be made NOT to move a critically ill or injured child between hospitals more than once while they remain critically ill.

3.2. Admission to ACCU

3.2.1. Medical oversight

- During any ACCU stay, there must be continuous liaison between the ACCU consultant or senior doctor, WATCh and/or the level 3 PCCU, the consultant paediatrician and the Children's Department.
- A child in an ACCU should be reviewed by a consultant paediatrician at least twice a day.
- The exact roles of paediatricians and paediatric anaesthetists in the care of a critically ill child on the ACCU will differ between units; units are encouraged to formalise these relationships ahead of any potential paediatric admissions.
- If a child is admitted to an ACCU, an anaesthetist, intensivist or other practitioner, with up-to-date competences in advanced paediatric resuscitation and life support and advanced airway management should be immediately available at all times.

3.2.2. Nursing oversight

- The need for a registered children's nurse to care for the child must be determined on an individual basis, according to the skills and abilities of the ACCU staff. For example, for an awake child admitted for observation, the continuous presence of a registered children's nurse, in addition to an Adult Critical Care nurse, may be beneficial for the care of the child. Conversely, for an intubated child where the skill set is more aligned to that of a critical care nurse, it may be more appropriate to have intermittent input from a registered children's nurse. Ultimately there needs to be appropriate and regular conversations at a nursing level, to ensure the appropriate level of nursing support.

- As a minimum the input from a registered children's nurse on the ACCU should be at least every 12 hours

3.2.3. Other professional oversight/input

- During the ACCU stay there will be a requirement for support from appropriately trained AHPs, e.g. paediatric physiotherapy and pharmacy teams. The process for contacting these teams will vary by organisation, and unless already established, discussions should be initiated ahead of any surge to determine how this is delivered.

3.2.4. Equipment and environment

- Individual ACCUs who may be asked to care for children must have paediatric equipment, drugs and consumables which are co-located and checked routinely, relevant checklists immediately available and formalised SOPs in place for the treatment of paediatric patients in an adult setting.
- Any ACCU that may have a child admitted to it, should have a suitably designated area for providing paediatric critical care interventions. If this is not possible, then there should be appropriate paediatric equipment which can be brought to the child's bedspace.
- The ACCU paediatric trolley must be kept in that bed space for the duration of the admission.
- If more than one child is admitted to an ACCU, co-locating them is advised to aid easy access to equipment, such as the paediatric trolley.

3.2.5 Parental involvement

- Parents must be given 24-hour access to visit their child whilst in an ACCU.

These recommendations align with the Guidelines for the Provision of Intensive Care Services (Care of the Critically Ill Child in an Adult Critical Care Unit- page 128), and also the Quality Standards for the Care of Critically Ill or Injured Children (Paediatric Anaesthesia and General (Adult) Intensive Care -page 108, Standards A502, 204 and 404). Lead consultants and matrons from ACCUs are encouraged to refresh their knowledge of the standards and recommendations relevant to them within these two documents at their earliest opportunity.

4.0 Governance, Assurance and Learning

Staff working on ACCU should be confident that their professional regulators, the CQC and the Paediatric Critical Care Society have made clear their support when caring for paediatric patients on an ACCU:

GMC guidance

NMC guidance

The guidance contained within this document should also support staff in ensuring that appropriate and balanced decisions are taken in the best interests of all critically ill patients, in the event that PCCUs are overwhelmed.

- ACCUs should inform their Chief Operating Officer in the event that a critically ill child/children are being cared for on the ACCU in a manner beyond initial resuscitation and stabilisation.

- Admissions should be audited and reviewed to support assurance and learning by the ACCU, and to aid future management of paediatric patients. This includes reporting all cases to the South West Audit of Critically Ill Children (SWACIC).
- Positive experiences, complaints, morbidity, mortality, clinical incidents and 'near misses' should be managed in the usual way for the ACCU, but with additional input from paediatrics +/- WATCh/PCCU to ensure an open culture of learning.
- We actively encourage any learning to be shared with the Adult and Paediatric Critical Care Networks, for the wider dissemination and benefit of other units across the SWCCN.

5.0 Training/Support

- The most valuable source of advice is likely to be gained by close interaction with the local paediatric team and WATCh as the usual source of paediatric critical care advice to referrers.
- There are number of useful guidelines produced by the WATCh team, designed to support the care of children on an ACCU, covering topics such as asthma, burns and the collapsed neonate, available here.
- WATCh have produced a one-page checklist for ACCUs looking after children. This is also on their guidelines page, but for convenience is also available in Appendix 1.
- There are in addition, rapid access resource links which cover topics such as RSV, bronchiolitis and high flow oxygen, for clinicians who require refresher information on these and other related topics.

6.0 Feedback

This guidance has been developed and published to provide broad principles through which adult and paediatric networks will work in order to best support both PCCU and ACCUs for dealing with surges in paediatric critical care demand. We welcome comments on the document so that it may be refined for future use.

7.0 Acknowledgements

This document is published with thanks to the ACC and Paediatric teams at Russell's Hall Hospital, Dudley Group of Hospitals FT (DGFT) and the Midlands Critical Care Network for sharing their guidance on which some of this document is based.

8.0 References

Guidelines for the Provision of Intensive Care Services

Quality Standards for the Care of Critically Ill or Injured Children

PCCS Guidance for when Resources are Constrained.

9.1 Appendix 1: Management of ventilated children on Adult Critical Care Units

Wales and West Acute Transport for Children

University Hospitals Bristol and Weston NHS Foundation Trust

MANAGEMENT OF VENTILATED CHILDREN ON GENERAL ICUs

Please refer all children requiring/receiving intensive care to WATCh on **0300 0300 789** and discuss twice a day

INTUBATION

Consider use of cuffed ETT if high ventilatory pressures anticipated / needed

If using cuffed ETTs ensure the cuff is inflated – do not leave cuffs deflated as this can cause pressure necrosis.

DO NOT cut tubes to calculated length, particularly for children with upper airway obstruction e.g. croup. Smaller tubes are shorter which makes securing more difficult

Remember to site a nasogastric tube at the time of intubation

Ensure CXR is performed post intubation – ETT position at lower border of T2 (or midway between clavicles and carina).

VENTILATION

Initial settings:

iTime	0.6 – 1.0 s (age dependent: e.g. neonates 0.6s; 1s by 1 year of age. Maintain I:E ratio < 1:1)
Rate	Age appropriate rate (e.g. neonate 30-35 bpm; 20-24 bpm by 1 year of age)
Pressures	PEEP 6cm H_2O / PIP 20-25cm H_2O (Monitor Vt – aim less than 10mL/kg)

Titrate FiO_2 as required to keep O_2 saturations between 92 and 95%

Target pH above 7.25 and accept high $EtCO_2$ if pH is in target range

Monitor with O_2 saturations, $EtCO_2$ and intermittent blood gases (capillary sampling may be useful)

Actively wean ventilation within target parameters as tolerated

Consider extubation to high flow support e.g. Airvo™ or Vapotherm™

CARDIOVASCULAR SUPPORT

Non-invasive blood pressure monitoring is adequate if the child is not shocked

If shocked: -

Give adequate fluid resuscitation (up to 40mL/kg of 0.9% Sodium Chloride / Plasma-Lyte 148 / Hartmann's) and reassess

Cautious fluid boluses in children with suspected impaired cardiac function / hepatomegaly

Transfuse if Hb < 70g/L (100g/L in children with cyanotic congenital heart disease)

- Volume required (packed cells) = 5 x weight x desired rise in Hb to a maximum volume of **20mL/kg**

Inotropes – please refer to WATCh Drug Sheet – usual dose range:

- Adrenaline 0.02 - 0.3 mcg/kg/min (different dilution strengths for peripheral and central administration)
- Noradrenaline 0.02 - 0.3 mcg/kg/min (only via central access)
- Dopamine 5 – 10mcg/kg/min (different dilution strengths for peripheral and central administration)

SEDATION / ANALGESIA / MUSCLE RELAXANTS

Neonates (<28 days): Morphine infusion 10-40 mcg/kg/h. If possible, give enteral feeds and then can supplement with enteral sedation: Chloral Hydrate 30-50mg/kg 6 hourly; or Promethazine 0.5-1 mg/kg 6 hourly (max 25mg).

Infants (>28 days) and older children: Morphine infusion 10 – 40mcg/kg/h with Midazolam infusion 50-100 mcg/kg/h (can be run at a higher rate short term e.g. 200mcg/kg/h).

Routine use of **muscle relaxants** is not indicated but continuous infusions may be beneficial in children with high ventilatory requirements or who are clinically unstable e.g. Rocuronium 600 – 1200mcg/kg/h.

FLUIDS / FEEDS / ELECTROLYTES

Restrict fluid intake to 80% calculated maintenance (based on WATCh drug sheet) in most cases.

Age appropriate enteral feeds at the earliest opportunity.

Insert a urinary catheter and aim for urine output of 1-2 mL/kg/h.

If IV route required, give maintenance as Plasma-Lyte + 5% Glucose or as per local policy; monitor electrolytes at least daily; titrate potassium in fluids according to serum potassium (up to 40mmol potassium /L peripherally).

Consider Furosemide 0.5 - 1mg/kg 8 hourly IV if fluid balance positive (please discuss with WATCh Consultant).

ANTIMICROBIALS

Admission screening should include blood cultures, CRP and FBC

If admission secondary to respiratory presentation send NPA (viral PCR) and ET aspirate

Antimicrobial choice is dependent on local policy and guided by previous positive cultures in at risk children

Review need for ongoing antimicrobials after 48 hours and discontinue if possible.

9.2 Appendix 2: Authorship and Consultation Schedule

Original Author	**Date produced**	
Andy Georgiou, Clinical Director, South West Critical Care Network	15/12/2022	
Individuals Consulted, Role	**Date Consulted**	**Responses Received and Incorporated**
David Cain, Deputy Director of the SWCCN	16/12/2022	21/12/2022
Denise Axelsen, QI lead, SWCCN	16/12/2022	19/12/2022
Graham Brant, Manager and Lead Nurse, SWCCN	16/12/2022	21/12/2022
Peter Wilson, Medical Director (Commissioning), NHS England South West	16/12/2022	21/12/2022
Peter Davis, Clinical Director, Paediatric Critical Care Network	16/12/2022	20/12/2022
Dora Wood, Clinical Lead, Wales and West Acute Transport for Children Service	16/12/2022	17/12/2022
Scott Grier, Clinical Lead, Retrieve	16/12/2022	19/12/2022