List of appendices

Appendix 1. Historical variation in models of high dependency care delivery within a region, using acute CPAP therapy in bronchiolitis as an example.

Critical care provision for children in the Yorkshire and Humber Region is as follows:

1. Leeds has a regional PICU within which some HDU activity is commissioned.
2. Sheffield has a regional PICU and there is also HDU provision in adjacent facilities which is commissioned by NHS England.
3. In Hull there has historically been a limited PICU provision. On the back of this PICU there is a paediatric HDU which is now funded by the CCG.
4. Hospital X is a large paediatric unit with a very busy workload, which does not offer any paediatric HDU provision. This has been attributed to being too busy to do so, but also because they fear that providing this level of care without explicit funding will preclude them from developing properly funded high dependency facilities.
5. Some of the surrounding DGHs have developed some high dependency capacity either within their ward areas or in designated units attached to their wards. None of this has explicit commissioner support or funding.
6. One, geographically isolated, DGH (Hospital Y) has entered into a local agreement with its local commissioners (CCG) to fund the provision of high dependency care.

The result of this model of provision is that the pathways and funding consequences vary considerably dependent on where the child requiring CPAP for bronchiolitis is admitted.

1. If the child presents in Leeds, then CPAP support will be initiated and continued on the PICU and this will be funded by NHS England.
2. If the same child presents to Sheffield, support will be initiated and continued within the paediatric HDU and this will be funded by NHS England.
3. In Hull the child will receive his episode of HDU care entirely within the hospital and it will be commissioned by the CCG.
4. A child presenting to Hospital X will not have an attempt made to initiate CPAP support. The infant would usually require intubation, ventilation and transfer to a PICU. The whole of this episode including the cost of the transfer will be commissioned by NHS England.
5. In a number of other DGHs the child will have CPAP support initiated and managed in the DGH. The unit will not receive any explicit funding for this care and will provide it potentially to the detriment of other children in the ward as staff will be occupied caring for the child on CPAP.
6. If the child presents to Hospital Y, with explicit funding from the local commissioners (CCG), the funding will enable the provision of adequate nursing and will therefore remove most of the risks described above.

Appendix 2. Network roles and responsibilities.

Foreword

Clinical networks are the key to delivering integrated pathways of care for our patients. Elsewhere they have transformed care, raised standards and encouraged best practice for example in cancer and stroke care. Neonatal Networks have been central to the commissioning of specialised neonatal services, supporting service configuration, benchmarking standards and the overall organization of regional care.

Informal Paediatric Intensive Care "networks" have existed for several years in some regions. They offer excellent clinical support and many have training programs but they do not consistently provide a strategic role and their governance structures vary widely.

It is hoped that the renewed focus on managed clinical networks, with Strategic Clinical Networks and Operational Delivery Networks, will support the development of more cohesive, structured and responsive critical care networks, with strong clinical governance, that focus on the entire critical care pathway.

Introduction

Paediatric intensive care has, since 1997 (DoH 1997; Bridge to the Future), been configured with a lead centre(s) serving a network of referring hospitals in a hub and spoke model supported by retrieval services. Regional hospitals having responsibility for the initial management and stabilisation of critically ill children. All units, which admit paediatric patients, need to have the ability to care for critically ill children. This should be in a clinical network "to promote a comprehensive, integrated and safe local service for children and young people when they are ill" (DoH 2006).

The PIC service provides a care pathway for the sick child from recognition and stabilisation, through retrieval, to delivery of care in a PICU. However, the majority of critically ill children do not need intensive care but need high dependency care (HDC). In the Wessex region only 10% of patients who received HDC subsequently required transfer for intensive care (Wessex audit 2010/11).

A paediatric critical care network needs to make provision for those children needing HDC as well as those needing paediatric intensive care.

Objectives of the Paediatric Critical Care Operational Delivery Network (PCC ODN)

The overall model of care will vary across regions according to local needs. However, the overriding principles and objectives will be the same for any organizational model.

The PCC ODN will support its member hospitals by providing the overall strategy, consistent guidance, operational principles and support service standards for paediatric critical care across its geographical area. Specifically this includes paediatric critical care (previously known as high dependency care) as well as paediatric intensive care.

It will assist commissioners in reviewing the local needs for paediatric critical care and in designating Level 1 and Level 2 critical care units.

The Network

A PCC ODN will cover a geographically defined area and consider the complete critical care pathway for children. Every hospital that admits children will belong to a PCC ODN. Within each PCC ODN there will be one or more PICUs, as well as a number of Level 1 and Level 2 Paediatric Critical Care Units (PCCUs).

The PCC ODN will work to ensure that every child who requires Level 1, 2 and 3 Critical Care is able to receive it in a timely manner, and to a high standard.

Each network will constitute an Operational Delivery Network (ODN), that is to say it will be a formal managed clinical network. Each PCC ODN will be hosted by one of the Trusts within the network. The overall governance responsibility will continue to lie with each of the individual Trusts within the network, and they should utilise the same escalation policies as for any other service they deliver. The ODN should itself establish robust governance arrangements and be made aware of any governance issues which affect the clinical care offered within the network.

The PCC ODN, working closely with commissioners, will designate Trusts to deliver Level 1 or Level 2 critical care in a Level 1 or Level 2 unit respectively, according to demands for PCC services. The PCC ODN will have a responsibility to ensure that PCCUs meet the relevant standards, as described in PICS Standards and the Service Specifications for Paediatric Critical Care. This will include consideration of how critically ill children are moved between Trusts within the network.

Network leadership

Each PCC ODN will work closely with the Strategic Clinical Network for Maternity and Children as well as with the ODNs for neonatal and adult critical care. For greatest efficiency it is envisaged that a number of networks may share administrative and office support.

Each PCC ODN should have a medical and nursing lead who work within one of the PCC ODN Trusts, preferably with a clinical commitment to PCC. Each ODN should also have a network manager. Each PCC ODN should have a clinical advisory group made up of doctors, nurses, AHPs, managers, parents and ambulance providers to advise the PCC ODN on clinical matters and review PCC ODN performance.

The network will provide strong leadership to support delivery of agreed pathways of care and clinical decision making for all clinicians within the network.

Network responsibilities

To demonstrate an attainment of minimum quality standards, good risk management and a sharing of good practice across the region.

To promote attainment of any relevant CQUIN (Commissioning for Quality and Innovation) targets across the network.

To work in partnership with NHS England and/or CCGs in designating the PCCUs within the PCC ODN.

Within each Paediatric Critical Care ODN the following functions must be fulfilled:

- Clinical governance of the Network
- Training of staff and maintenance of skills and competencies for all DGH staff in the stabilisation and short term management of the critically ill child and their high dependency care
- Identifying those training needs
- Performance monitoring of critical care services within their network and driving quality improvements
- Leading guideline and clinical pathway development within the network
- Leading audit and data collection within the network, and supporting national participation in such activities as required
- Demonstrating the attainment of minimum quality standards (eg PICS Standards)

Strategy and planning

- Offering a strategic vision to local commissioners, encouraging appropriate investment, overseeing and auditing local activity.
- A sharing of best practice across the network
- Coordination and cooperation with other relevant paediatric networks (eg cardiac, neurosurgical, neonatal) and Adult critical care network.
- Involvement of appropriate patient groups

Research

- Participation in research and dissemination of research findings.
- Work with regional and national research bodies

In turn each network will need

1) Clinical lead and administrative support/facilities.
2) Network manager support
3) Data collection support and facilities.
4) Support from LAT SCNs for Maternity and Child Health
5) Support from local commissioners/specialist commissioners and CCG's to ensure best local service.
6) Full agreement with each Trust at Board level and acknowledgement of its role and duties.

Proposed network standards

District General Hospitals Standards

Each Trust which admits Paediatric patients who require critical care will need to:

1) Be a member of a PCC ODN and have a clear understanding of whether it hosts a level 1, 2 or 3 paediatric critical care unit (or more than one of these).
2) Have representation within that network
3) Incorporate the governance aspects of the network into local trust governance framework
4) Record activity and report that to the network
5) Feedback to responsible body within the Trust (critical care group) with Board level input.
6) Be commissioned for PCC activity and need to attain acceptable standards.
7) Appoint a medical and nursing lead for PCC with responsibility to ensure relevant policies and guidelines are produced and up to date.

8) Medical and nursing lead for PCC should ensure facilities and equipment are appropriate for level of service offered.
9) Ensure medical staff (trainees and consultants) meet the required competency standards.
10) Ensure nursing staff have achieved appropriate competencies and training.
11) Ensure appropriate levels of nurse staffing to provide 1:2 care.
12) Ensure physiotherapy and pharmacy support is available.
13) Have an operational policy in place covering admission and discharge criteria for PCC, criteria for escalating critical care support, and for arranging a critical care transfer if required.
14) The policy should include reference to the role of anaesthetic and adult ICU teams in providing support and advice to PCC areas.

Suggested Paediatric Critical Care ODN standards

N1. Written details of geographical and patient population covered. This would normally be centred upon those units referring into one or more PICUs.

N2. Ensure representation from each Trust within the network by clinician lead for Paediatric Critical Care in that Trust.

N3. Ensure representation from each Trust within the network by senior registered children's nurse lead for Paediatric Critical Care in that Trust.

N4. Ensure representation of other relevant disciplines within each trust to include anaesthesia, adult ICU and ED membership.

N5. Governance structure to include monitoring of critical incidents, activity and audit across the network. Named governance lead for the network. Demonstrate ability to report on governance issues to individual Trusts.

N6. Lead on development for key clinical pathways.

N7. Membership and clinical support from host PICU(s).

N8. Named Clinical lead to be a clinician with experience and knowledge of paediatric critical care (from either regional or tertiary centre), with administrative support.

N9. Demonstrate co-operation and collaboration with related local networks, to include trauma, burns, adult and neonatal critical care, cardiac, neuroscience, as well as SCN for Maternity and Child Health.

N10. Demonstrate ability to support local strategic planning including pandemics.

N11. Provide specialist advisory role to commissioning teams regarding commissioning, deployment of resources and service development of safe, effective, patient-centred, equitable and sustainable Paediatric Critical Care. Material from audits and benchmarking can inform this.

N12. Produce or adopt written protocols and policies for the retrieval service including decision to retrieve, time critical transfers, transfers to a Level 2 PCCU, policies when lead centre is full and supra-regional transfers.

N13. Benchmark network PCCUs against national standards.

Appendix 3. Clinical Pathways.

Acute respiratory failure

Below we have presented the pathway for the infant or child with acute respiratory failure. An example would be acute bronchiolitis, a common problem every winter which places considerable pressure on in-patient beds and in particular PICU beds. Within the pathway are a number of 'trigger points' which would prompt consideration of escalating care up to a higher critical care level, which might also require transfer of the child to a different critical care unit (Level 1 to Level 2/3, or Level 2 to Level 3).

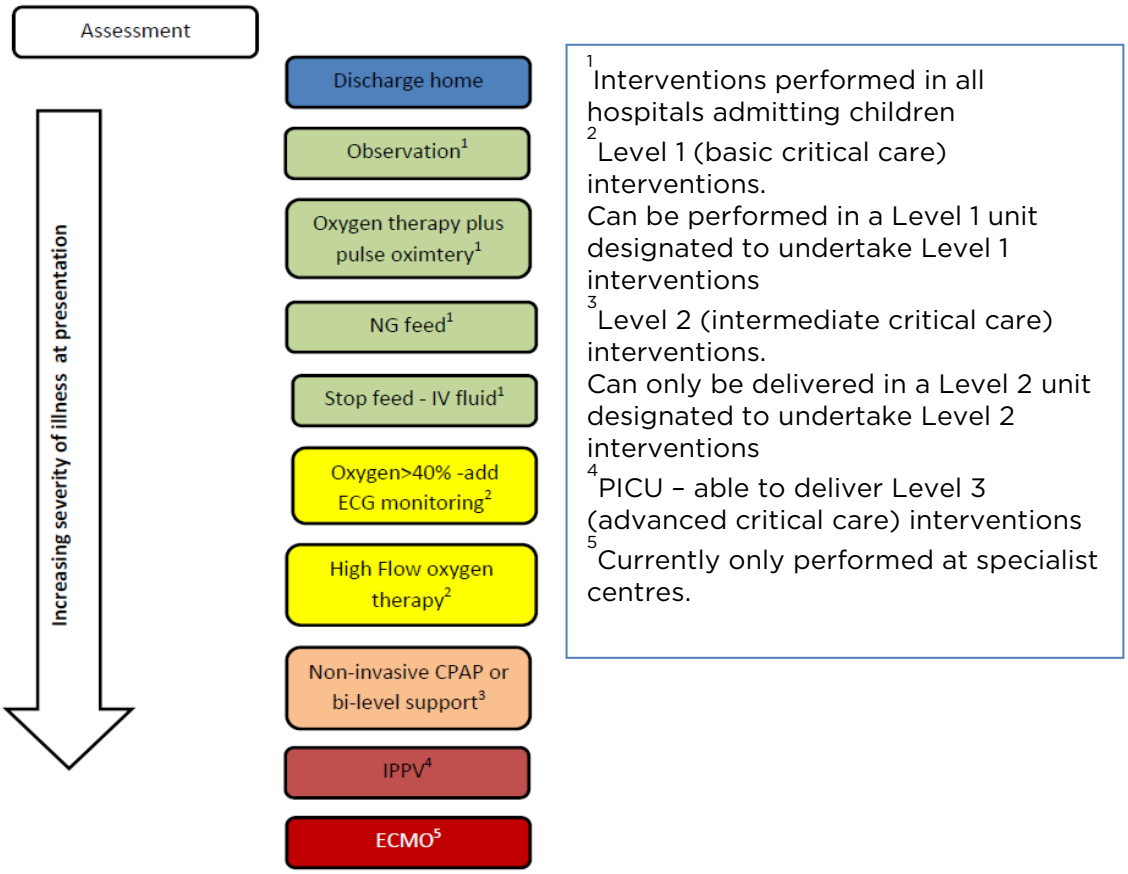
Some of the trigger points within the proposed pathways are difficult to define in a way that is applicable to all geographical regions and across a range of clinical scenarios. Each critical care network should be responsible for setting the trigger points to implement across their network, taking into account geographical and other considerations. At the very least the trigger should result in a discussion of the case with the network transport service and an agreed plan of how to proceed.

The trigger or escalation point from one level to the next may be set at different levels dependent on patient factors, such as age or diagnosis. For example a network may consider it clinically appropriate to support the delivery of low levels of nasal CPAP support ($\leq$ 6 cms H2O) for babies with acute bronchiolitis within a Level 1 PCCU rather than transfer these babies to Level 2 centres. They may choose to set their trigger for escalation as a requirement for a higher level of support or a persistent CPAP requirement beyond a defined time limit.

The network may not feel it appropriate for the same Level 1 unit to provide acute CPAP to an older child with asthma or pneumonia, and may recommend this be restricted to a network Level 2 unit.

The emphasis should be on local pathways being agreed through the Paediatric Critical Care ODN.

Bronchiolitis pathway



The current situation which these recommendations aim to tackle

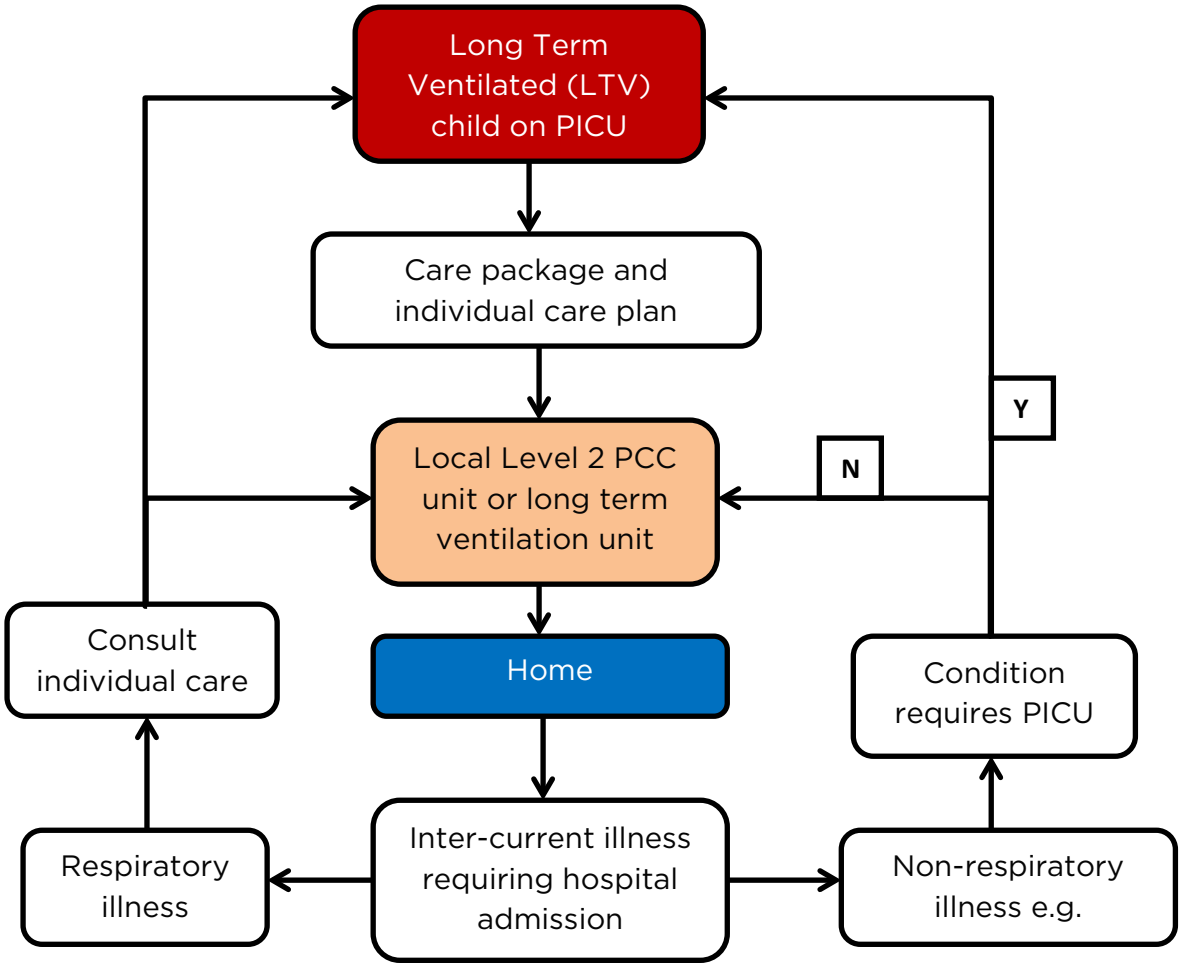
"A tale of two babies" born at 30 weeks gestation. At 8 weeks of age and weighing 2.8 kg Baby A and Baby B develop acute bronchiolitis and are taken to their local hospital with shortness of breath and difficulty feeding. Both are given oxygen, antibiotics and have a nasogastric feeding tube passed to help them feed. They continue to deteriorate and are unable to maintain saturations despite 60% inspired oxygen.

Baby A lives in an area where the local hospital is able to offer enhanced respiratory care, so he is started on non-invasive CPAP and his condition stabilises. The level of CPAP required is altered in the light of the clinical assessment, oxygen requirement and blood gas results. He requires up to 8 cms H2O CPAP. After three days his CPAP is stopped and his respiratory failure resolves. He is able to go home after 3 more days in hospital – a total hospital stay of 6 days.

Baby B's local hospital does not offer enhanced respiratory support, so when he deteriorates the doctors speak to the local PICU. He needs intubation for transfer, but the local PICU doesn't have any beds and the nearest PICU bed is 70 miles away. He is intubated and ventilated and transferred by the retrieval team. He is ventilated for 4 days, and needs a course of antibiotics because he develops a ventilator associated bacterial pneumonia. After 4 days ventilation he stays another 2 days in the High Dependency Unit at the Tertiary Centre before transfer is arranged back to his original hospital. He still needs some oxygen and is not able to be discharged home for another 3 days – a total hospital stay of 9 days.

Long-term ventilation

Pathway for long-term ventilated child



Clinical vignette

J is a two year old girl ventilated following a high cervical spine injury. Her acute care is provided on the PICU closest to her local hospital. It is clear that she has suffered a severe injury and so a tracheostomy is performed after two weeks and she is referred to the long term ventilation team. The LTV team meet family, arrange for a domicillary ventilator, inform her local commissioners and DGH and start the process of discharge planning. Once she is stable on the ventilator she is transferred to the long term ventilation ward, where parents are trained in aspects of her care. At the same time staff from the PCCU in her local hospital receive training updates and come to meet J and her family. An individual care plan is made which includes clear instructions on who to ring for advice if J's condition were to change. J is discharged to her local hospital PCCU a month later. It takes a further 4 months to make the required modifications to her house and to recruit and train the staff that will help to look after her at home.

Two years later J falls out of her wheelchair and breaks her arm. She is taken to her local hospital where she admitted to have the arm plated. Her postoperative care is delivered on the local PCCU.

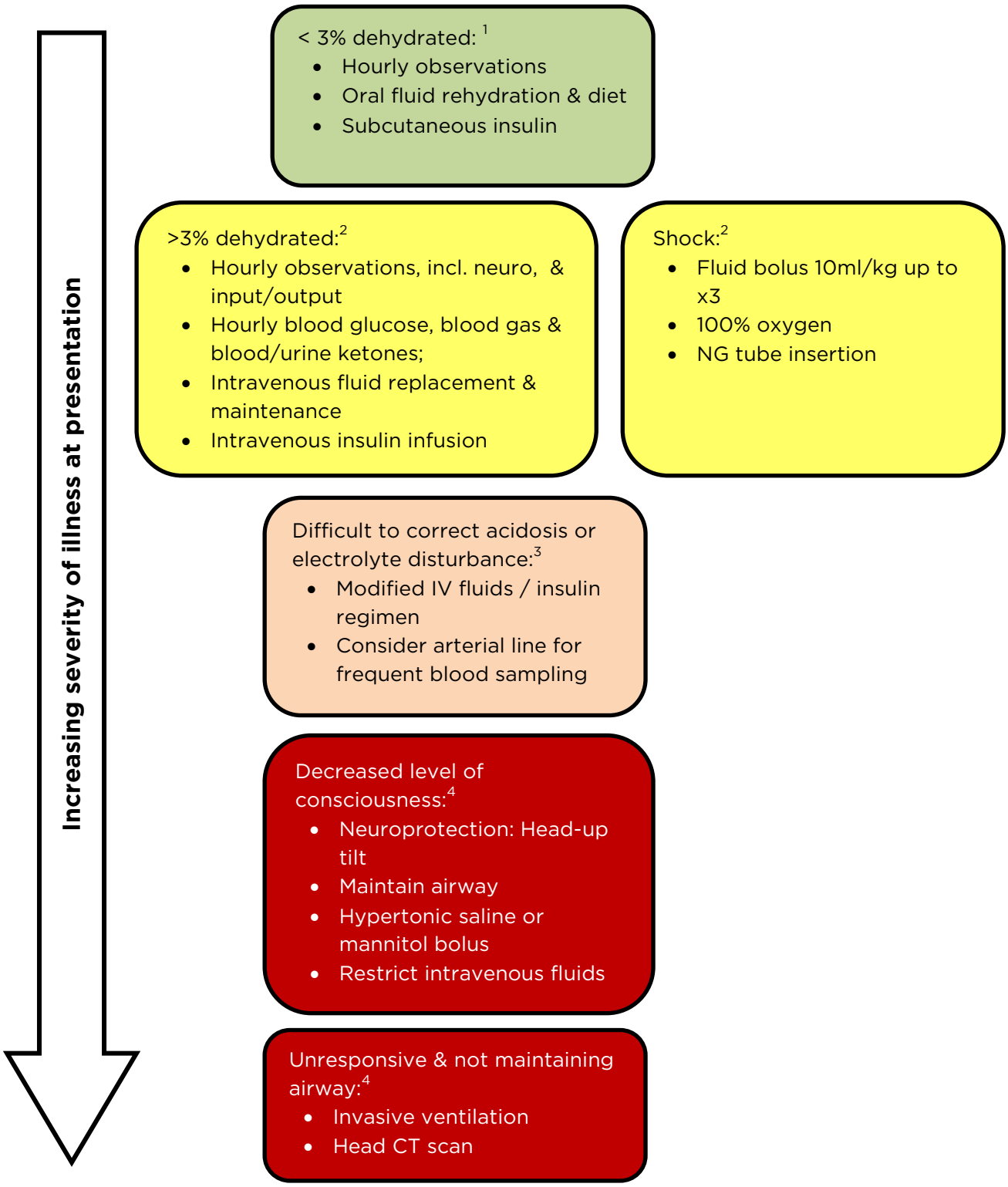
Acute Paediatric Trauma Care

In April 2012 each NHS Region in England was made responsible for the instigation of comprehensive Trauma Networks. This initiative included the establishment of agreed protocols for the assessment, resuscitation and transfer of children to the most appropriate clinical setting for their care. In the case of the child with major trauma this care should be delivered in a Major Trauma Centre (MTC). This will either be a combined adult and paediatric MTC or a stand-alone paediatric MTC.

A service specification for major trauma has been developed and applies to children as well as adults. Trauma Operational Delivery Networks have been established.

It is anticipated that each Paediatric Critical Care Network will be responsible for integrating the recommendations from this report and the relevant trauma care pathways in a way most appropriate to local and regional arrangements and organisation.

Diabetic Ketoacidosis pathway



[1] Interventions performed in all hospitals admitting children. They are additive in sequence.

[2] Performed in a Level 1 unit designated to undertake Level 1 (basic) critical care.

[3] Performed in a Level 2 unit designated to undertake Level 2 (intermediate) critical care.

[4] PICU (Level 3 unit) only - after stabilisation at DGH.

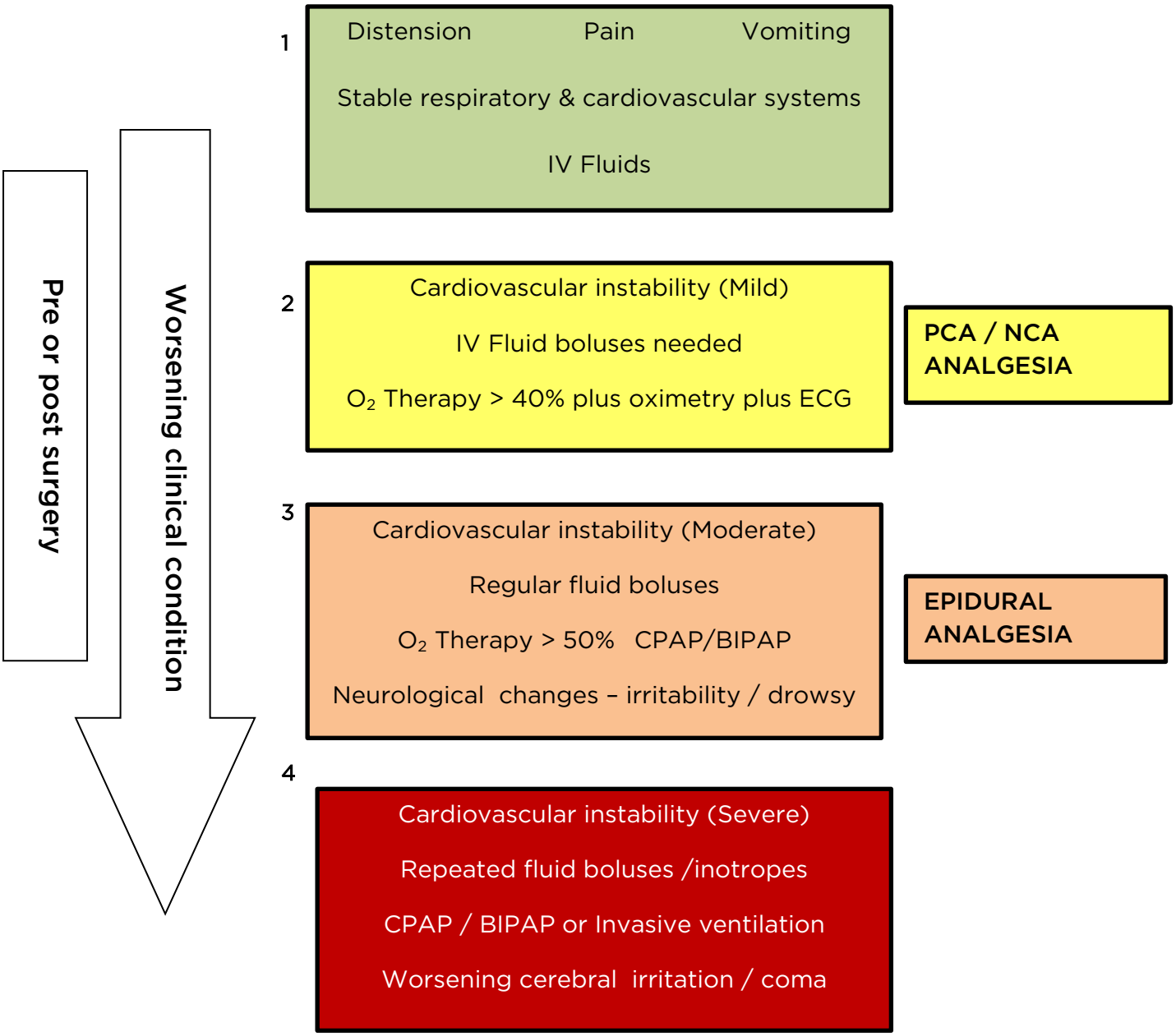
Clinical vignette

A two-year-old girl is admitted to the local hospital with a history of polydipsia and polyuria for the previous 10 days and increasing lethargy. She is estimated to be 8% dehydrated, and is noted to be peripherally shut down with a fast thready pulse. She is immediately given 10ml/kg of 0.9% saline, followed by a second bolus of 10ml/kg. Her blood sugar is 34 mmol/l and a blood gas confirms a severe metabolic acidosis of pH 7.05. She is transferred to the local Level 1 PCCU for close observation and is started on intravenous fluid rehydration, followed an hour later by an intravenous continuous infusion of insulin.

However after a couple of hours she becomes increasingly less responsive, so she is placed at 30 degrees head up, started on 100% oxygen and given a bolus of hypertonic saline. After discussion with the transport service, her fluids are reduced and she is subsequently retrieved to the regional PICU for continuing treatment.

After three days on PICU on intravenous fluids, her dehydration has been corrected, her blood sugar has normalised and her blood ketone levels have fallen to below 1mmol/l. Her first dose of subcutaneous insulin is given and the insulin infusion is stopped an hour later. She is initially transferred back to the Level 1 PCCU in her local hospital and subsequently to the paediatric ward to establish her on-going diabetic management.

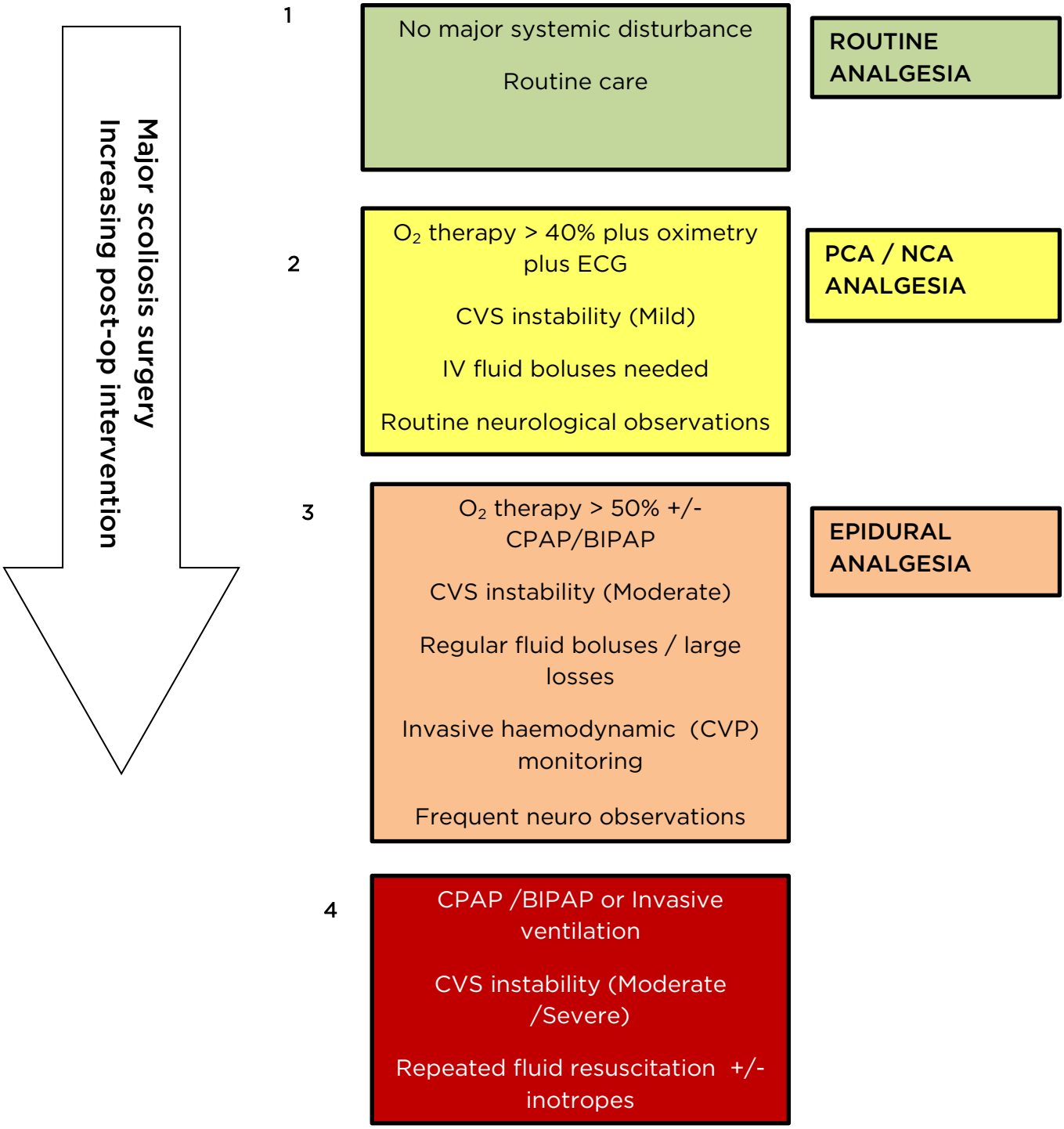
Acute abdomen – surgical care pathway



Key

1. Interventions performed in all hospitals admitting children.
2. Level 1 critical care interventions - can be performed in a level 1 unit designated to undertake Level 1 (basic) critical care interventions.
3. Level 2 critical care interventions - can only be delivered in a level 2 unit designated to undertake Level 2 (intermediate) critical care interventions.
4. PICU (Level 3) – able to deliver advanced critical care interventions.

Complex Spinal Surgery – Post-operative care pathway

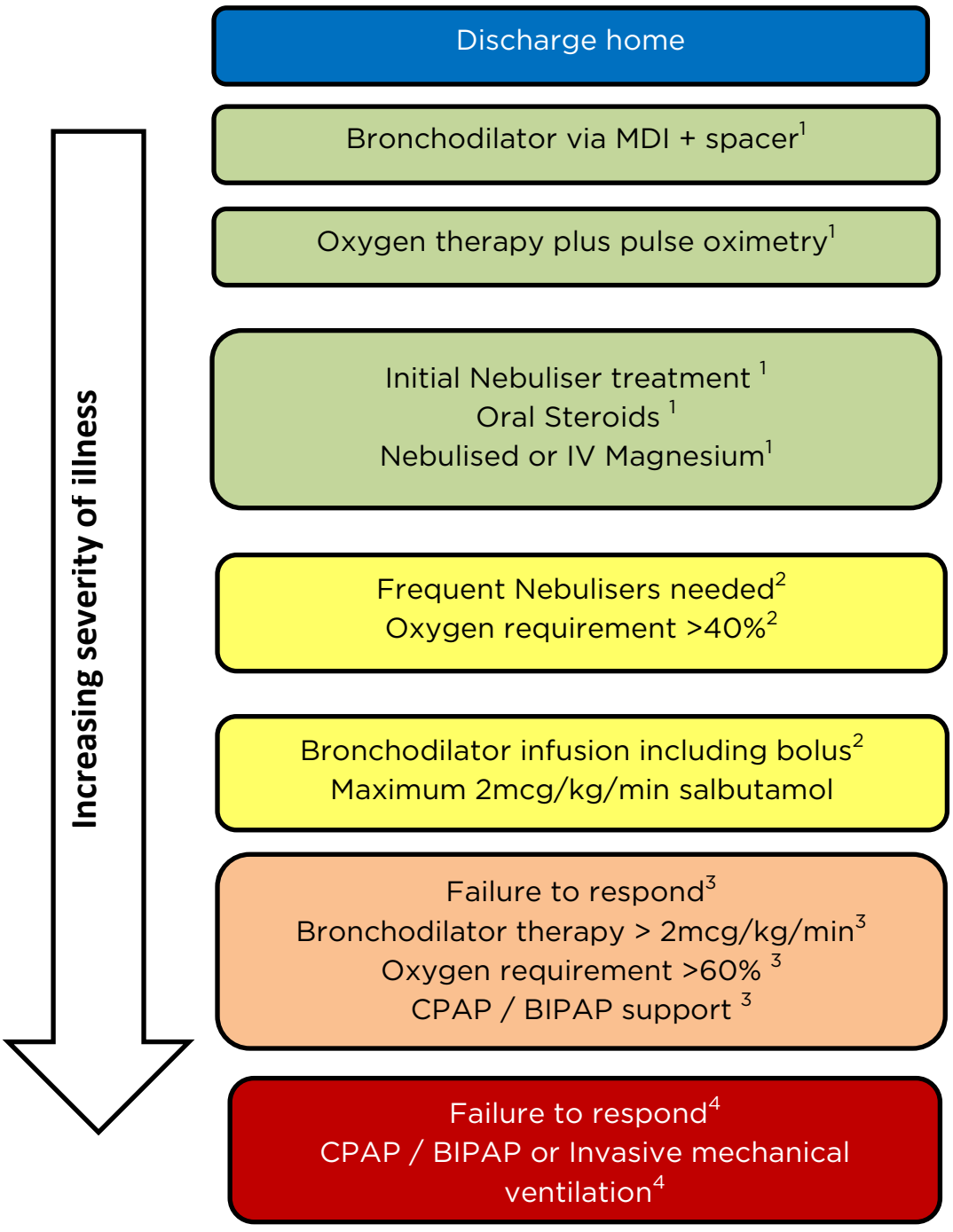


Key

1. Routine post-operative care
2. Level 1 (basic) critical care interventions. Appropriate to Level 1 unit.
3. Level 2 (intermediate) critical care, delivered in a Level 2 unit.
4. PICU (Level 3 unit) – advanced critical care

NB It is likely that the level of post-operative care necessary will be determined pre-operatively

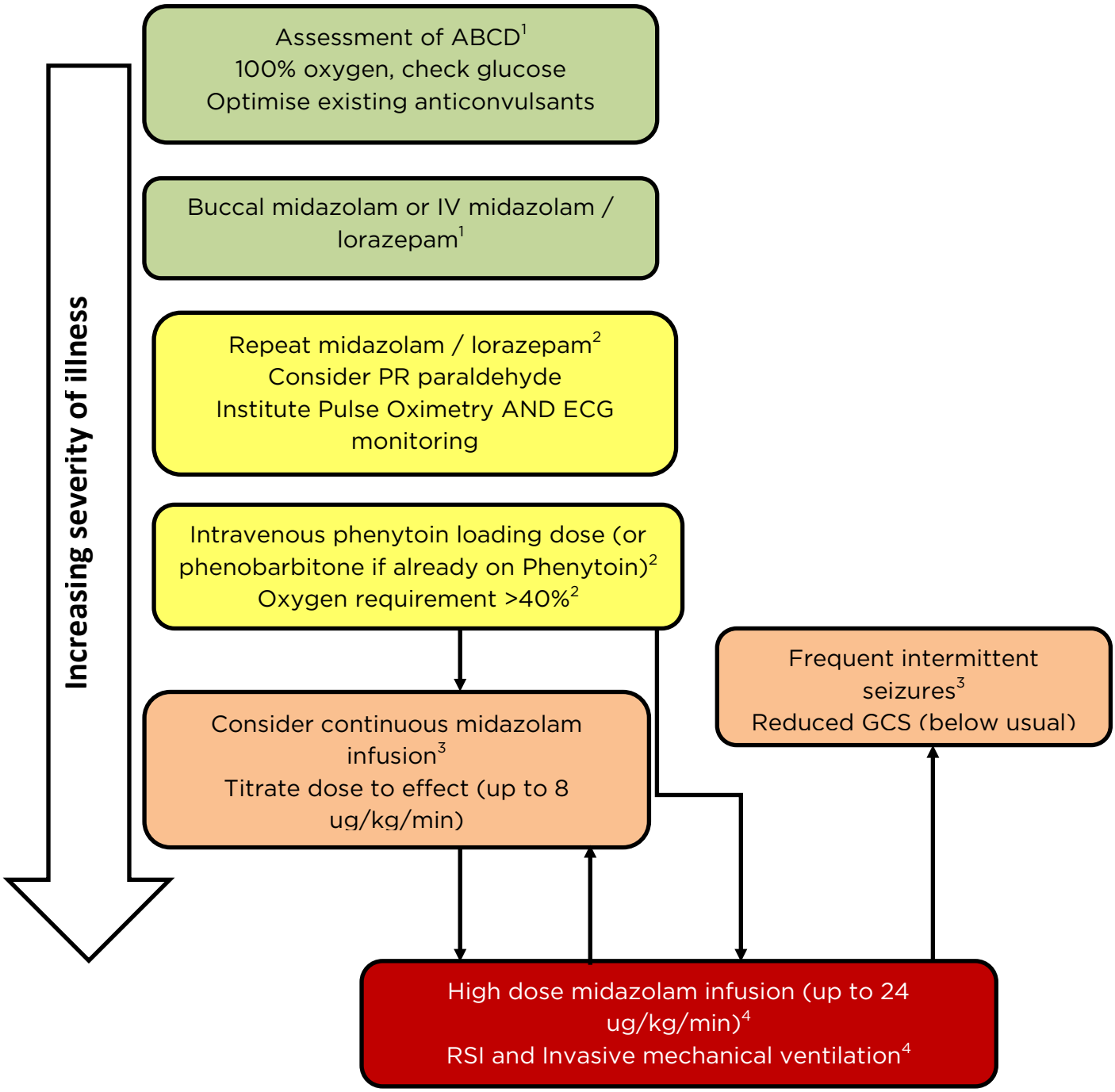
Acute asthma



[1] Interventions performed in all hospitals admitting children in ED or on paediatric ward.
[2] Level 1 (basic) critical care interventions delivered in a Level 1 unit.
[3] Level 2 (intermediate) critical care interventions delivered in a Level 2 unit.
[4] PICU – able to deliver Level 3 (advanced) critical care interventions

Seizure pathway

(APLS algorithm and pathway apply for child presenting to ED with status epilepticus)



[1] Interventions performed in all hospitals admitting children in ED or on paediatric ward.
[2] Level 1 (basic) critical care interventions delivered in a Level 1 unit.
[3] Level 2 (intermediate) critical care interventions delivered in a Level 2 unit.
[4] PICU – able to deliver Level 3 (advanced) critical care interventions

Clinical vignettes

Patient A is a two-year-old girl who has no medical history of note, when she develops a febrile seizure associated with an otitis media. An ambulance is called and she is given rectal diazepam by the paramedics and taken to the accident and emergency department of a nearby DGH. In the Emergency Department IV access is secured and more benzodiazepines are given before a phenytoin infusion finally terminates the seizure. The child is admitted to the Level 1 paediatric critical care unit for observation and, after a post-ictal phase, regains a normal level of consciousness within a few hours. She is discharged back to the paediatric ward area. A full septic screen is done and she is started on empirical intravenous antibiotics. She is discharged home when, after 48 hours, all cultures come back as negative.

Patient B is a seven-year-old girl with a known seizure disorder with two recent admissions for status epilepticus, who develops status epilepticus associated with an episode of gastroenteritis. She is taken by ambulance to the nearest Emergency Department. She is given benzodiazepines and a phenytoin infusion before she is intubated after rapid sequence induction to terminate the status epilepticus. She soon develops abnormal twitching of her face and hands again and a midazolam infusion is started after a further midazolam bolus. Retrieval to a PICU is requested. In the PICU the midazolam infusion requires further increasing because of recurrence of abnormal movements. The midazolam dose is slowly tapered down, and after 36 hours the patient is successfully extubated. After six hours the patient is transferred to a Level 2 paediatric critical care unit in the same hospital, where the continuous antiepileptic medication is weaned off over the next 48 hours, while her regular anti-epileptic medication is adjusted. She is then transferred to the general paediatric ward of her local hospital, and is discharged home after a total hospital stay of six days.

Appendix 4. Critical care skills for children's nurses working in Level 1 and Level 2 paediatric critical care units.

Children's Critical Care Passport

Critical Care Skills for Children's Nurses working in Level 1 and Level 2 Paediatric Critical Care Units

NAME: ..... NMC NUMBER: .....

PROFESSIONAL QUALIFICATIONS:

.....

WORKPLACE: .....

KEY MENTOR / SUPERVISOR:..... NMC Number: .....

Royal College of Nursing

PAEDIATRIC INTENSIVE CARE SOCIETY

RCPCH
Royal College of
Paediatrics and Child Health
Leading the way in Children's Health

Introduction

The Children's Critical Care Passport is a list of clinical skills considered essential for nurses working in Level 1 and Level 2 critical care units where critically ill or injured children are cared for, who meet the criteria of the Paediatric Critical Care Healthcare Resource Groups (HRGs)(Information Standards Board 2007) see Appendix 1 for a list of all 7 HRG categories.

Skill acquisition should be supported by the appropriate education, training and self-directed learning, so that individuals have the essential physiological knowledge to underpin the necessary skills. .

Within this document, generic skills are initially listed which are followed by specialty specific skills which are *additional* skills required by those working within cardiac, neurology / neurosurgery and renal critical care areas. These speciality specific skills and associated care are specific to these clinical areas and are in addition to those expected of a general Level 1 or Level 2 Critical Care area.

All Level 1 skills are required to work within a Level 2 area.

This skills passport has been written under the umbrella of the Paediatric Intensive Care Society (PICS), the Royal College of Nursing and the Royal College of Paediatrics and Child Health (RCPCH) and has been developed by an experienced working party. The document is the intellectual property of this group and any use of, or alteration must acknowledge the group. The document is generic and can be used freely by anyone caring for critically ill or injured infants and children as a stand alone document. This document can be expanded and adapted at local level to meet local need.

The PICS / RCN / RCPCH working party included:

Caroline Haines, Bristol Royal Hospital for Children, University Hospitals Bristol NHS FT
Kay Rushforth, Leeds Teaching Hospitals NHS Trust
Kevin Morris, Birmingham Children's Hospital NHS FT and PICS Past President
Yvonne Heward, Birmingham Children's Hospital NHS FT
Lyvonne Tume, Alder Hey Children's Hospital NHS FT and University of Lancashire
Nicola Holdback, Birmingham Children's Hospital NHS FT
Sue Fidment, Sheffield Hallam University
Paula Lane, Heart of England NHS FT

Limitations of this document

Skills included within this document are considered to be the minimum required to safely care for a critically ill or injured child at the level stated.
No competency framework, or specific level of competence is identified for any skill, however it is expected that the Paediatric Critical Care Operational Delivery Network will develop and implement this. Three-yearly competency reassessment is advised.

Throughout this document the words 'children', 'child' and 'paediatric' refer to a neonate, infant, child or young person in hospital.

Levels of Children's Critical Care and Critical Care Unit

Level 1 critical care is delivered in a Level 1 Paediatric Critical Care Unit.
Level 2 critical care is delivered in a Level 2 Paediatric Critical Care Unit.
Level 3 critical care is delivered in a Level 3 Paediatric Critical Care Unit (a PICU).

The Levels of care relate to the seven paediatric critical care HRGs as shown in the Table.

Level of Care	HRG Definition
Level 1	Basic Critical Care
Level 2	Intermediate Critical Care
Level 3	Advanced Critical Care (level 1)
	Advanced Critical Care (level 2)
	Advanced Critical Care (level 3)
	Advanced Critical Care (level 4)
	Advanced Critical Care (level 5)

All nurses registered on part one (sub part children) of the Nursing and Midwifery Council will hold basic skills in caring for ill children as defined in the Standards for Pre registration Nursing Education for Nurses (2010).

This document is a record of skills which are additional to the basic nursing skill set of children, which are necessary to care for a critically ill or injured child meeting basic and intermediate critical care. (Information Standards Board 2007)

Level 1 Paediatric Critical Care Unit interventions

- Oxygen therapy + pulse oximetry + Electrocardiogram (ECG) monitoring (includes 'high flow' nasal oxygen therapy).
- Arrhythmia requiring IV anti-arrhythmic
- Diabetic Ketoacidosis requiring continuous infusion of insulin
- Severe Asthma requiring IV bronchodilator therapy
- Reduced conscious level (Glasgow Coma Score (GCS) 12 or below) AND hourly (or more frequent) GCS monitoring
- Upper airway obstruction requiring nebulised adrenaline
- Apnoea

Level 2 Paediatric Critical Care Unit interventions

- Any Level 1 intervention where there is a failure to respond to treatment as expected or the requirement for intervention is expected to persist for > 24 hours
- Status epilepticus requiring treatment with continuous intravenous (IV) infusion (e.g. midazolam)
- Nasopharyngeal airway
- Long term ventilation via a tracheostomy or mask
- Arterial line
- Central venous pressure monitoring
- Epidural
- Care of tracheostomy (first 7 days of admission)
- Acute non-invasive ventilation, including Continuous Positive Airway Pressure (CPAP)
- >80 mls/kg fluid bolus in 24 hours
- Inotropic / vasopressor treatment
- Acute cardiac pacing
- IV thrombolysis
- Acute renal replacement therapy (Continuous Veno-Venous hemofiltration (CVVH) or Hemofiltration (HF)HD or Peritoneal Dialysis (PD)
- Intracranial pressure (ICP) monitoring or Extra Ventricular Drain (EVD)
- Exchange blood transfusion
- Plasma exchange
- MARS (Molecular Adsorbent Recirculating System) therapy
- CPR in past 24 hours

Qualification in Specialty (QiS)

Successful completion of this document or equivalent, together with any additional education and competency completion as stated above and below will constitute the equivalent of a qualification in the specialty (QiS) of Children's Level 1 and Level 2 Critical Care (formerly known as high dependency care).

Qualified in Specialty is defined by the Royal College of Nursing as the validation of individual courses and programmes of study leading to the recognition of qualified in specialty (Royal College of Nursing 2012).

Recommended standard for staffing levels

Level 1 Paediatric Critical Care Unit – delivering Level 1 critical care.

- Nurses new to critical care should work a minimum of 75 hours of supervised practice in a Level 1/2 critical care area, to gain the essential skills required.
- All skills should be gained within 12 months of working in this area.
- There should be a minimum of one nurse on every shift, who is directly involved with caring for the critically ill child, who should have successfully completed all the required Paediatric Critical Care (PCC) skills to Level 1 or have completed an in house education and training programme covering similar learning outcomes
- There should be a minimum of one nurse on every shift who is directly involved with caring for the critically ill child, who must have completed a recognised paediatric resuscitation course for example PILS / PLS / EPLS / APLS (Resuscitation Council UK, 2010 / ALSG, 2011) or have completed an in-house education and training programme covering similar learning outcomes.

Level 2 Paediatric Critical Care Unit – delivering Level 2 (and Level 1) critical care.

- Nurses, new to critical care should work a minimum of 75 hours of supervised practice in a Level 1 or Level 2 critical care area, to gain the essential skills required.
- All skills should be gained within 12 months of working in this area. Supporting experience may be gained in areas such as anaesthetics, recovery room, adult or neonatal critical care.
- A minimum of one nurse on every shift, who is directly involved with caring for the critically ill child, should have successfully completed a validated / accredited education and training programme of study addressing all the required Paediatric Critical Care (PCC) skills to Level 2. Recommendations for the learning outcomes, content and assessment are in Appendix 5. A course of study should be quality controlled and ideally Quality Assurance Accredited (QAA) for Higher Education.
- There should be a minimum of one nurse on every shift who is directly involved with caring for the critically ill child, who must have completed a recognised advanced paediatric life support course for example Advanced Paediatric Life Support (APLS) (ALSG 2011), European Paediatric Life Support (EPLS) (Resuscitation Council UK 2010).

70 % of nursing staff should hold a qualification in specialty (Defining Staffing Levels for Children and Young People's Services RCN, 2012). This is defined by completion of the skills attained in this package and evidence of acquisition of the necessary underpinning knowledge.

It is recommended that each regional Paediatric Critical Care Operational delivery Network (ODN) ensures that all PCCUs within the network have access to a Paediatric Critical Care Educator; this may be through the Regional Retrieval Service or Lead Centre.

Definitions:

- Mentor / Supervisor – An individual who is QiS for the specific unit and who has two or more years of experience in this clinical area
- '√' indicates the expected level of achievement
- n/a indicates not applicable for the Level of Unit

Children's Critical Care Skills Passport for Nurses

Essential Skills	LEVEL 1 UNIT			LEVEL 2 UNIT		
Essential Patient Care	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Bedside safety checks and preparation of the bed space	√			√		
• Correct completion of appropriate nursing documentation for child	√			√		
• Appropriate & correctly sized & functional equipment	√			√		
• All checks appropriate to the level of critical care for e.g. Appendix 14 for drugs & equipment checklist	√			√		
Resuscitation training						
• Current Basic Life Support Training	√			√		
• Successful completion of resuscitation course e.g. PILS / PLS, or equivalent	√			√		
• Successful completion of recognised advanced resuscitation course e.g. EPLS/ APLS	n/a			√		

Airway and Breathing	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Completed local Paediatric Early Warning System/tool (PEWS/T)and escalation policy training	√			√		
• Use & interpret of paediatric early warning score / tool (PEWS/T)	√			√		
• Respond to sick child through the use of a local communication tool for escalation, e.g. SBAR	√			√		
• Accurately assess and recognise changes in child' s clinical condition	√			√		
Assessment & Management of Airway & Breathing:						
• Noise / Grunting	√			√		
• Vocalising	√			√		
• Breathing rate	√			√		
• Effort of breathing	√			√		
• Efficacy of breathing	√			√		
• Chest movement	√			√		
• Auscultation	√			√		
• SpO_2 interpretation	√			√		

Airway and Breathing	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Skin colour	√			√		
• Conscious level – AVPU	√			√		
• Assess and position open airway	√			√		
• Size and insert oropharyngeal (OP) airway	n/a			√		
• Assess oropharyngeal secretions	√			√		
• Suction clearance of OP secretions	√			√		
• Perform effective auscultation of the chest	√			√		
• Identify wheeze and noise and basic air entry	√			√		
• Appropriately size face mask for ventilation	√			√		
• Perform effective use of face mask and self-inflating bag	√			√		
Upper Airway Obstruction						
• Recognize partially obstructed and obstructed airway and take appropriate action.	√			√		
• Discuss severity assessments and problems associated with noise and stridor	√			√		
• Effectively position the child receiving adrenaline nebulizer	√			√		

Airway and Breathing	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Discuss need for minimal handling and distress avoidance	√			√		
• Identify changes in condition associated with nebulised adrenaline	√			√		
Care of child with nasopharyngeal (NP) airway						
• Prepare equipment	n/a			√		
• Indicate the child likely to benefit from a NP Airway	n/a			√		
• Effectively size and insert of NP airway	n/a			√		
• Perform suction	n/a			√		
• Provide skin and nostril care	n/a			√		
• Effectively position the child	n/a			√		
Suctioning						
• Effectively perform oral suction	√			√		
• Use of appropriately sized yankauer suction catheter	√			√		
• Effectively perform nasopharyngeal (NP) suction	√			√		
• Use of appropriately sized yankauer / suction catheter	√			√		

Airway and Breathing	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Perform nasopharyngeal aspiration (NPA) for airway clearance and for sampling	√			√		
• Document type of secretions, frequency of suction	√			√		
• Effectively perform oral suction	√			√		
• Perform Tracheostomy suction (*acute care, first 7 days of care*) (See section on Tracheostomies	n/a			√		
• Correct sizing of catheter	n/a			√		
• Correct depth of suction	n/a			√		
• Application of correct pressure	n/a			√		
• Document type of secretions and frequency of suction	n/a			√		
• Perform Tracheostomy suction (*established ≥ 8 days or long-term tracheostomy*) (See section on Tracheostomies	√			√		
• Correct sizing of catheter	√			√		
• Correct depth of suction	√			√		
• Application of correct pressure	√			√		
• Document type of secretions and frequency of suction	√			√		

Airway and Breathing	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
Care of the child requiring oxygen therapy						
• Correct choice of delivery devise & demonstrate correct use and set up	√			√		
• Correct use of face mask with reservoir for emergency or short term use	√			√		
• Correct use humidified facemask / tracheostomy mask	√			√		
• Correct use of nasal specs / prongs / cannula and correct choice of flow	√			√		
• Set up and use Head Box	√			√		
• Set up and use of High flow/high humidity oxygen therapy e.g.: Optiflow/vapotherm	√			√		
• Demonstrate set up and management of all the above and humidification for oxygen therapy	√			√		
Care of the child with Apnoea						
• Discuss underlying causes for apnoea's & investigations required	√			√		
• Explain immediate care	√			√		

Airway and Breathing	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Discuss treatment for recurrent apnoea's	√			√		
Intubation						
• Demonstrate awareness of drugs used, location of intubation drugs	n/a			√		
• Knowledge of and location of equipment and escalation to relevant personnel	n/a			√		
• Determine successful tube placement	n/a			√		
Tracheostomy Care						
• Recognize tracheostomy occlusion, displacement	√			√		
• Explain need for spare tubes and equipment	√			√		
• Change tracheostomy tube (***Not*** including first tube change which will be by ENT specialists or other)	√			√		
Care of child with non-invasive ventilation e.g. CPAP, BiPAP and of child being ventilated via a tracheostomy						
• Set up, mode and settings specific to the child	n/a			√		

Airway and Breathing	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Demonstrate correct documentation of settings and delivery	n/a			√		
• Set alarm limits specific to the child	n/a			√		
• Demonstrate correct response to alarms	n/a			√		
• Set up and correctly use humidification	n/a			√		
• Demonstrate timely emptying of water from tubing and traps	n/a			√		
• Ensue delivery devise is securely positioned	n/a			√		
• Assess and care for skin under delivery device	n/a			√		
• Use various interfaces	n/a			√		
• Assess child's response to ventilation with multi-disciplinary team (MDT) and take appropriate action – weaning or escalation	n/a			√		
Acute Asthma						
• Monitor observations and discuss side effects of continuous infusions of aminophylline and salbutamol	√			√		

Airway and Breathing	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Demonstrate knowledge of severity assessments, guidelines and pathways	√			√		
Pulse Oximetry						
• Demonstrates correct probe selection and placement	√			√		
• Demonstrates correct setting of alarm limit	√			√		
• Demonstrates awareness of probe placement in SpO2 monitoring	√			√		
• Demonstrates awareness of limitations of SpO2 monitoring	√			√		
• Outlines reasons for site rotation	√			√		
Blood Gases (capillary)						
• Perform a capillary stab and sample capillary blood	√			√		
• Identify normal values	√			√		
• Interpret values and refer for escalation	√			√		
Chest Drain Care *						
• Set up and care for an underwater seal drainage system	√			√		

Airway and Breathing	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Demonstrate and describe documentation of observations for a child with a chest drain and checks to the drain itself	√			√		
• Observe and manage chest drain insertion site	√			√		
• Change the underwater seal bottle	√			√		
• Know when to use clamps	√			√		
• Provide safe transfer of a child with a chest drain e.g. to X-ray	√			√		
• Set up and care of suction on chest drain	√			√		
• Removal of chest drain	√			√		

* To educate and maintain nurses competence in chest drain care, training may need to be undertaken in General (Adult) Critical Care Units in DGHs and through Simulation. Additionally, Network Lead Centres will need to support this education and training.

Cardiovascular	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Accurately measure heart rate, pulses (peripheral and central)	√			√		
• Capillary refill time (CRT), colour, blood pressure and temperature	√			√		
• Demonstrate correct placement of ECG / respiratory leads	√			√		
• Recognise sinus rhythm	√			√		
• Recognise an abnormal ECG rhythm and actions to take	√			√		
• Recognise life threatening rhythms (VF,VT,PEA, asystole) and take appropriate urgent response	√			√		
• Calculate dose, draw up, and administer IV anti-arrhythmic, IV inotropic and vasopressor support	√			√		
Defibrillator						
• Locate, switch on and check	√			√		
• Correctly place defibrillator pads and connect leads	√			√		
• Demonstrate how to use defibrillator to monitor patient	√			√		
• Demonstrate awareness of joules required to treat a shockable rhythm	√			√		

Cardiovascular	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Undertake 12 lead ECG	√			√		
Temperature Monitoring						
• Demonstrate use of continuous core temperature monitoring in children	√			√		
• Demonstrate use of appropriate warming device	√			√		
• Demonstrate use of cooling techniques	√			√		
Blood Sampling						
• Take blood samples from a central / arterial line including short and long term lines / Hickman lines.	n/a			√		
Care of child with invasive pressure monitoring e.g. Central Venous Pressure (CVP) / Arterial						
• Care and removal of arterial lines	n/a			√		
• Care and removal of central venous catheters	n/a			√		
• Transducing and monitoring of arterial line	n/a			√		
• Transducing and monitoring of central venous line	n/a			√		
Care of the child requiring fluids and renal monitoring						

Cardiovascular	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Calculate child's' fluid requirements correctly	√			√		
• Keep accurate and timely fluid balance documentation	√			√		
• Set up system for urinary catheter placement	√			√		
• Insert urethral catheter and take a sterile urine sample, position drainage bag	√			√		
• Perform cares for child with a urethral catheter	√			√		
• Flush a urinary catheter	√			√		
• Remove a urethral catheter	√			√		

Abdominal / Intestinal	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Confirm naso-gastric tube (NGT) placement as per NPSA guidance, including pH levels	√			√		
• Confirm NGT position on X-Ray	n/a			√		
• Take and record an accurate abdominal girth measurement	n/a			√		

Neurological care	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Assess, use, interpret and act on AVPU score	√			√		
• Assess, document, interpret and act on Modified Paediatric Coma Scale findings	√			√		
• Identify and take appropriate action to take if consciousness decreases	√			√		
• Administer IV anti-convulsants	√			√		
• Administer of continuous anti-convulsant or benzodiazepine in status epilepticus	n/a			√		
• Care for child with Diabetic Ketoacidosis (DKA) requiring continuous IV insulin infusion	√			√		
• Perform, record and interpret blood glucose measurements	√			√		

Surgical Care	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Care for a child following a laparotomy	√			√		
• Care for a child following a thoracotomy	n/a			√		

Pain and Sedation	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Care for a child with continues IV infusion of opiate	√			√		
• Manage a child with Patient Controlled Analgesia (PCA) / Nurse Controlled Analgesia (NCA)	√			√		
• Care for child with an epidural infusion	n/a			√		

Additional specialty specific skills required in speciality specific critical care areas or lead centres						
Cardiovascular	**LEVEL 1 UNIT**			**LEVEL 2 UNIT**		
Clinical Skill	**Level to be achieved**	**Sign – Learner & Mentor / Supervisor**	**Date**	**Level to be achieved**	**Sign – Learner & Mentor / Supervisor**	**Date**
• Describe common cardiac medications used locally and their side effects	n/a			√		
• Care of the child receiving cardiac pacing via an external control device	n/a			√		
• Change the pacing box battery	n/a			√		
• Check the pacing mode and settings and document	n/a			√		
• Administer IV heparin and thrombolysis	n/a			√		
• Care if a child following a cardiac surgical procedure	n/a			√		
• Describe the action and side effects of vasoactive drugs	n/a			√		
• Safe administration and changing of IV vasoactive drug infusions	n/a			√		
• Care of a child receiving IV vasoactive drug infusion	n/a			√		

Additional specialty specific skills required in speciality specific critical care areas or lead centres						
Neurological	**LEVEL 1 UNIT**			**LEVEL 2 UNIT**		
Clinical Skill	**Level to be achieved**	**Sign – Learner & Mentor / Supervisor**	**Date**	**Level to be achieved**	**Sign – Learner & Mentor / Supervisor**	**Date**
• Set up and care for a child with an External Ventricular Drain (EVD), with appropriate documentation of observations	n/a			√		
• Set up and care for a child requiring Intra Cranial Pressure (ICP) monitoring	n/a			√		
• Care of the child following a craniotomy	n/a			√		

Additional specialty specific skills required in speciality specific critical care areas or lead centres						
Care of child requiring Acute Renal Replacement Therapy (RRT)	LEVEL 1 UNIT			LEVEL 2 UNIT		
Clinical Skill	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date	Level to be achieved	Sign – Learner & Mentor / Supervisor	Date
• Care of the child requiring acute Peritoneal Dialysis (PD)	n/a			√		
• Care of the child requiring acute haemodialysis	n/a			√		
• Care of a child requiring continuous renal replacement therapy (RRT) e.g. hemofiltration	n/a			√		
• Care of a child requiring plasma exchange	n/a			√		

Completion of Paediatric Critical Care Passport

Qualification in Specialty (QiS) completed	
• Course / Module title	
• Institution	
• Academic level	
• Credit Accumulation & Transfer Scheme (CATS) points value	

Reflection on Learning:

Completion of Critical Care Passport - verified by:

Name/ qualifications/NMC PIN:

Date:

Professional Position and place of work:

Signature:

References

Advanced Life Support Group (ALSG) (2011) http://www.alsg.org/uk/APLS

Information Standards Board (2007) http://www.isb.nhs.uk/documents/dscn/dscn2007/01-2007v3.pdf

Mid Staffordshire NHS Foundation Trust Public Inquiry (2013) http://www.midstaffspublicinquiry.com/report

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Nursing and Midwifery Council (2010) Standards for pre-registration nursing education. NMC. London

Paediatric Intensive Care Society (PICS) http://www.ukpics.org.uk/

Royal College of Nursing 2012. Matching knowledge and skills for Qualified in Specialty (QIS) Neonatal nurses: A core syllabus for clinical competency http://www.bapm.org

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APPENDIX 1

Paediatric Critical Care Minimum Dataset (PCCMDS)

Interventions to support payment by results (PbR)

HRG Definitions

- HRG1 = Critical Care Basic
- HRG2 = Critical Care Intermediate
- HRG3 = Critical care Advanced Level 1
- HRG4 = Critical care Advanced Level 2
- HRG5 = Critical Care Advanced Level 3
- HRG6 = Critical Care Advanced Level 4
- HRG7 = Critical Care Advanced Level 5

HRG1 Interventions (Basic Critical Care)

- Continuous ECG monitoring +Oxygen therapy + continuous pulse oximetry
- Arrhythmia requiring IV anti-arrhythmic
- Upper airway obstruction requiring nebulised adrenaline
- Severe asthma requiring IV bronchodilator therapy
- DKA requiring continuous insulin infusion
- Upper Airway Obstruction requiring nebulised adrenaline
- Reduced conscious level (GCS 12 or below) AND hourly or more frequent GCS monitoring

HRG2 Interventions (Intermediate Critical Care)

- Status epilepticus requiring continous anti-convulsant infusion
- Nasopharyngeal airway
- CVP monitoring
- Epidural
- Acute non-invasive ventilation / CPAP
- Arterial monitoring
- Acute renal replacement therapy (CVVH or HD or PD)
- Plasmafiltration
- Exchange transfusion
- Acute temporary pacing
- Inotropic/vasopressor treatment)
- Intravenous thrombolysis (tPA, streptokinase)
- ICP monitoring or EVD
- CPR in last 24 hrs
- Extracorporeal Liver Support (MARS)
- >80 mls/kg volume boluses
- Care of tracheostomy (first 7 days of admission)
- Care of long term ventilation patient

HRG3 Interventions (Advanced CC Level 1)

- Invasive Mechanical Ventilation (IMV)

OR

- Non-invasive ventilation / CPAP

Plus one or more of:

- Vasoactive infusion
- CPR in last 24 hrs
- >80 mls/kg volume boluses
- Intravenous thrombolysis
- Hemofiltration
- Burns >20% BSA
- Haemodialysis
- iNO / Surfactant
- Peritoneal dialysis
- Exchange transfusion
- Plasmafiltration
- ICP monitoring
- Molecular Adsorbent Recirculation System (MARS) - Extracorporeal Liver Support

HRG4 Interventions (Advanced CC Level 2)

- Invasive Mechanical Ventilation (IMV)
- Plus one or more of:
- Vasoactive infusion
- ICP monitoring
- Burns 20-49% BSA
- Intravenous thrombolysis
- CPR in last 24 hrs

OR

- Advanced Respiratory Support (ARS) (Jet ventilation or High
- Frequency Oscillatory Ventilation (HFOV))

OR

- HRG 3 + Isolation

HRG5 Interventions (Advanced CC Level 3)

- Invasive Mechanical Ventilation (IMV) or
- Advanced Respiratory Support (ARS) (HFOV or Jet Ventilation)

- **Plus** one or more of:
- Hemofiltration
- Haemodialysis
- Peritoneal dialysis
- Burns 50-79% BSA
- Extracorporeal Liver Support (MARS)
- Exchange transfusion
- iNO
- Surfactant
- Plasmafiltration

OR

- HRG 4 + Isolation

HRG6 Interventions (Advanced CC Level 4)

- Invasive Mechanical Ventilation (IMV) or
- Advanced Respiratory Support (ARS) (HFOV or Jet Ventilation)

- **Plus** one or more of:
- Burns >79% BSA
- >80 mls/kg volume boluses

OR

HRG 5 + Isolation

HRG7 Interventions (Advanced CC Level 5)

- Extracorporeal membrane oxygenation (ECMO)
- Extracorporeal Life Support (ECLS) including VAD
- Aortic balloon pump

Appendix 5. Critical care programme for nurses caring for children in Level 1 and Level 2 paediatric critical care units.

Introduction

This Paediatric Critical Care programme complements the Children's Critical Care Skills Passport and is considered essential for nurses working in areas where critically ill or injured children, who meet Level 1 and Level 2 critical care criteria (Paediatric Critical Care Healthcare Resource Groups (Information Standards Board 2007)) are cared for (RCPCH/PICS/RCN 2014 – High Dependency Care for Children – Time to Move On).

This programme provides the appropriate education and training to enable individuals working in a Level 1 or Level 2 Paediatric Critical Care Units (PCCUs) to gain the essential knowledge to underpin their clinical skills and should be completed by all nursing staff working within these areas.

Providing one training programme for both groups of staff allows participants to gain greater knowledge and confidence in all areas of critical care, increases the confidence of staff in caring for the child awaiting PICU transportation (which can occur in any paediatric ward environment), and will provide for a more flexible workforce if staff wish to move from one centre to another. The Skills Passport will then direct the individual to the specific clinical skills required in their Unit.

This Paediatric Critical Care programme has been written under the umbrella of the Paediatric Intensive Care Society (PICS), Royal College of Nursing (RCN) and the Royal College of Paediatric and Child Health (RCPCH) and has been developed by an experienced working party. The document is the intellectual property of this group and any use of or alteration must acknowledge the group. This document can be expanded and adapted at local level to meet local need.

The PICS/RCN/RCPCH working party included:

- Caroline Haines, Bristol Royal Hospital for Children, University Hospitals Bristol NHS FT
- Kay Rushforth, Leeds Teaching Hospitals NHS Trust
- Kevin Morris, Birmingham Children's Hospital NHS FT and PICS Past-President
- Yvonne Heward, Birmingham Children's Hospital NHS FT
- Lyvonne Tume, Alder Hey Children's Hospital NHS FT and University of Lancashire

Limitations of this document

The content included within this document is a broad overview of the critical care course advocated for nurses caring for children in a Level 1 and Level 2 paediatric critical care unit. Additional specialist education will be required for specialist critical care units e.g. cardiac, neuro, renal, liver.

The words 'children', 'child' or 'paediatric' refer to a neonate, infant, child or young person in hospital.

Suggested learning outcomes and content of Critical Care Programme

Learning outcomes for the course

At the end of a course learners will be able to:

- Demonstrate and evaluate the nursing and medical management of the child in relation to the pathophysiological processes affecting acutely ill children
- Discuss and illustrate the assessment of an acutely ill child requiring basic and intermediate levels of critical care
- Discuss and analyse holistic approaches to care for the critically ill child and their family acknowledging key psychosocial, legal and ethical issues.
- Discuss the evidence base for practice in relation to the care of the critically ill child
- Discuss and illustrate the ability to assess, plan, implement and evaluate care for a critically ill child
- Be able to discuss, debate and manage the professional issues relating to working within the multidisciplinary team and between units, hospitals and community provision.
- Be able to demonstrate decision-making, time management and prioritising care skills.
- Show an increased awareness of the politics and policies surrounding children's critical care and their relevance to practice.

Practitioners will be able to recognise a sick child, undertake appropriate and timely assessment, provide evidence based care for the child and participate in transfers to other critical care areas.

Teaching approaches

- Lectures including use of DVDs
- Workshops, Group work and Discussion Groups
- Demonstrations and Simulation
- Reflective Practice
- E-learning

Assessment approaches

Assessment will be a decision taken collaboratively the Network Lead Centre, their DGH's and the appropriate Academic Institution, however approaches should consider:

- Simulation – OSCE's
- Portfolio of Evidence including reflective practice
- Case presentations
- Poster presentation with Viva
- Demonstration of Clinical Competency
- Essay

General issues related to Critical Care

- Introduction to critical care
    - Developing an understanding of national policy initiatives and their implications on service development.
- Professional nursing issues relating to critical care and accountability.
- Using evidence in critical care practice
- Organisational management – prioritising your workload
- Communication Tools – Situation, Background, Assessment, Recommendations / Readback (SBAR)
- Importance of documentation – observations and clinical care
- Use of Child / Paediatric Early Warning (PEW) tools and safe systems to support children's critical care

Acute Respiratory care

- Respiratory anatomy and physiology
- Introduction to assessment – assessing the critically ill children
    - Normal respiratory patterns in infants & children
    - Normal chest sounds / auscultation
    - Effort of breathing / Efficacy of breathing / Pulse oximetry
- Blood gas analysis
- Respiratory Illnesses
    - Croup, Bronchiolitis, Asthma, Pneumonia
- Understanding the mechanism of different oxygen delivery systems:
    - Mask, headbox, high-flow, NCPAP
- Physiotherapy
- Basic chest x-ray interpretation
- Management and care of intra-pleural / mediastinal chest drains
- Basics of mechanical ventilation
- Long term ventilation (LTV)
- Non-invasive ventilation
- Tracheostomy Care
    - Understanding the indications for a tracheostomy
    - Managing the child with a tracheostomy - Suctioning, changing tapes, tubes and general care
    - Understand and manage the potential complications of tracheostomy.

Cardiovascular care

- Cardiac Anatomy & Physiology, including Cardiac Output
- Shock – causes and stages – implications in practice
- Understand and review the indications and use of crystalloids and colloids.
- Sepsis – meningococcal disease
    - Epidemiology
    - Physiology
    - Recognition / Management ABC approach / Treatment
    - Future therapies
- Assessing Cardiovascular status
- Pharmacology in critical care

    - Vasoactive drugs – definition, how they work, use in clinical practice
    - Thrombolysis
- Incidence and aetiology of Congenital Heart Disease
- Common congenital cardiac anomalies / lesions and prostaglandin therapy
- Cardiopulmonary bypass and post-operative surgical management
- Cardiac Failure
- ECG's – The normal ECG and child arrhythmias
- Cardiac Pacing
- Invasive pressure lines and monitoring – central and arterial lines
- Capillary blood sampling

Renal care

- Renal Anatomy and Physiology
- Fluids and electrolyte management
    - Normal fluid requirements in children
    - Causes of fluid loss
    - Fluid replacement therapies
- Male and female catheterisation
- Acute Renal Failure
- Peritoneal Dialysis
- Haemolytic uraemic syndrome (HUS)

Neurological care

- Anatomy and physiology of the brain and central nervous system
- Understand thermoregulation and the implications of hyper and hypothermia
- Neurological Assessment Tools, including modified Glasgow Coma Scores (GCS)
- Understanding and managing raised Intra-cranial pressure
- Understand Epilepsy
- Understand Meningitis
- Management of the child having a seizure
    - Types of seizure disorders
    - Management of the fitting child
    - Monitoring of the fitting child
    - Pharmacology of the drugs used
- Understand the issues around scoliosis and spinal cord injury in children.

Pain and sedation management

- Pain management physiology and pharmacology
- Sedation weaning
- Pharmacological treatment of pain
- PCA'S, NCA's, epidural analgesia. Inhalation analgesia
- Assessing and Managing pain in the critically ill child with special needs

Surgical care

- Specific care relating to children post larparotomy
- Specific care relating to children following thoracotomy
- Pre and post-operative management of neurosurgical children

- Evaluate the care and management of post spinal surgery patients

Oncological emergencies

- Pathophysiology of sepsis
- Severe infection, sepsis and septic shock in children,
- Specific childhood cancers – overview
- Oncology emergencies e.g. tumour lysis syndrome
- Impact of oncology treatments e.g. protocols for ALL, AML, neuroblastoma
- Palliative and end of life care, challenges and issues
- Understand Sickle Cell Disease and Sickle Cell Crisis
- Ethical issues

Metabolic and nutritional care

- Understand the presentation and management of DKA
- Nutrition in critical illness
    - Understand the importance of nutrition in the sick children.
    - Critically analyse the merits of enteral versus parenteral feed.
    - Examine the risks of Total Parenteral Nutrition.

Neonatal care

- Neonatal critical care: common pathology & management of neonatal conditions

Burns care

- Definition, cause and incidence of major burns
- Initial treatment in the Emergency Department
    - On-going acute management in critical care areas
    - Fluid management
    - Pain assessment

Trauma care

- Incidence of major trauma
- Mechanism of injury relating to type of injury (including NAI)
- Initial management
- Monitoring and management in the first 24 hours following major trauma

Transporting/transferring critically ill children

- Preparing the child for safe transfer
- Examine the referral and retrieval team's role in transferring sick children.
- Review carer and family considerations

Examples of specific clinical skills development

- Recognising and understanding resuscitation equipment, including intubation
- ETT management and strapping
- Arterial and central line monitoring
- Guedel airway / naso-pharyngeal airway insertion

- Hand ventilation – cope-set, pressure used.
- Tracheostomy care, including suctioning
- Chest drain management
- Familiarisation with respiratory support equipment:
  - Ventilators used for LTV
  - Non-invasive ventilators
  - High flow humidified nasal oxygen systems e.g. Optiflow, Vapotherm

Useful journals

- Archives of Diseases in Childhood
- British Journal of Nursing
- Child: care, health and development
- Current Opinion in Critical Care
- Dimension of Critical Care Nursing
- Evidence-based child health
- Evidence Based Nursing
- Intensive and Critical Care Nursing
- Issues in Comprehensive Pediatric Nursing
- Journal of child health care
- Journal of Clinical Nursing
- Journal of Advanced Nursing
- Journal of Pediatrics
- Journal of paediatrics and child health
- Journal of Pediatric Nursing
- Nursing in Critical Care
- Paediatrics and child health
- Pediatric Clinics of North America
- Paediatric Nursing

Useful websites

- http://www.dh.gov.uk
- http://www.diabetes.org.uk
- http://www.nice.org.uk
- http://www.nmc-uk.org
- http://www.rcn.org.uk
- http://www.resus.org.uk
- http://www.pted.org

Appendix 6. Medical staff considerations.

Doctors in training

With the overall reduction in length of training and working hours junior paediatricians in training have fewer opportunities to encounter a critically ill child. Anecdotally some of those completing training do not feel confident in managing a critically ill child.

Current standards pertaining to staff training and delivery of critical care to children have been heavily influenced by the need to set a standard at a level that can be met by current staffing levels and training opportunities. The requirement for all hospitals to be able to deliver HDU care and the failure to discriminate different levels of complexity of HDU care have made it difficult to consider other options until now.

The group recommendation is to set challenging targets for staff training and competence for the future, recognising at the same time the need to allow some flexibility about how to deliver these targets, and in what time frame. We do not accept the point of view that says we cannot set the bar at the appropriate level because we do not have enough middle grade doctors in training. Innovative ways of delivering equivalent care should be considered, recognising that these may not be immediately available and will need a period of transition.

The training and competence requirements need to be appropriate for the complexity of care being delivered. Therefore the level for staff working within a Level 2 PCCU must be set higher than that expected of staff delivering care in a Level 1 unit.

RCPCH have published a comprehensive competency framework which describes the knowledge, skills and competencies a paediatrician in training should acquire at level 1 (ST 1-3), level 2 (ST4-5) and level 3 (ST6+) of their training. This is broken down into generic knowledge, skills and competencies and then a list of specialty specific knowledge, skills and competencies for cardiology, dermatology, diabetes and endocrinology, gastroenterology and hepatology, genetics, haematology and oncology, infection, immunity and allergy, metabolic medicine, musculoskeletal medicine, neonatology, nephrology, neurology and neurodisability, ophthalmology, palliative care, respiratory medicine and ENT, and safeguarding.

Unfortunately this framework does not include a specific section on emergency and critical care competencies, and which competencies should be acquired at levels 1 to 3 of training. However within the general and specialty specific sections of the framework are a number of competencies which are highly relevant to delivery of Level 1 and level 2 CC for children. An exercise to map RCPCH competencies to critical care clinical pathways and interventions has highlighted that many of the competencies required to deliver Level 1 (Basic) and Level 2 (Intermediate) CC are contained at levels 2 and 3 in the RCPCH framework, with, not surprisingly, a number of the Level 2 (Intermediate) CC competencies at Level 3 in the RCPCH framework. In total 144 competencies were identified at level 2 which relate directly to delivery of critical care, with a further 49 mapped to level 3 of training.

This is not consistent with the current PICS Standards (2010) which states that 24 hour cover for a high dependency care unit should be provided by a doctor at ST3 level or above – ST3 doctors will be very unlikely to have acquired level 2 competencies and therefore be very unlikely to have the appropriate critical care knowledge and skills to

manage a child in a critical care unit in the middle of the night without on-site consultant supervision.

Someone working within a critical care unit should however quickly acquire the knowledge, skills and competencies most relevant to critical illness. Clear identification of the relevant general and specialist skills and competencies is not easy with the lack of a discrete emergency and critical care section within the RCPCH document. Consideration should be given to incorporating a separate section within the RCPCH Competency Framework in the future.

In the light of the RCPCH framework and recognising that the recommendations contained in this report are intended to result in a larger number of more complex children who require Level 2 (Intermediate) CC being cared for closer to home in regional hospitals it is clear that the minimum competency requirement will need to be raised above the level recommended within the current PICS standards (2010).

We therefore recommend that:

- 24/7 middle grade cover for a Level 1 unit providing Level 1 (Basic) CC should be provided by a paediatrician in training (or equivalent) who has achieved all Level 1 RCPCH competencies (at ST 4 or above).
- 24/7 middle grade cover for a Level 2 unit providing Level 2 (Intermediate) CC should be provided by a paediatrician in training (or equivalent) who has achieved all Level 2 RCPCH competencies (typically ST 6 or above).
    - Recognising the limited number of ST6+ trainees who are available across a network we would emphasise the need to consider staff groups who can provide an equivalent level of critical care expertise on a 24/7 basis.
    - Staff groups who may, with appropriate training, be able to provide equivalent expertise and relevant competencies might include Advanced Nurse Practitioners, and non-consultant non-training doctors (staff grade and specialty doctors). These staff groups may also offer a more sustainable and consistent model over time. On call models based on 24/7 on-site paediatric consultants will also deliver the required level of cover.
    - A doctor in training who has already completed a 6 month full time posting in a PICU should also be considered in the equivalent group, as they would be expected to have achieved the level 2 competencies relevant to critical care.
- The responsibility for assessing the level of cover provided for each critical care unit will rest with the Trust hosting the PCCU and the relevant paediatric critical care network.
- Middle grade (or equivalent) staff must have up to date paediatric advanced resuscitation training (APLS, EPLS).
- There is recognition that some of the proposed staff competency and training standards may prove challenging to achieve in the immediate term. These recommendations should be seen as developmental and a timescale for their adoption should be agreed by each PCC ODN. It is expected that all PCCUs should be compliant by 2018 and beyond.

Consultant medical staff

It is equally important to ensure that every Consultant Paediatrician responsible for supervising the care of children within a PCCU should have had the appropriate training in management of the critically ill child.

There is currently no expectation that every paediatrician in training will spend time training in a PCCU, whether a PICU or an 'HDU'. This is in sharp contrast with the requirement for every paediatrician in training to complete a minimum of 12 months training in a Neonatal Intensive Care Unit.

Whilst there is broad agreement that undertaking a period of PICU within training would be desirable and provide every Consultant Paediatrician with useful skills in managing critical illness this is not currently mandated. Newly appointed Consultant Paediatricians may therefore have limited knowledge of critical care.

We recommend discriminating the level of critical care training and experience expected for Consultant Paediatricians working in hospitals with Level 1 and Level 2 paediatric critical care units.

We recommend no significant change for those appointed to a hospital with a Level 1 PCCU. The requirement would be a CCT in paediatrics without any specific critical care training beyond that delivered as part of regular run-through training (although a period of PICU training remains highly desirable). The only exception would be the lead paediatrician for critical care who should have undertaken relevant training in paediatric critical care (as below).

We recommend that those appointed as a general paediatrician and providing clinical cover for a Level 2 PCCU should have undertaken relevant training in paediatric critical care.

RCPCH has previously developed a number of special study modules (also called Special Study modules or SPIN modules) aimed at developing general paediatricians with a particular area of interest / expertise.

One of the existing competency frameworks relates to paediatric high dependency care for children. It was principally developed to allow a paediatrician in training wanting to play a lead role on delivery of HDU care for children to gain the required competencies. The SPIN module has until now recommended a training period of 12 months in PICU and 12 months working as a general paediatric trainee in a centre with a designated HDU for children.

We propose using a modified version of the SPIN competency framework as the template to ensure newly appointed consultants have the necessary critical care knowledge and skills to work in a Level 2 PCCU providing clinical supervision to children meeting Level 2 (Intermediate) CC criteria.

The modified competency framework (Appendix 7: A framework of competence for a Special Study Module in Paediatric Critical Care) is expected to require a period of 6 months spent working in PICU as well as 6 months working in a hospital with a Level 2 PCCU. Being shorter than the original SPIN module we anticipate this should be more deliverable for a greater number of paediatricians in training.

We strongly recommend flexibility about when the PICU module is delivered. Whilst the goal should be for it to be delivered during run-through training if possible it may also be delivered post-CCT, allowing trainees who have not had the opportunity to complete a PICU attachment to do so before taking up a consultant post in a centre with a Level 2 PCCU.

It is recognised that a large number of existing consultant paediatricians provide excellent care to critically ill children and will not have completed equivalent training. It is important to discriminate what should be required of someone going through training from what can reasonably be expected of someone already in a consultant post. These recommendations should therefore be seen as developmental and a timescale for their adoption should be agreed by each PCCN. It is expected that general paediatricians appointed to a consultant post in 2018 and beyond will have completed this training module.

Appendix 7. A framework of competence for a Special Study Module in Paediatric Critical Care (RCPCH).

A framework of competence for a Special Study Module in Paediatric Critical Care

April 2014

Version 1

Royal College of Paediatrics and Child Health
www.rcpch.ac.uk

CONTENTS

Section 1: Introduction

Who is this book for?

It is for doctors in their General Paediatric training who wish to work towards an expertise in Paediatric Critical Care during RCPCH Level 3 training (or earlier). It is also there to guide tutors and educational supervisors.

Why do I need it?

This book gives you and your tutors' guidance about the competences you need to cover **in addition** to the Framework of Competences for training in General Paediatrics. It gives you a clear picture of what you have to achieve by the end of this module of training in order to have expertise in this area.

How do I use the book?

You can sit down with the book on your own and use it to help you identify areas of practice that you need to work on and those areas in which you feel fairly confident. You can talk to your tutor about the balance of your experiences and look for ways to ensure you cover all areas you need to. It should be used by Schools and Educational Supervisors to ensure that a programme of training is developed which will allow the trainees to achieve these competences. In the appendix, there is guidance for training in the module that the programme must adhere to.

Progression

Following completion of Level 3 training and the module, the CCT holder should be competent to take up a post as a General Paediatrician with a Special Expertise in this area. It is expected that there will be a requirement for a Consultant Paediatrician appointed to work in a hospital with a Level 2 Paediatric Critical Care Unit (PCCU) to have completed this module prior to taking up post. If necessary this module can be undertaken post-CCT and prior to taking up a Consultant position.

A note about the format of this document

This framework sets out the additional competences that should be achieved by the end of Level 3 training. The trainee also has to achieve all the competences in the Level 3 General Paediatric Framework

Assessment

The RCPCH Assessment Strategy (GMC approved) for Level 3 Training will be used. Trainees working with their educational supervisors should ensure that the Assessment Strategy is tailored to cover the area of Special Expertise as well as General Paediatrics and that learning and assessment are well documented within the e-portfolio.

Background to this module

- The 2001 Department of Health report on 'High Dependency Care for Children' specified that all in patient paediatric units should be able to provide HDU level care
- Since then large amounts of HDU level care have been delivered in DGH ward areas, and in tertiary centres outside of PICUs
- 'High level' HDU areas have been undertaking non-invasive ventilation, arterial and central venous pressure monitoring, and delivering continuous infusions of inotropes, prostaglandin, anti-hypertensive agents (labetalol etc) and bronchodilator therapy (aminophylline, salbutamol).
- To ensure the highest quality of care, and optimal outcomes, children requiring HDU level care should be looked after by doctors and nurses who have had specific training in care of the critically ill child
- A recent RCPCH report recommends a) use of the term Paediatric Critical Care rather than high dependency care, b) discriminating Level 1 (*basic*) critical care from Level 2 (*intermediate)* critical care (with the term *advanced* critical care reserved for PICU care), with Level 1 *(basic)* critical care being delivered in every hospital with in-patient paediatrics but Level 2 *(intermediate)* critical care being delivered in fewer centres.
- Paediatric critical care is to be delivered in a specific area called a critical care unit, with each unit designated as a Level 1 PCCU or a Level 2 PCCU.
- Training and competency requirements for medical staff to provide cover and care for children meeting Level 2 critical care criteria have been set above those for medical staff providing cover for Level 1 critical care.

These recommendations are intended for all paediatricians providing Consultant cover to a Level 2 PCCU in either a daytime or an on call arrangement **and** those *leading* on the delivery of Paediatric Critical Care within a Level 1 PCCU*.*

Any paediatrician working in a hospital with a Level 1 PCCU may be required to look after a child requiring Level 1 (basic) critical care in the context of their on-call

duties. It is acknowledged that, whilst desirable, it may not be feasible for all general paediatricians to be trained to the level of competencies recommended in this document.

Training recommendations

The knowledge and understanding, and skills required are outlined below in the Competency Framework.

It is recognised that the time taken to achieve these competencies will vary depending on the abilities of the individual doctor, and the amount of clinical experience and training that can be provided in any unit. However it is estimated that in most cases a minimum period of 6 months spent working in a PICU will be required, along with a minimum period of 6 months working within the paediatric department of a tertiary centre or large DGH with a designated Level 2 PCCU. These should be seen as minimum recommendations and there is considerable merit in a period of 12 months being spent working in a PICU. Specifically someone taking a lead role on delivery of critical care within a Level 2 unit should aim to complete 12 months in a PICU.

To achieve the specific airway, sedation and anaesthesia, and pain management knowledge and skills it is recommended that a period of 2-4 weeks be spent in the operating theatre, working alongside a consultant anaesthetist.

Characteristics of the paediatric department training post

- 3 or more designated beds in a Level 2 PCCU.
- Minimum throughput of 150 infants and children per year meeting Level 1 or Level 2 critical care criteria.

Characteristics of PICU training post

- Minimum of 5 PICU beds
- Minimum throughput of 300 infants and children per year, of whom at least 150 require mechanical ventilation (invasive or non-invasive).
- Access to consultant anaesthetists, operating theatres and pain management team, in order to achieve airway, sedation and anaesthesia, and pain management skills.

Section 2: Specific competences in paediatric critical care

Knowledge and Understanding

- know the natural history of the major causes of critical illness in childhood and prognostic indicators
- understand the structure of paediatric critical care service in the UK, the rationale for centralisation and consequent evolution of retrieval services and managed clinical networks
- recognise the fluctuant nature of the demand for critical care unit admission and how units plan for this
- know about severity of illness scores, how they are developed and used
- know the complications of critical illness and methods used to minimise these

Skills

- be able to offer clear, prioritised and realistic advice on the management of the critically ill child
- recognise the need to accelerate the level of support of the critically ill child and institute the necessary interventions

Values and Attitudes

- be able to function with both confidence and diplomacy outside the comfort of the PCCU environment, for example in ED or non-critical care wards
- recognise the impact of separation between child and parents during critical illness
- be aware of the stresses placed on patient and family by admission to a critical care unit

Teaching and Research

- understand the need for accurate data collection to allow continuous audit and quality control in PCCU
- appreciate the need to carry out research in the sickest patients to facilitate improvement in care, but also the problems involved in performing these studies, for example obtaining informed consent in the emergency situation

Leadership and Management

- recognise when the limits of improvement have been reached with medical management and the patient requires urgent intervention, perhaps elsewhere
- be able to plan safe and timely discharge from PCCU

Communication Skills in Paediatrics

- ensure detailed discharge plans are explained to referring clinicians including outstanding issues that have not been addressed on the PCCU

Section 3: Specific clinical competences in paediatric critical care

Growth and Nutrition

- understand the importance of adequate nutrition and how nutritional needs may be altered in critical illness
- understand the principles behind prescribing and monitoring of parenteral nutrition
- understand that specific nutritional deficits can complicate critical illness
- understand how obesity may complicate the management of critical illness and take account of this when planning care

Section 4: Condition-specific competences in paediatric critical care

Sedation & Anaesthesia, Pain Management, Airway Management and Resuscitation

- understand the benefits and potential risks of controlled ventilation in the serious ill or injured child
- have knowledge of the pharmacology of commonly used anaesthetic agents, sedatives and analgesics the indications for their use and their side effect profiles
- understand the principles behind key monitoring modalities, such as pulse oximetry, end-tidal CO2 monitoring and invasive pressure monitoring.
- know the principles of regional anaesthesia
- be able to manage a child with an epidural in place
- recognise the child who requires airway intervention and ventilation
- be able to manage the airway to the point of intubation, using appropriate equipment
- be able to safely employ sedation for procedures where the child is stable and cooperative enough to facilitate this
- work within the bounds of their experience and training and recognise when expert assistance is required

	Knowledge and understanding	Skills
Stable patient requiring non emergency invasive procedure, for example vascath for semi-urgent CVVH	understand the need for an empty stomach know the patient factors which increase risk of anaesthesia	be able to supervise post-anaesthetic monitoring and assess fitness for discharge to ward be able to prescribe post-procedure analgesia and monitoring on ward
Patient requiring emergency procedure	understand the principles involved in anaesthetising the high-risk patient understand the principles of a rapid sequence induction	be able to plan post-procedure care according to procedure and patient factors be able to prescribe post-procedure analgesia and monitoring on ward
In shock	understand the outcome benefits of early organ support in the child with septic shock understand the cardiovascular effects of sedation and anaesthetic agents	recognise the child with cardiovascular compromise

With cardiac pathology	understand the benefits of assisted ventilation in myocardial dysfunction understand the specific anaesthetic risks for specific cardiac pathology	be able to identify situations where expert help is needed
With serious head injury	understand need for low threshold for intubation in child with serious head injury requiring transport understand factors which increase risk of secondary injury know which anaesthetic agents increase intracranial pressure (ICP)	be able to monitor child for clinical signs of seizures, rising ICP and/or under-sedation
With respiratory failure	understand particular difficulties which may occur in severe acute asthma know which agents may be useful in alleviating bronchospasm	be able to anticipate cardiovascular compromise recognise the need to avoid drugs which precipitate bronchospasm
With upper airway obstruction including tracheal compression	understand the use of inhalational anaesthesia in this setting understand the need for caution with muscle relaxants	be able to assess a patient for airway obstruction and determine the level know when to call expert help recognise when airway is inadequate for transfer
The difficult airway	be familiar with assessment of the airway	have a structured approach to airway management know when to call expert help
Resuscitation	know the algorithms for management of cardiac arrest understand and be able to identify the reversible causes of cardiac arrest understand the problems surrounding the patient post-successful resuscitation	be able to lead a team in CPR be able to treat reversible causes of cardiac arrest be able to make an informed decision to stop resuscitation be able to manage a patient following successful resuscitation

Cardiology

The patient presents with:	Knowledge and understanding	Skills
Cyanosis		be able to initiate inotropic support and prostaglandin therapy in a sick neonate with possible congenital heart disease
Heart Failure, including cardiac conditions which present with shock	understand the potentially deleterious effects of anaesthetic and sedatives agents in this setting	be able to use inotropes and vasodilators appropriately to support the failing heart

Diabetes and Endocrinology

- understand the impact of critical illness on normal endocrine function and the potential for clinically important effects
- be able to manage children with known endocrine abnormalities admitted to PCCU with an acute exacerbation or for another condition or surgery

The patient presents with:	Knowledge and understanding	Skills
Hyperglycaemia	Understand the pathophysiology of the stress response in a critically ill child Have knowledge of the literature relating to hyperglycaemia and outcome in critically ill patients	be able to treat hyperglycaemia safely and effectively with intravenous insulin where appropriate

Gastroenterology and Hepatology

- understand the effect of cardiovascular dysfunction on hepatic function
- understand the systemic effects of liver failure
- understand the pharmacokinetic and pharmacodynamic changes which occur in liver failure

The patient presents with:	Knowledge and understanding	Skills
	know the principles of use of the Sengstaken tube	be able to initiate therapies to reduce bleeding and to empty the gut
Acute liver failure	understand markers of severe liver dysfunction and their prognostic value with respect to indications for liver transplantation know the clinical grading of encephalopathy in liver disease understand that early intervention, including intubation and ventilation is important	

Haematology and Oncology

- know the reasons why patients diagnosed with oncology and haematology conditions present with critical illness
- recognise the special requirements of the critically ill oncology patient cared and liaise effectively with the oncologist involved
- recognise the child at risk from tumour lysis syndrome (TLS)
- know the methods used to minimise the risk of TLS and how do identify it
- be able to institute therapy urgently for TLS
- understand the risk to the airway presented by a mediastinal mass
- liaise with oncologists and anaesthetists to ensure any intervention is performed in the most appropriate setting

The patient presents with:	Knowledge and understanding	Skills
Anaemia	know the limited indications for exchange transfusion know the pathophysiology and therapy of sickle chest syndrome and plastic bronchitis	be able to perform an exchange transfusion when indicated be able to recognise the need for bronchoscopy in sickle chest crisis
Neutropaenia	understand the most likely source and pathogens in oncological sepsis	be able to elicit signs of severe neutropenic sepsis and give appropriate advice
Leukaemia	understand that an extremely high white cell count increases the risk of tumour lysis syndrome	
Thrombosis	understand the risk factors for arterial and venous thrombosis particularly when associated with intravascular access know the indications, contraindications and complications of thrombolysis know the long term sequelae of thrombosis	take steps to minimise the risks of developing thrombosis be able to initiate investigations for procoagulability and liaise with haematologists regarding more specific investigations be able to diagnose and treat venous and arterial thrombosis

Infection, Immunology and Allergy

The patient presents with	Knowledge and understanding	Skills
Septic shock	understand how changes in cardiac output and systemic vascular resistance vary in paediatric septic shock and methods used to assess these parameters understand how vasoactive drugs may affect these parameters understand the systemic effects of hyperthermia and rhabdomyolysis know the causes, clinical presentation and specific therapies for Toxic Shock Syndrome know the causes, associations and distinguishing features of necrotising fasciitis understand the need for urgent surgical debridement in necrotising fasciitis know about immune-modulatory therapies know about the use of haemofiltration in septic shock know about the Surviving Sepsis Campaign and associated care bundles	be able to recognise Toxic Shock Syndrome and / or necrotising fasciitis and instigate specific therapies

Metabolic Medicine

- have an advanced knowledge of acid base physiology and be able to interpret results in the clinical context
- be able to manage the child with a known metabolic condition admitted with an acute exacerbation of their condition, including indications for haemofiltration

Multi-organ failure and support

- know how organ systems interact in health and serious illness
- know the available scoring systems that are available to estimate severity of illness in critically ill children
- be able to collect appropriate data accurately to record the level of organ dysfunction and predict the risk of mortality

System involved	Knowledge and understanding	Skills
Respiratory	know the indications and benefits of different forms of ventilation including non-invasive methods know the causes of failure to wean ventilation know the principles of respiratory function tests	be able to initiate and manipulate ventilation according to patient's pathophysiology be able to manage pneumothoraces, chest drains be able to construct a weaning plan be able to manage a patient with a tracheostomy including tube change
Cardiovascular	know the parameters which affect oxygen delivery know how these parameters such as cardiac output can be measured understand cardiopulmonary interactions know how vasoactive drugs and fluid affect the circulation	be able to determine cardiovascular status at the bedside be able to manage a child with arterial and central venous cannulation for the purpose of monitoring be able to manipulate parameters which affect oxygen delivery and assess the response to therapy
Haematology	know the risk factors for thrombus formation and diagnostic and therapeutic options understand the involvement of the coagulation cascade in the pathogenesis of systemic inflammatory response	be able to assess need for thromboembolic prophylaxis
Renal	understand the benefits and risks of renal support in multi-organ failure know about hepatorenal syndrome	be able to prescribe medication appropriately to achieve maximal effect with minimal toxicity

	know how renal impairment affects pharmacokinetics know the non-renal indications for haemofiltration	know when renal support is indicated
Neurology	know the causes of peripheral weakness after critical illness including critical care polyneuropthy and its associations know the principles of management of raised ICP	be able to recognise and investigate the cause of peripheral weakness be able to monitor the patient for level of analgesia and sedation
Nutrition and fluids	understand the fluid requirement of the critically ill child, how this may differ from healthy children and methods used to monitor requirements understand the value of enteral feeding and know the complications of TPN understand the importance of glycaemic control	be able to prescribe fluid and nutritional therapy for the critically ill child appropriately
Musculoskeletal	understand the factors that lead to pressure wounds and methods used to reduce their occurrence	recognise and treat pressure wounds

Neonatology

- know the principles of management of the major neonatal conditions requiring surgical intervention
- be able to liaise effectively with the surgical team

Nephro-urology

- understand the principles in management of the post-renal transplant patient and liaise effectively with the renal team

The patient presents with	Knowledge and understanding	Skills
Acute renal failure	know methods of preventing renal failure understand the principles of various forms of renal support and when they may be employed	be able to manage the underlying cause of hyperkalaemia
Hypertension		be able to initiate and monitor the use of intravenous antihypertensive agents

Neurology and Neurodisability

- know what constitutes a neurosurgical emergency and understand the consequences of delay in transfer to an appropriate centre

The patient presents with	Knowledge and understanding	Skills
Seizures	know about the ICU management options for status epilepticus, including thiopentone and midazolam infusions	
Acute focal neurological signs	know the diagnostic features and principles of treatment of acute demyelinating encephalomyelitis (ADEM)	
Hypotonia, neuropathies and myopathies	understand the principles and indications for non-invasive respiratory support in chronic weakness	be able to assess for respiratory fatigue and instigate support appropriately
Meningism and altered consciousness	know the principle of maintaining adequate cerebral perfusion and the methods used to achieve this	be able to seek advice regarding the need for intubation and ventilation particularly where the child is to be imaged

Palliative Care

- understand how paediatric critical care admission plays a role in supporting the child, the family and referring clinicians
- understand how clinicians can facilitate discussions regarding the appropriateness of future intensive intervention

Respiratory Medicine, with Ear, Nose and Throat

- have a knowledge of the clinically relevant anatomy of the paediatric airway (upper and lower), how it changes with age and the more common congenital abnormalities
- have a knowledge of respiratory physiology and pulmonary mechanics and how these alter with disease and mechanical ventilation
- know the determinants of normal gas exchange, how disease may effect these, which therapies may work to improve these and how they work
- know the parameters that are calculated and used to assess severity of respiratory illness
- know the importance and mechanism of cardiopulmonary interactions in the self ventilating and ventilated child with respiratory disease
- be able to assess a child to determine the need for respiratory support
- be able to institute non-invasive respiratory support and invasive respiratory support via a tracheostomy
- be able to tailor ventilatory strategy according to pathophysiology of the underlying respiratory condition
- know of emergency interventions for respiratory crises and indications for their use
- understand the use of bronchoscopy in the diagnosis and management of respiratory failure

- know the prognoses of respiratory conditions admitted to PCCU
- be aware of the current options for and issues surrounding long term respiratory support

The patient presents with	Knowledge and understanding	Skills
Snoring and obstructive sleep apnoea		manage the airway appropriately instigate investigations for pulmonary hypertension
Acute stridor	know the indications for airway intervention	manage the child with stridor
Acute severe asthma	know the abnormalities of lung mechanics and resulting abnormal gas exchange pattern know the goals of therapy including ventilation know the mechanism of action of adjuvant therapies indications for use and important side- effects and/or complications that may result know the principles of delivering CPAP/NIV in this group understand the risks of repeated PCCU admission and the need for follow up by a respiratory specialist	be able to institute intravenous bronchodilator therapy and titrate therapy according to clinical response
Lower respiratory tract infection, including pneumonia' bronchiolitis and pertussis	understand pathophysiology, respiratory mechanics and gas exchange abnormalities in these conditions	be able to assess the need for respiratory support be able to institute non-invasive respiratory support and monitor the response to treatment
Respiratory failure and Respiratory Distress Syndrome [ARDS]	have knowledge of relevant normal respiratory physiology, including VQ matching, shunt, deadspace ventilation, respiratory system compliance, resistance and time constants. know the defining characteristics, pathophysiology and causes of ARDS know the principles and debates surrounding ventilatory strategies know the mechanism of action and effectiveness of adjuvant therapies know the acute complications of ARDS know the long term effects on lung function	be able to institute non-invasive respiratory support and monitor the response to treatment recognise the associated multi-organ dysfunction and support as appropriately

Transport and Retrieval of the critically ill child

- understand why a child might require inter-hospital transfer
- be able to organise the logistics of a retrieval
- be able to communicate effectively with receiving hospital
- recognise and minimise the potential risks involved in transfer both to the patient and the team
    - understand the need to retain an open mind regarding diagnosis
    - understand the need for clear documentation
    - understand the need for stabilisation prior to transfer but be able to recognise the child in extremis who requires specialist life saving intervention and urgent transfer
    - understand the stressful nature of transfer on both the awake child and the family
    - take steps to reduce parental anxiety through clear communication, calm demeanor and minimising their time spent separated from the child

Retrieval of the child with	Knowledge and understanding	Skills
Multi-trauma including head injury	understand need to identify all sources of cardiorespiratory compromise prior to transfer understand that cardiovascular instability may be the direct result of a severe head injury but that other causes should first be excluded understand which head injuries are time critical	ensure cervical spine immobilisation in any child at risk of cervical spine trauma recognise the child with the time critical head injury
Shock	understand the need for early intervention in the shocked child to improve outcome understand the importance of aggressive fluid resuscitation in a child with shock understand the effect of positive pressure ventilation in a child with shock	be able to elicit signs of shock and give appropriate advice be able to consider the most likely pathogen in septic shock and treat accordingly be able to recognise toxic shock syndrome and necrotising fasciitis
Upper airway obstruction	understand the risks of transferring a child with inadequate airway (intubated or not) know the indications for intubation and the special precautions required	be able to elicit the most likely diagnosis be able to seek specialist help where necessary

Non-traumatic brain injury and raised intracranial pressure	understand that acute hydrocephalus requires urgent neurosurgical intervention know the signs of raised intracranial pressure	be able to elicit an accurate assessment of level of consciousness and other signs of raised ICP recognise signs of raised intracranial pressure and institute strategy to control this recognise time-critical lesion and assist in logistics of urgent transfer

Trauma and Poisoning

- know the natural history of specific injuries
- know the value of investigations performed, their indications and how they should be interpreted
- liaise effectively with other specialities involved
- arrange for the transfer of the injured child to the appropriate centre

The patient presents with:	Knowledge and Understanding	Skills
Multi trauma	know the symptoms and signs of spinal injury and investigations understand the pathophysiology of hanging injury and resulting cerebral injury	
Burns	understand the complications of burns to special areas including airway burns understand the systemic effects of severe burns	be able to assess airway involvement and seek expert help if required be able to manage carbon monoxide poisoning
Drowning	understand the pathophysiology of near-drowning and resulting cerebral and lung injury	be able to manage the patient with lung injury and provide neuroprotection
Head injury	know the mechanisms of primary injury and secondary injury know the effects of injury on cerebral blood flow know the effects of hyperventilation on cerebral blood flow know the indications for intubation know about ICP monitoring : devices and the value of their use know about existing guidelines for the management of raised ICP	be able to instigate neuroprotective measures be able to recognise and treat signs of raised ICP be able to interpret a Brain C.T. Scan know when to call for expert help

	know about therapies for raised ICP know the prognostic indicators and outcomes	

Section 5: Practical procedures and investigations

Therapeutic Procedures

- tracheostomy tube change
- arterial line insertion
- peripheral long line insertion
- Naso-jejunal (NJ)tube insertion
- insertion of a chest drain

Pharmacology and Therapeutics

- understand the pharmacology of drugs used in critical care
- understand how severe illness effects the distribution and handling of drugs and alter prescriptions accordingly
- understand how individuals vary in their ability to metabolise drugs
- understand the risks of dependence and physical withdrawal symptoms from certain sedative and analgesic drugs
- be able to construct safe weaning plans for drugs where indicated

Appendix 1

Paediatric Guidance Checklist
These standards were derived to assist in the assessment of the paediatric training standards in your deanery

Specialty: Special Study Module in Paediatric Critical Care

The Programme (which will consist of a period of training in a PICU and a period of training in a DGH or tertiary centre PCCU) should provide:

1. Supervision	✓/✖
For both PICU and DGH or tertiary centre PCCU components	
1.1 An educational supervisor who is trained in assessment and appraisal	
1.2 Evidence that the assessment strategy is being delivered	
1.3 Trainers receive appropriate training on the delivery of the assessment strategy	
For PICU component	
1.5 All consultants providing PICU cover are appropriately trained in PICM (refer to ICTPICM guidance)	
1.6 A Consultant is present on the unit during normal working hours throughout the week with no other commitments. The on- call consultant provides cover solely to PICU	
For PCCU component	
1.7 A consultant is available to provide supervision on the PCCU	

2. Other Personnel	
For both PICU and DGH or tertiary centre PCCU components	
2.1 Nursing staff with appropriate training in caring for a child in PICU or PCCU (see RCPCH Paediatric Critical Care document)	
2.2 Middle grade medical staff with appropriate training in caring for a child in PICU or PCCU (see RCPCH Paediatric Critical Care document)	
2.3 a consultant is available to the unit during normal working hours throughout the week.	
2.4 pharmacist, physiotherapist, dietician, psychologist	

3. Service requirements and facilities	
For DGH or tertiary centre PCCU component	
3.1 Specialty specific requirements of subspecialty department: 3 or more designated HDU beds Minimum HDU throughput of 150 infants and children per year	
For PICU component	
3.1 Specialty specific requirements of subspecialty department: Minimum of 5 PICU beds Minimum patient throughput of 300 admissions of whom at least 150 require mechanical ventilation (invasive or non-invasive) Designated retrieval service operating 24 hours a day with consultant availability to provide advice and support	
For both PICU and DGH or tertiary centre PCCU components	
3.2 Specialty specific requirements of related clinical departments that are involved in delivery of the curriculum: Input from paediatric pharmacist, paediatric physiotherapist, paediatric dietician, psychologist, pain management teams Access to Consultant Anaesthetists and operating theatres	
3.3 Specialty specific requirements of service departments relevant to delivery of curriculum (e.g. investigation departments, PAMs departments, surgery or anaesthesia): Onsite access to radiology with onsite radiographer 24 hours a day, pathology,	

haematology and blood bank	
3.4 Specialty specific requirements of clinical networks: The unit participates in an established clinical network	

4. Educational activities and training	
For both PICU and DGH or tertiary centre PCCU components	
4.1 It is desirable that 2-4 weeks be spent in the operating theatre working alongside a consultant anaesthetist to achieve anaesthesia, sedation and pain management to achieve skills	
PICU component	
4.2 *Specialty specific clinical exposure required to provide sufficient learning opportunities(NB if giving workload data ensure it is explicit whether this is number per annum or number trainee would be expected to be exposed to over entire programme):* End of life discussions Training in principles of retrieval/transport	
4.3 *Specialty specific requirements for other experiential learning(excluding clinics and ward rounds):* Early access to training in the operating theatre, supervised by a consultant anaesthetist. Experience of non-invasive and invasive ventilation, ultrasound guided line placement, end-of–life discussions with parents. Desirable to have experience of ICP monitoring, renal replacement therapy, high frequency oscillatory ventilation.	

5. Working patterns	
For both PICU and DGH or tertiary centre PCCU components	
5.1 Safe cover arrangements for paediatric department out of hours in line with RCPCH guidance	
5.2 Evidence of compliance with existing employment rules to working time	
5.3 Working intensity and pattern that is appropriate for learning	
5.4 Access to training time which allows achievement of competences throughout the programme	
5.5 This post forms part of a complete paediatric training programme which provides a minimum of 5 years of acute clinical experience, including out of hours duties	

6. Specific Post requirements	
For the total programme	
6.1 It is recommended that 6-12 months be spent working in a PICU and 6-12 months in a large DGH or a tertiary centre that has designated PCCU beds as part of a regional network.	

7. Enabled to learn new skills, necessary skills and curriculum coverage (speciality specific) *This section can be used to highlight marker conditions to which trainee should be exposed or the numbers of cases/procedures that trainee will be expected to see/do. Ensure that it is clear whether any numbers are for whole training programme or per annum*	
For both PICU and DGH or tertiary centre PCCU components	
7.1 *Specialty specific marker conditions trainee should be exposed to:* as per 'A Framework of Competences for the Special Study Module in Paediatric Critical Care'	
7.2 *Specialty specific skills/procedures trainee needs to complete:* as per 'A Framework of Competences for the Special Study Module in Paediatric Critical Care'	

8. Access to clinics and ward rounds and long term care of patients	
8.1 *Specialty specific numbers and types of clinics expected to attend (including outreach clinics:*	

8.2 *Specialty specific combined clinics expected to attend:*	
8.3 *Specialty specific ward rounds consultant led and independent per week:* 2 consultant led ward rounds each day Opportunities for trainee to lead ward rounds	
8.4 *Specialty specific involvement in transitional care:*	
8.5	

9. Meetings	
For both PICU and DGH or tertiary centre PCCU components	
9.1 *Specialty specific number and types of MDT meetings expected to be exposed to:* Clinical practice meetings PCCU strategy and business planning	
9.2 *Specialty specific multi-professional meetings expected to be exposed to:* Discharge planning of complex cases Critical incident review	
9.3 *Speciality specific other meetings:* Audit meetings	

10. Clinical audit	
For both PICU and DGH or tertiary centre PCCU components	
10.1 Evidence of trainees participation in clinical governance (at least 1 full audit/year and attendance at critical incident meetings)	
10.2 Evidence of trainees participation in clinical guideline development	
10.3 the unit participates in network and/or national audit	

11. Teaching appraising and assessing	
For both PICU and DGH or tertiary centre PCCU components	
11.1 Opportunities for formal and informal teaching	
11.2 For senior trainees: opportunities for involvement of assessment of others	
11.3 For senior trainees: opportunity to be involved in the appraisal of others	

12. Research	

13. Management	
For both PICU and DGH or tertiary centre PCCU components	
13.1 Opportunities to be involved in management e.g. participation in management meetings and projects	
13.2 Senior trainee has opportunity to co-ordinate patient care and to take responsibility of the unit	

X-ref	Comments

Appendix 8. Draft revised PICS Standards (2010) relating to 'high dependency care' reflecting the recommendations of this report.

Paediatric Critical Care Units (Level 1 and 2)

Ref.	Standard	Demonstration of compliance
SUPPORT FOR CRITICALLY ILL CHILDREN AND THEIR FAMILIES		
1.	**Parent information** Parents should be given written information about the unit, including visiting arrangements, ward routine and location of facilities within the hospital that the parents may want to use.	Examples of information for parents. *Note: Information should be available in formats and languages appropriate to the needs of the patients and their families.*
2.	**Parent facilities** Facilities should be available for the parent of each child, including: • Somewhere to sit away from the unit • A quiet room for relatives • A kitchen, toilet and washing area • A changing area for other young children.	Facilities available.
3.	**Overnight facilities** Overnight facilities should be available for the parent or carer of each child, including a foldaway bed or pullout chair-bed next to the child.	Facilities available.
4.	Paediatric critical care units should have appropriate facilities for parents and carers to stay overnight, including accommodation on site but away from the unit.	Facility available.
CLINICAL COMPETENCES		
5.	**Lead Consultant** A nominated paediatric consultant should have lead responsibility for guidelines, policies and procedures and medical staff (and ANP if relevant) competences relating to paediatric critical care. This consultant should undertake Continuing Professional Development of relevance to critical care.	Name of consultant and evidence of training and CPD *Note:* *1 This may or may not be the same person as the nominated lead for the area* *2 New appointments to posts of consultant with lead responsibility for critical care should have achieved the 'A framework of competence for a Special Study Module in Paediatric Critical Care' (RCPCH)*

Ref.	Standard	Demonstration of compliance
6.	**Middle grade cover** ***Level 1 PCCU*** A clinician trained to the equivalent of paediatric medicine and neonatal medicine (RCPCH) level 1 competences or above should be available on site at all times. This may be a doctor in training but other professionals with equivalent competencies are also acceptable. ***Level 2 PCCU*** A clinician trained to the equivalent of paediatric medicine and neonatal medicine (RCPCH) level 2 competences or above should be available on site at all times. This may be a doctor in training but models that include other professionals with equivalent competencies are also acceptable (such as Advanced Nurse Practitioners, Specialty doctors, resident Consultants). A trainee who is at a more junior level but who has completed a minimum of 6 months working in a paediatric intensive care unit is considered to be a satisfactory equivalent.	Medical staff rotas. *Notes:* *1 For doctors in training, this will normally be ST4 or above.* *2 For doctors in training, this will normally be ST6 or above, or previous training in PICU.* *RCPCH competence frameworks are available at:* *www.rcpch.ac.uk/Training/Competency-Frameworks*
7.	**Paediatric consultants** All consultants appointed after April 2018 to work in a hospital and provide on call cover for a Level 2 unit should have achieved 'A framework of competence for a Special Study Module in Paediatric Critical Care' (RCPCH). This involves spending a minimum of 6 months working in a PICU.	Evidence of training records.
8.	**Other specialties** Access to other appropriate specialties should be available, depending on the usual case mix of patients, for example, 24-hour ENT cover for tracheostomy care.	Details of arrangements.
9.	**Lead Nurse** There should be a nominated lead nurse with responsibility for guidelines, policies and procedures and staff competences relating to paediatric critical care. This should be a senior registered children's nurse with additional training, competences and experience in providing paediatric critical care.	Name of nurse and evidence of training and CPD.
10.	**Intensive Care support** There should be 24-hour on-site access to a senior registered nurse with intensive care skills and training	Details of arrangements.

Ref.	Standard	Demonstration of compliance
11.	**Nursing competences** Children needing critical care should be cared for by a registered children's nurse with paediatric resuscitation training and competences in providing paediatric critical care. Nurses new to critical care should work a minimum of 75 hours of supervised practice in a level 1/2 critical care area, to gain the essential skills required. All skills should be gained within 12 months of working in this area. Supporting experience may be gained in areas such as anaesthetics, recovery room, adult or neonatal critical care. Competency must be assessed by an assessor and updated regularly. This should include training in the skills necessary to communicate with and provide emotional support for parents /children. **Level 1 Unit** A minimum of one nurse on every shift should have successfully completed all the required PCC skills to level 1. A minimum of one nurse on every shift should have completed a recognised paediatric advanced resuscitation course for example EPLS/APLS (Resuscitation Council UK, 2010/ALSG, 2011) or an in house course covering similar learning outcomes. **Level 2 Unit** One nurse on every shift who should have completed all the required PCC skills to level 2. One nurse on every shift should have completed an advanced paediatric life support course for example APLS (Advanced Life Support Group 2011), EPLS (Resuscitation Council UK 2010). A minimum of one nurse on each shift should have successfully completed a validated /accredited education and training programme in paediatric critical care. 70 % of nursing staff should hold a qualification in specialty (RCN, 2013). This is defined by completion of the skills attained in Appendix 4 and evidence of acquisition of the necessary underpinning knowledge.	Nursing rotas showing at least one nurse per shift with appropriate competences. *Notes:* *1 Appendix 2 includes definitions of levels of paediatric critical care. Appendix 4 and 5 describes the competences for Level 1 and Level 2 units, along with recommendations on delivery of courses.* *2 Appropriate courses which develop paediatric critical care competences include:* • *Paediatric intensive care* • *Neonatal intensive care* • *University high dependency care courses* *Nurses providing specialist care for specific conditions (for example, burns, renal, cardiac liver disease) should have completed a high dependency module as part of their specialist training or should have additional high dependency training. They are expected to meet all of the PCC core Level 1 and Level 2 competencies as well as any specialty-specific competencies.*

Ref.	Standard	Demonstration of compliance
12.	**Nurse staffing levels** Nurse staffing for children needing critical care will be influenced by a number of factors, including patient diagnosis and complexity, severity of illness (PEWS score), and nursing skill-mix and seniority. These should be based on a 1:2 ratio, though this will vary with the above factors.	Local audit of high dependency care. *Notes:* *1 Appendix 9 includes definitions of paediatric critical care.* *2 In larger critical care units, a super-numerary shift leader will also be needed.* *3 A critical care unit with a number of cubicles may require additional staff.*
13.	**Tracheostomy care** If children with tracheostomies are cared for on the critical care unit, there should be a healthcare professional with skills in tracheostomy care on each shift.	Details of arrangements.
14	**Pharmacy and physiotherapy** Paediatric Critical Care areas should have pharmacy and physiotherapy staff with appropriate competences and job plan time allocated for their work with children needing critical care.	Details of pharmacy and physiotherapy support available.
FACILITIES AND EQUIPMENT		
15	A designated and appropriately designed and equipped unit for providing critical care for children of all ages should be available. Equipment available should be appropriate for the critical care interventions provided. Drugs and equipment should be checked in accordance with local policy.	Suitable area containing the drugs and equipment listed in Appendix 14. Policy covering frequency of checking and evidence of checks having taken place in accordance with this policy.
GUIDELINES, POLICIES AND PROCEDURES		
16	Clinical guidelines / clinical pathways should be in use covering the provision of paediatric critical care support, including: a. Care of children with: i. Bronchiolitis and Acute respiratory failure ii. Seizures and Status epilepticus iii. Diabetic ketoacidosis iv. Acute asthma v. The child undergoing surgery vi. Trauma vii. Long-term ventilation b. High dependency interventions	Written guidelines / clinical pathways
17	All paediatric ward areas should use an early warning tool to identify children at risk of deterioration	Evidence of use of tool
SERVICE ORGANISATION AND LIAISON WITH OTHER SERVICES		

Ref.	Standard	Demonstration of compliance
18	The Hospital Board / Trust should be clear whether it provides the following services and the hospital site or sites on which each service is available: • Paediatric Critical Care -Level 1 or Level 2 PCCU • Paediatric Intensive Care	Written description of services consistent with other publicly available material about the hospital
19	Trust Boards must acknowledge the needs of the critically ill in their client child population and to take measures to ensure their staff are appropriately trained.	Trust policy document agreed by Clinical Directors & Nurse managers of Paediatrics, Emergency Deptartment (ED) and Intensive Care Unit (ICU) Demonstrable provision of time, facilities and resources to ensure maintenance of skills and knowledge.
20	Hospitals providing hospital services for children should have a single group responsible for the coordination and development of care of critically ill children. The membership of this group should include the nominated lead consultants and nurses for each of the areas where children may be critically ill, and lead anaesthetist and the Resuscitation Officer with lead responsibility for children. Where a hospital has more than one PCCU this group must provide oversight of these arrangements and ensure that consistent standards are met across all areas. The accountability of the group should include the Hospital Board /Trust Director responsible for children's services. The relationship of this group to the Hospital's mechanisms for safeguarding and clinical governance issues relating to children should be clear.	Terms of reference, membership and accountability of the group. Note: This group may have other functions so long as the standard is met in relation to terms of reference, membership and accountability.
21	The mechanism for approval of all policies and procedures relating to the care of critically ill children should comply with Hospital document control procedures.	Evidence of document control standards for monitoring, review and version control of policies and procedures.

Ref.	Standard	Demonstration of compliance
22	The Trust should have implemented all aspects of the National Service Framework for Children: Standard for Hospital Services regarding clinical governance, including those relating to serious events and near misses. All meetings to review patients and Critical Incidents should be multi- professional and involve all specialities involved in the child's care, especially when there has been a death of a child.	Investigation and reporting arrangements. Evidence of multi-disciplinary learning. Records of Attendees.
23	**Operational policy** Paediatric critical care units should have an operational policy covering: a. Infants and children for whom critical care will normally be provided b. Admission and discharge criteria c. Critical care interventions provided, and duration of interventions, including whether the following are provided: i. CPAP / Non-invasive ventilation ii. Ventilation via a tracheostomy iii. Invasive monitoring (arterial / CVL) iv. renal support d. Expected competences of healthcare staff providing high dependency interventions e. Escalation criteria to consider transfer for an enhanced level of critical care f. Arrangements for liaison with transport service/ lead PICU for advice and support Note: the above will be different for Level 1 and Level 2 units A Level 2 PCCU within a regional hospital should as a minimum be able to deliver acute(and chronic) non-invasive ventilator support and be able to care for a child receiving long term ventilation via a tracheostomy.	Operational Policy
24	**Long term ventilation** A level 2 unit providing support for children requiring long-term ventilation should meet the relevant standards within the Long Term Ventilation service specification	Assessment of service against standards *Notes:* *1 The standards currently in use are the WMQRS Quality Standards for Services providing long-term ventilation for children and young people*

Ref.	Standard	Demonstration of compliance
25	**Critical care transfers** For a Level 2 PCCU which accepts transfers in of children needing critical care from other hospitals, the operational policy should also include: a. protocol for transfer of children needing critical care agreed with referring hospitals	Operational policy *Notes:* *1 This QS is not applicable to paediatric wards or Level 1 PCCUs* *2 Transfers of children needing paediatric critical care should be discussed through the critical care transport service.*
DATA COLLECTION, AUDIT-AND GOVERNANCE		
26	The Trust should have implemented all aspects of the National Service Framework for Children: Standard for Hospital Services regarding clinical governance, including those relating to serious events and near misses. All meetings to review patients and Critical Incidents should be multi- professional and involve specialities involved in the child's care, especially when there has been a death of a child. The clinical leads (medical and nursing) will have responsibility for clinical governance, research and audit, training, and liaison with local clinical networks. Morbidity and mortality meetings should be held at least twice yearly at intervals of no more than 6 months and each designated PCC unit should have a programme of clinical audit and critical incident reporting, so that quality of the delivery of care is monitored.	Evidence of critical incident reporting. Investigation and reporting arrangements. Evidence of multi-disciplinary learning. Minutes of Morbidity and Mortality meetings with action plans Records of Attendees.
28	Every PCCU should have arrangements in place for collection of data on all children receiving paediatric critical care. The Paediatric Critical Care Minimum Dataset (PCCMDS) should be collected on every child admitted to PCCU and submitted to the Secondary Users Service (SUS). Level 2 PCCUs should submit data to PICANet on every child admitted to PCCU.	Evidence of data collection Evidence of submission of data to SUS Evidence of submission of data to PICANet
29	Each hospital will adopt a strategy for data validation to ensure that quality is checked for completeness and accuracy through: • Systematic computerised checks • Review of patient case notes	Local data quality protocol

Appendix 9. The Paediatric Critical Care Minimum Dataset (PCCMDS) and mapping to HDC HRGs.

Current structure of PCCMDS and HRGs

Four additional items agreed by the EWG for inclusion are shown in italics below each section.

HRG1. Basic Critical Care.

Airway

Upper airway obstruction requiring nebulised adrenaline

Breathing

Apnoea - recurrent

Oxygen therapy **plus** continuous pulse oximetry **plus** ECG monitoring (note: includes 'nasal high flow oxygen therapy')

Diagnosis

Severe asthma (IV bronchodilator / continuous nebulisers)

Diabetic ketoacidosis requiring continuous insulin infusion

Arrhythmia requiring IV anti-arrhythmic
Reduced conscious level (GCS 12 or below) AND hourly (or more frequent) GCS monitoring

HRG 2. Intermediate Critical Care.

Airway

Nasopharyngeal airway

Care of tracheostomy (first 7 days of episode only)

Breathing

Non invasive ventilation, including CPAP

Long-term ventilation via a tracheostomy

Circulation

>80 mls/kg volume boluses

Vasoactive infusion

Temporary external pacing

Cardiopulmonary resuscitation in last 24 hrs

Diagnosis

Acute renal failure requiring dialysis or haemofiltration

Monitoring

Invasive arterial monitoring

Central venous pressure (CVP) monitoring

Intracranial pressure monitoring / External ventricular drain

Other

Exchange transfusion

Intravenous thrombolysis

Extra-corporeal liver support (MARS)

Plasmafiltration

Status epilepticus requiring treatment with continuous intravenous infusion (eg midazolam). Epidural infusion

Appendix 10. Example PCCMDS data collection forms.

Note: these were developed before recent changes to the PCCMDS and HRGs.

PHDU audit form (Wessex)

Please start data collection when High Dependency Care begins.

Patient ID (*e.g. Poole 1*): **Age** (*Months & years*):
Postcode:

Source of admission: (*Immediately prior to "qualifying" as a HDU patient – Circle appropriately*)
Home/GP/A&E/OPD/HDU(Funded)/HDU(Unfunded)/NNU/PICU/Theatre/AICU/Ward/DGH ward/Other (*Specify*)

Date of onset of HD Care episode:

Area HDU care provided (*Circle appropriately*): Ward/AICU/PICU/HDU (Funded)/HDU (Unfunded)

Date HD Care episode ended:

Outcome (Circle appropriately): Stayed in same area/HDU transfer/PICU transfer/DIED/Ward/Home/Other

If outcome death: Treatment withdrawn/Treatment Limited/Failed CPR

Was the patient discussed with PICU: Yes/No

Outcome of discussion with PICU: Advice only/Accepted/Refused/AICU admission
Transfer team: PICU/NNU/Local/Other PICU teams (e.g. CATS)

DIAGNOSES
Primary Diagnosis: ……

Diagnostic Category: Cardiovascular Respiratory Neurological

Renal Endocrine Metabolic Gastrointestinal Trauma

Sepsis Poisoning / Ingestion Surgery Oncology

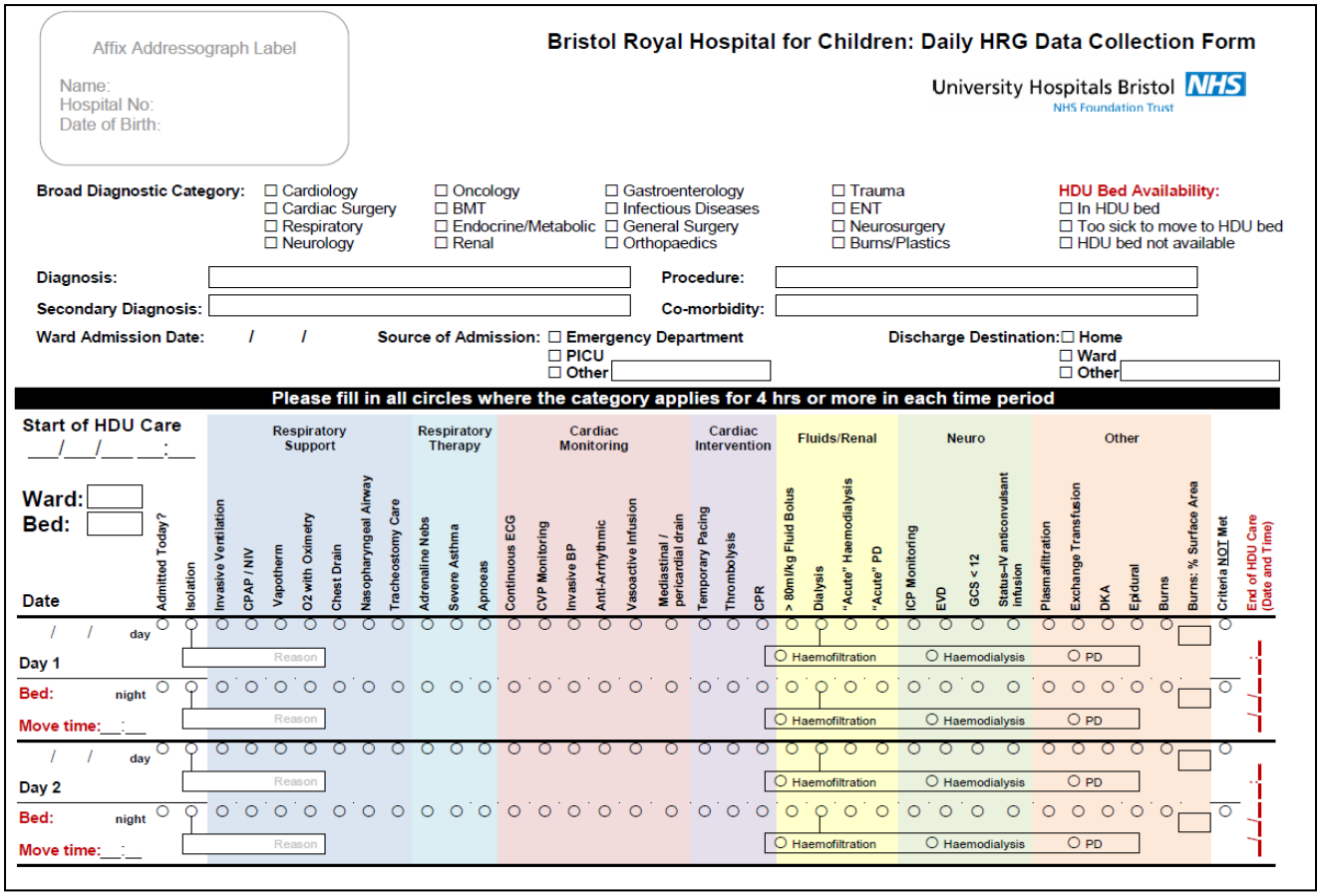
Secondary Diagnosis: ……

Co-morbidities: Prematurity (gestation) Cardiovascular Respiratory
Neurological Chromosomal Undiagnosed Syndrome

Other (specify)

Intensity of HDU care: Please tick all the interventions received during the time patient received HDU care – **4 hours minimum**		
HRG1 Interventions (High Dependency Care Basic)		
62	CVP Monitoring	
09/50/73	Oxygen therapy plus continuous pulse oximetry plus continuous ECG Monitoring	
55	Nasopharyngeal airway	
13	Tracheostomy (cared by nursing staff) (first 7 days of admission only)	
57	Upper airway obstruction requiring nebulised adrenaline	
59	Severe asthma (IV bronchodilator / >1 nebuliser an hour for 4 hours)	
70	DKA requiring continuous insulin infusion	
HRG2 Interventions (High Dependency Care Advanced)		
51	Invasive ventilation via endotracheal tube	
52	Invasive ventilation via tracheostomy tube	
53	Non-invasive ventilation / CPAP	
58	Apnoea requiring Intervention (>3 in 24 hours or IPPV)	
06	Vasoactive infusion (inotrope, vasodilator, prostaglandin)	
64	CPR in last 24 hours	
60	Arterial line monitoring	
74	Isolation / Cubicle	
	Enhanced Care (if satisfies no other criteria)	

Proposed HRG Interventions (High Dependency Care)		
A	Status epilepticus requiring continuous infusion of anti-epileptic drug	
B	Arrythmia requiring IV anti-arrythmic	
C	Reduced conscious level (GCS<12) and hourly (or more frequent) GCS monitoring for at least 6 hours	
D	Epidural	



Affix Addressograph Label

Name:
Hospital No:
Date of Birth:

Bristol Royal Hospital for Children: Daily HRG Data Collection Form

University Hospitals Bristol NHS
NHS Foundation Trust

Broad Diagnostic Category: ☐ Cardiology ☐ Cardiac Surgery ☐ Respiratory ☐ Neurology ☐ Oncology ☐ BMT ☐ Endocrine/Metabolic ☐ Renal ☐ Gastroenterology ☐ Infectious Diseases ☐ General Surgery ☐ Orthopaedics ☐ Trauma ☐ ENT ☐ Neurosurgery ☐ Burns/Plastics

HDU Bed Availability: ☐ In HDU bed ☐ Too sick to move to HDU bed ☐ HDU bed not available

Diagnosis: **Procedure:**

Secondary Diagnosis: **Co-morbidity:**

Ward Admission Date: / / **Source of Admission:** ☐ Emergency Department ☐ PICU ☐ Other **Discharge Destination:** ☐ Home ☐ Ward ☐ Other

Please fill in all circles where the category applies for 4 hrs or more in each time period

Start of HDU Care ___/___/___ __:__

Ward: **Bed:**

Date	Admitted Today?	Isolation	Respiratory Support: Invasive Ventilation	CPAP / NIV	Vapotherm	O2 with Oximetry	Chest Drain	Nasopharyngeal Airway	Tracheostomy Care	Respiratory Therapy: Adrenaline Nebs	Severe Asthma	Apnoeas	Cardiac Monitoring: Continuous ECG	CVP Monitoring	Invasive BP	Anti-Arrhythmic	Vasoactive Infusion	Mediastinal / pericardial drain	Cardiac Intervention: Temporary Pacing	Thrombolysis	CPR	Fluids/Renal: > 80ml/kg Fluid Bolus	Dialysis	"Acute" Haemodialysis	"Acute" PD	Neuro: ICP Monitoring	EVD	GCS < 12	Status–IV anticonvulsant infusion	Other: Plasmafiltration	Exchange Transfusion	DKA	Epidural	Burns	Burns: % Surface Area	Criteria NOT Met	End of HDU Care (Date and Time)
/ / day	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	☐	○	
Day 1			Reason																			○ Haemofiltration				○ Haemodialysis				○ PD						
Bed: night	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	☐	○	
Move time:__:__			Reason																			○ Haemofiltration				○ Haemodialysis				○ PD						
/ / day	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	☐	○	
Day 2			Reason																			○ Haemofiltration				○ Haemodialysis				○ PD						
Bed: night	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	☐	○	
Move time:__:__			Reason																			○ Haemofiltration				○ Haemodialysis				○ PD						

Form used at Bristol Children's Hospital

Patient details *(or hospital label)*

Family name

First name

Address

Postcode

NHS number *(or CHI number)*

☐ Tick if patient is not eligible for NHS no.

Case note number

Date of birth *(dd/mm/yyyy)*

/ /

Indicate if date of birth is

☐ Estimated ☐ Anonymised ☐ Unknown

Sex

☐ Male ☐ Female ☐ Ambiguous ☐ Unknown

Ethnic category *(refer to categories on back page)*

GP practice code

Gestational age at delivery *(if patient is under 2 years old)*

weeks

Birth order **Multiplicity**

of

Admission details

Date and time of admission to unit *(dd/mm/yyyy)*

/ / 20 :

Admission number

Type of admission to unit

☐ Planned – following surgery
☐ Unplanned – following surgery
☐ Planned – other
☐ Unplanned – other

Previous admission *(during current hospital stay)*

☐ ICU
☐ PICU
☐ NICU
☐ None
☐ Unknown

Source of admission

☐ Same hospital ☐ Clinic
☐ Other hospital ☐ Home

Care area admitted from *(includes transfers in)*

☐ X-ray / endoscopy / CT scanner ☐ ICU / PICU / NICU
☐ Recovery only ☐ Ward
☐ HDU (step up/step down unit) ☐ Theatre and recovery
☐ Other intermediate care area ☐ A & E

Retrieval / transfer

☐ Yes ☐ No

Diagnoses and procedures

Primary diagnosis for this admission:

Other reasons for this admission:

Operations and procedures performed during this admission:

Co-morbidity:

Daily interventions

Please record all interventions given on each day of admission using a cross ☒.
If no interventions given, choose "No defined critical care activity".

Admission date:

			Day 0	1	2	3	4	5	6	7	8	9	10	11	12	13
Basic	No defined critical care activity	Code 99														
	Continuous ECG monitoring	50														
	Continuous pulse oximetry	73														
Airway and ventilatory	Invasive ventilation via endotracheal tube	51														
	Invasive ventilation via tracheostomy tube	52														
	Non-invasive ventilatory support	53														
		~~56~~														
		~~56~~														
	Nasopharyngeal airway	55														
	Tracheostomy cared for by nursing staff	13														
	Supplemental oxygen therapy (irrespective of ventilatory state)	09														
	Upper airway obstruction requiring nebulised adrenaline (epinephrine)	57														
	Apnoea requiring intervention (>3 in 24 hours or need for bag-mask ventilation)	58														
	Acute severe asthma requiring IV bronchodilator therapy or continuous nebuliser	59														
Cardio-vascular		~~60~~														
	External pacing	61														
		~~62~~														
	Continuous infusion of inotrope, vasodilator or prostaglandin	06														
	Bolus IV fluids (>80 ml/kg/day) in addition to maintenance IV fluids	63														
	Cardio-pulmonary resuscitation	64														
		~~65~~														
		~~65~~														
		~~65~~														
Renal	Peritoneal dialysis	05														
	Haemofiltration	16														
	Haemodialysis	66														
	Plasma filtration	67														
	Plasma exchange	67														
		~~68~~														
		~~69~~														
Metabolic	Diabetic ketoacidosis (DKA) requiring continuous infusion of insulin	70														
Other	Exchange transfusion	04														
	Intravenous thrombolysis	71														
		~~72~~														
	Patient nursed in single occupancy cubicle (*state reason for isolation below†*)	†74														
		~~X841~~														
		~~X842~~														

†If patient nursed in single occupancy cubicle, state reason for isolation

Illness severity

*Applies to observations recorded within **one hour after admission**. Always use the first recorded measurement during this time period.*

Is evidence available to assess past medical history?

☐ Yes ☐ No

If yes, tick all that apply

- ☐ Cardiac arrest before admission
  - ☐ Cardiac arrest OUT of hospital
- ☐ Cardiomyopathy or myocarditis
- ☐ Severe combined immune deficiency
- ☐ Hypoplastic left heart syndrome
- ☐ Leukaemia or lymphoma after first induction
- ☐ Liver failure main reason for admission
- ☐ Admitted following cardiac bypass
- ☐ Spontaneous cerebral haemorrhage
- ☐ Neurodegenerative disorder
- ☐ Human Immunodeficiency Virus (HIV)

Day 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55

99
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73

51
52
53
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60
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63
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04
71
72
†74

X841
X842

Tracheostomy

Was a tracheostomy performed during this admission?

☐ Yes ☐ No

Illness severity *(continued)*

Systolic blood pressure

☐☐☐ mmHg

Blood gas measured

☐ Yes ☐ No

Arterial PaO_2

☐☐ . ☐☐ kPa OR

Arterial PaO_2

☐☐☐ mmHg

FiO_2

☐ . ☐☐

At the time of arterial PaO_2 sample

Intubation

☐ Yes ☐ No

Headbox

☐ Yes ☐ No

Base excess *(arterial/capillary)*

☐ ☐☐ . ☐ mmol/l

Lactate *(arterial/capillary/venous)*

☐☐ . ☐☐ mmol/l

Mechanical ventilation

☐ Yes ☐ No

CPAP *(include mask, nasal, and negative pressure ventilation)*

☐ Yes ☐ No

Pupil reaction

☐ Both fixed and dilated

☐ Other reaction

☐ Unknown

Discharge information

Status at discharge from your unit

☐ Alive ☐ Dead

Discharged for palliative care

☐ Yes ☐ No

Date and time of discharge *(dd/mm/yyyy hh:mm)*

☐☐ / ☐☐ / 2 0 ☐☐ ☐☐ : ☐☐

Date and time of death *(dd/mm/yyyy hh:mm)*

☐☐ / ☐☐ / 2 0 ☐☐ ☐☐ : ☐☐

Destination following discharge from your unit

☐ Normal residence
☐ Hospice
☐ Same hospital
☐ Other hospital

→

☐ ICU
☐ PICU
☐ NICU
☐ HDU
☐ SCBU
☐ Ward
☐ Other

Comments

Form completed by

Ethnic categories

White – British, Irish, Any other White background*

Mixed – White and Black Caribbean, White and Black African, White and Asian, Any other mixed background*

Asian or Asian British – Indian, Pakistani, Bangladeshi, Any other Asian background*

Black or Black British – Caribbean, African, Any other Black background*

Chinese

Any other ethnic group*

Not stated – if the patient had been asked and had declined

Unknown – if the patient had not been asked

* Specify ethnicity alongside category

Appendix 11. Draft service specification for Level 1 (Basic) and Level 2 (Intermediate) paediatric critical care.

E07/S/B

NHS STANDARD CONTRACT
FOR PAEDIATRIC CRITICAL CARE

PARTICULARS, SCHEDULE 2 – THE SERVICES, A - SERVICE SPECIFICATIONS

Service Specification No.	
Service	Paediatric Critical Care – (previously known as High Dependency Care)
Commissioner Lead	
Provider Lead	
Period	12 months
Date of Review	

1. Population Needs

1.1 National/local context and evidence base

Paediatric High Dependency Care (HDC) has been the term used to describe the provision of close observation, monitoring and specific therapies to critically ill children which is beyond the capability of a general paediatric ward.

Entry into HDC is governed by the degree of physiological instability as much as by diagnosis.

A recent report from RCPCH / PICS / RCN has highlighted a number of restrictions and limitations that arise from use of the term HDC, not least that it fails to discriminate the critically ill child requiring close observation and monitoring from a child who is not critically ill but requires enhanced nursing supervision for other reasons.

A change in terminology has been proposed by RCPCH/PICS/RCN, along with a number of other recommendations, which have been incorporated into this service specification.

One of the key recommendations of the report is to recognise the complete critical care pathway, including that part of the patient pathway which occurs outside of a Paediatric Intensive Care Unit (PICU).

Three levels of critical care support are described – Level 1 (basic HRG) Level 2 (intermediate HRG) and Level 3 (advanced 1-5 HRGs) critical care. Level 1 and Level 2 Critical Care will replace the previous terms of Basic and

Advanced High Dependency Care, while Level 3 Critical Care describes activities which can only be undertaken in a PICU.

Critical care activities will be undertaken in paediatric critical care units and these units will be designated by their paediatric critical care Operational delivery Network (PCC ODN) as either Level 1, Level 2 or Level 3 units. Level 3 units are PICUs and have a separate service specification document.

Each hospital Trust that admits children will be able to deliver Level 1 Critical Care activities and support (defined in section 2.3) within a Level 1 paediatric critical care unit.

A more limited number of hospital Trusts will be designated by their PCC ODN to deliver more complex, or prolonged, critical care activities known as Level 2 Critical Care (defined in section 2.3). These will be delivered in a Level 2 paediatric critical care unit.

Level 2 units will exist within tertiary children's hospitals and will be able to provide support for complex specialist paediatric services, but others will be within larger regional hospitals and/or more remote regional hospitals. Each PCC ODN, working closely with commissioners, will be responsible for designating units based on their network requirements.

Children will move along the critical care pathway as their physiological condition stabilises to the point where they can be cared for on a general ward or their condition deteriorates and they require care on a PICU.

Paediatric Critical Care is provided in an identified paediatric critical care setting: i.e. it is not provided on a general Paediatric Ward or an Adult HDU

Paediatric Critical Care occurs in a number of locations:

- Within or alongside a PICU, either as the highest level of care attained by some admissions or else as "step-up" or "step-down" care from an episode of Paediatric Intensive Care.
- In defined paediatric critical care units, associated with other specialist services such as cardiology, burns or specialist surgery, usually in tertiary centres.
- In defined paediatric critical care units that are not associated with specialist services, both within tertiary centres and outside tertiary centres.

Paediatric Critical Care will be provided in a manner in which it is under the clinical governance arrangements of the host Trust but with oversight of a PCC ODN and commissioners.

The PICU service is under particular demand during the bronchiolitis season, which occurs November to January. During this period demand often exceeds capacity with the result that children may be transferred long distances to access care. Adequate provision of paediatric critical care outside of PICUs will improve capacity in the system at this crucial time.

Evidence Base

The Paediatric Intensive Care Audit Network (PICANet) report for 2010 to 2012 [3] shows considerable regional disparity in the use of PICU beds across the country with at the extremes, a two-fold difference between the South West and the North East. It also highlights marked regional variation in the proportion of PICU bed-days that map to a 'high dependency care' Healthcare Resource Group (HRG) rather than a PICU HRG (from 16.0 to 91.5%), and in the proportion of children who require mechanical ventilation (a proxy for complexity of care)(37.2 to 91.0%). It is likely that local and regional differences in the provision of adequate critical care provision outside of PICU contribute to this variation.

A number of excellent regional audits in England and a national audit in Scotland have provided an estimate of the numbers of children who meet HDC criteria. A limitation however has been that a different tool has been used in each audit to define HDC, making a reliable estimate of the numbers meeting the latest definitions difficult.

Data from the South West, South Central and the West Midlands regions using the Paediatric Critical Care Minimum Care Dataset (PCCMDS) and the Paediatric Critical Care HRG classification suggest that at any one time around 4-8% of hospitalised children will meet criteria for Critical Care.

The West Midlands study found that children meeting HDC HRG criteria consumed significantly more staff time than other ward patients (approximately 2.5 fold increase) and demonstrated greater physiological derangement on Paediatric Early Warning Score (PEWS) monitoring. These findings suggest that the existing PCCMDS and HRGs are able to identify a group of children needing more staff input and consuming more resources, highlighting the importance of additional funding following the activity.

A number of Trusts who deliver this activity without a co-located PICU are already submitting their activity through the Secondary Users Service (SUS) and submitting Reference Costs for the activity.

Implementation of the RCPCH/PICS/RCN recommendations and robust commissioning of all paediatric critical care activity is likely to result in a shift in activity demographics over time, with an increase in the volume of Level 1 and Level 2 critical care that is undertaken in Level 1 and Level 2 paediatric critical care units alongside a reduction in the volumes undertaken in PICUs. It is estimated that improved provision of critical care support outside of PICUs could release upward of 10,000 PICU bed days each year (RCPCH 2014).

Commissioning will need to ensure that funding resources are used appropriately to encourage delivery of critical care support at the most appropriate location. A reduction in the volumes delivered within PICUs will free up much needed PIC capacity, as well as providing resources to support paediatric critical care unit activity

http://webarchive.nationalarchives.gov.uk/+/www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4010058

http://www.isb.nhs.uk/library/standard/174

http://www.picanet.org.uk/Documents/General/Annual_Report_2013/PICANet_Annual_Report_2013_Summary.pdf

http://www.picanet.org.uk/:.Documents/General/SWACIC%20Report%202001%20-%202010%20Final%20Version%2020%2002%2012.pdf

2. Scope

2.1 Aims and objectives of service

This Service aims to provide high quality Paediatric Critical Care (PCC) as close to home as possible which meets the standards set out in national guidance for:

- Critically ill children whose severity of illness does not require acute invasive ventilation or intensive care.
- The care of long term ventilated children, either while waiting for discharge to the community or during treatment of episodes of intercurrent illness.

The PCC Service will achieve these aims by:

- Admitting children for care in designated PCC beds aligned to the PICU service or in designated PCC beds outside the PICU / regional children's unit(s). These PCC facilities will operate as part of a Paediatric Critical Care Operational Delivery Network (PCC ODN)
- Facilitating both the avoidance of admission to PICU and rapid repatriation to a "network" PCC facility where that is safe and appropriate
- Avoiding unnecessary transfer for the child to a regional centre where appropriate care can be delivered more locally
- Reducing disruption and costs to parents of travel and support
- Enabling improved capacity at regional centres, therefore improving access for other critically ill children

The Failure to provide adequate PCC facilities has the following consequences:

- Children are transferred to regional centres at levels of illness that could be managed locally, with unnecessary disruption for families and cost and capacity issues for both the regional centres and their transport services.
- Some children have the level of care escalated simply to facilitate safe transfer because of a lack of local facilities.
- Children remain in regional centres for longer than is necessary because there is inadequate provision of PCC support (sufficient staff with the relevant competencies and appropriately equipped beds) to facilitate discharge from PICU at the end of an episode of care.

2.2 Service description/care pathway

There are two principal requirements for PCC capacity – in the care of critically ill children and in the care of the long-term ventilated (LTV) child. A number of models of care exist for care of the latter group but there are large regional differences in how care is delivered. As a consequence, and to support earlier discharge of these children out of the regional centres and closer to home, LTV has been included as a distinct entity within the PCC classification.

Critically Ill Children

Critically ill children can present to any hospital which admits children. At presentation they are assessed and stabilised. On-going care depends on the level of intervention required following stabilisation and on the hospital's capacity to provide it. They may require:

- General ward care which is provided in every DGH
- Level 1 critical care which should be provided in every DGH (within a level 1 unit)
- Level 2 critical care, which can be provided in tertiary paediatric centres, either within PICU or on a Paediatric Critical Care Unit (level 2 unit), or in larger DGHs on a Paediatric Critical Care Unit (Level 2 unit).
- Level 3 critical care, which is usually provided in a regional PICU but can occasionally occur in an Adult ICU.

Historically the commissioning of HDC / level 1 critical care has fallen to PCTs whilst commissioning of PIC and some advanced HDC/ Level 2 critical care was supported through SCTs. As a result in the first instance it is anticipated that NHS England will only commission those critical care activities undertaken within PICUs and Level 2 PCCUs, provided they meet the definitions below.

However, discrete and clear commissioning of critical care activities undertaken in Level 1 units will be required to support Trusts in meeting the enhanced expectations and standards required to deliver this activity. Failure to recognise and fund this activity could jeopardise the optimum functioning of a PCC ODN and continue to encourage the transfer of children away from their local hospital when care could be provided there.

General ward provision is outside the scope of this Service Specification.

Long Term Ventilation

The numbers of children requiring invasive LTV are increasing by the year. Their care is often initiated in a PICU or neonatal unit. Discharge to home may be a protracted process, often requiring multi-agency involvement, adaptations to the home or rehousing and the recruitment and training of a care team. In many areas, care continues to be provided in the regional centre while this process is taking place. This typically involves disruption and travel for the family, may incur substantial cost to the commissioner and may reduce critical care capacity in PICU.

Provision of enhanced PCC facilities in some DGHs will enable earlier discharge so

care of these children will take place closer to home, will enhance the skills of the DGH staff and will enable staff and family to become familiar with each other. The child may then be admitted to their local hospital (with a Level 2 unit) for the treatment of some intercurrent illnesses.

2.3 Definitions

A list of interventions that define PCC were described within the Paediatric Critical Care Minimum Dataset (PCCMDS). Further work has shown these to be inadequate to fully describe the work undertaken in PCCUs and modifications to PCCMDS have been requested. The proposed definitions to be used to commission PCC activity are shown below (which take into account these modifications):

Level 1 Critical Care Definitions:

= Level 1 unit interventions (note: can also be undertaken in a **Level 2** unit.)

- Oxygen therapy AND pulse oximetry AND ECG (electrocardiography) monitoring (includes Nasal High Flow Oxygen Therapy)
- Arrhythmia requiring intravenous anti-arrhythmic
- Diabetic Ketoacidosis requiring continuous infusion of insulin
- Severe Asthma requiring intravenous bronchodilator therapy
- Reduced consciousness level (Glasgow Coma Scale (GCS) 12 or below) AND hourly (or more frequent) GCS monitoring
- Upper airway obstruction requiring nebulised adrenaline
- Apnoea

Level 2 Critical Care Definitions:

= Level 2 unit interventions

- Any of the above where there is a failure to respond to treatment as expected and/or the requirement for intervention persists for > 24 hours
- Cardiopulmonary resuscitation (CPR) in past 24 hours
- Nasopharyngeal airway
- Acute non-invasive ventilation, including continuous positive airway pressure (CPAP) and bi-level positive airway pressure (BIPAP)
- >80 mls/kg fluid bolus in 24 hours
- Status epilepticus requiring treatment with continuous intravenous (IV) infusion (e.g. midazolam)
- Arterial line
- Central venous pressure monitoring
- Epidural
- Care of tracheostomy (first 7 days of admission)
- Inotropic / vasopressor treatment
- Acute cardiac pacing
- Intravenous thrombolysis

- Acute renal replacement therapy (CVVH (continuous veno venous haemofiltration) or HD (haemodialysis) or PD (peritoneal dialysis)
- ICP (intracranial pressure) monitoring or EVD (external ventricular drain)
- Exchange transfusion
- Plasma exchange
- MARS (liver) therapy
- Invasive ventilation of the Long Term Ventilated Child via a tracheostomy

It is not expected that every Level 2 unit will be able to deliver all Level 2 critical care interventions. Some will predominantly be undertaken in specialist children's hospitals. As a minimum however every general Level 2 unit within a regional hospital will be expected to be able to provide non-invasive ventilation support (CPAP and BIPAP) to infants and children with respiratory failure, and to be able to care for a child requiring mechanical ventilation via a tracheostomy. It will be the responsibility of each PCC ODN, working with commissioners, to determine what interventions are supported at each unit within the network.

The service will additionally follow the standards and criteria outlined in the general specification for specialised children's services (attached as Annex 1 to this Specification).

General Paediatric care

When treating children, the Service will additionally follow the standards and criteria outlined in the Specification for Children's' Services

2.3 Population covered

The service outlined in this specification is for patients ordinarily resident in England*; or otherwise the commissioning responsibility of the NHS in England (as defined in Who Pays?: Establishing the responsible commissioner and other Department of Health guidance relating to patients entitled to NHS care or exempt from charges).

Note: for the purposes of commissioning health services, this EXCLUDES patients who, whilst resident in England, are registered with a GP Practice in Wales, but INCLUDES patients resident in Wales who are registered with a GP Practice in England.

Specifically this service is for critically ill children whose care needs

- exceed the capacity of a general ward
- and do not meet the criteria for PICU - defined as meeting one of the Advanced Paediatric Critical Care HRG levels.

Paediatric critical care services shall be available to all critically ill children from the point of discharge from maternity or a neonatal unit until their 16th birthday. On occasion, it is appropriate for young people beyond their 16th birthday to be cared for in paediatric facilities, either because their underlying disease process is predominantly paediatric or because of their stage of physical or emotional

development.

Some providers have policies in which patients up to the 19th birthday are classified as children / young people. In the case of these providers PCCUs will accept patients up to their 19th birthday.

Children are also admitted to PCC directly from a neonatal unit.

2.4 Any acceptance and exclusion criteria

Acceptance Criteria

The PCC service will accept referrals inward from secondary care clinicians. Children will be under the care of a consultant paediatrician with relevant training and experience in PCC. Note that the training competencies required to provide support to a Level 2 unit are described in detail in the RCPCH/PICS/RCN (2014) document

- The service will accept referrals from providers within their Paediatric Critical Care Network, including general and specialist paediatric wards, emergency departments, children's assessment units, neonatal units and PICUs.
- The service will also accept referrals from other providers of Paediatric Critical Care Services, either to provide specialist care that is not available in the referring unit, or to enable care to be delivered closer to the patient's home.

Criteria for referral
Level 1 unit
The service will accept referrals for children who meet the criteria for Level 1 Critical Care.

Level 2 unit
The service will accept referrals for children who meet the following criteria:
- Level 1 critical care requirement that has persisted for more than 24 hours, or is not responding as expected.
- Level 2 critical care requirement.

In addition a Level 2 unit would be expected to admit children from within the same hospital as soon as they meet the criteria for Level 1 critical care (assuming there is not a co-located Level 1 unit within the same hospital).

Patients will be accepted subject to capacity. Where demand exceeds capacity a network-wide process of prioritisation will be required and will be the responsibility of the PCC ODN to draw up a Standard Operating Procedure for this eventuality.

In addition, in order to qualify for provision of PCC service providers will:
- Meet the relevant PICS Standards (2010).
- Meet the RCPCH/PICS/RCN standards (2014).
- Submit PCCMDS data to the Secondary Users Service (SUS)
- Submit relevant Reference Costs each year

- Be a member of a Paediatric Critical Care Network
- Audit activity within their PCC unit and submit data both to their PCC ODN and through PICANet.

Exclusions

- Adults
- Infants who have not been discharged from a neonatal unit.
- Children cared for within an adult/general critical care unit or within ED or within theatres
- Children cared for outside of a designated paediatric critical care unit

2.5 Interdependencies with other services

Interdependencies in PCC depend on the designated level of the unit, site and speciality coverage.

For a Level 1 unit the following services must be co-located (i.e. available 24/7 on the same hospital site.)

- General Paediatrics
- Anaesthesia

For a Level 2 PCC unit in a DGH the following services must be co-located (i.e. available 24/7 on the same hospital site.)

- General Paediatrics
- Anaesthesia
- ENT surgery

For PCC in a specialist or tertiary centre the dependencies are defined within the PICS standards document.

3. Applicable Service Standards

3.1 Applicable national standards e.g. NICE, Royal College

3.1.1 Core Standards	Providers will need to meet the general obligations for the provision of paediatric services as outlined in the National Service Framework[5] and "*Commissioning Safe and Sustainable specialised paediatric services: a framework of critical inter- dependencies Department of Health* (DH) 2008[6]").
	Standards for the provision of Paediatric High Dependency Care have been published by the Paediatric Intensive Care Society (Paediatric Intensive Care Society - Standards 2010[7] PICS) and are being updated by a group convened with the Royal College of Paediatrics / RCN.

References:

- http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_4090552.pdf
- http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_088068
- http://www.ukpics.org.uk/documents/PICS_standards.pdf

4. Key Service Outcomes

Provision of a PCC service will:

- Maximise the numbers of children that can receive care in their local hospitals.
- Reduce the numbers of ventilated and non-ventilated admissions to PICU.
- Encourage earlier discharge from PICU for 'step-down' care
- Improve the capacity of the PICU service, which can be measured by a combination of PICANET data and the services" quality dashboard:
  - Reduced refusal rate.
  - Fewer cancellations of elective surgery
  - Fewer "out-of-catchment" transfers
  - Reduced bed occupancy
- A reduced number of days that long term ventilation (LTV) patients remain in tertiary centres if these are not their local hospitals.

Appendix 12: Abbreviations

BLS	Basic Life Support
CCT	Certificate of Completion of Training
CCG	Clinical Commissioning Group
CC	Critical Care
CPAP	Continuous Positive Airway Pressure
CPD	Continuing Professional Development
CRG	Clinical Reference Group
EWG	Expert Working Group
HDC	High Dependency Care
HQIP	Health Quality Improvement Partnership
HRG	Healthcare Resource Group
LAT	Local Area Team
LTV	Long-Term Ventilation
ODN	Operational Delivery Network
PbR	Payment by Results
PCC	Paediatric Critical Care
PCCMDS	Paediatric Critical Care Minimum Care Dataset
PCCU	Paediatric Critical Care Unit
PEWS	Paediatric Early Warning Score
PIC	Paediatric Intensive Care
PICS	Paediatric Intensive Care Society
PICANet	Paediatric Intensive Care Audit Network
PICU	Paediatric Intensive Care Unit
QAA	Quality Assurance Accredited
RCPCH	Royal College of Paediatrics and Child Health
SCT	Specialised Commissioning Team
SUS	Secondary User Service
SWACIC	South-West Audit of Critically Ill Children

Appendix 13. Full list of recommendations.

Each recommendation is colour coded to reflect the expected timescale for implementation.

	Implemented within 1 year (end 2015)
	Implemented within 3 years (end 2017)
	Implementation may take 3+ years (end 2018)

Terminology		
1.		The terms Level 1, Level 2 and Level 3 critical care should be used to describe escalating levels of critical care, with Level 1 and Level 2 care capturing activity that would previously be described as High Dependency Care.
2.		The term High Dependency Care should no longer be used to describe a level of care. For the child who requires considerable staff input but who is not critically ill the term 'high nurse dependency' should be used.
3.		All hospitals admitting children should be able to deliver Level 1 CC in a defined critical care area, classified as a Level 1 paediatric critical care unit (PCCU).
4.		A more limited number of hospitals should be designated as Level 2 PCCUs and be able to Level 2 CC (as well as Level 1 CC) to children within a defined critical care area.
5.		A Level 2 PCCU within a regional hospital should be able to deliver acute (and chronic) non-invasive ventilatory support, and be able to care for a child on long term ventilation via a tracheostomy.
Definitions		
6.		The Paediatric Critical Care Minimum Care Dataset (PCCMDS) should be used to define the interventions that map to Level 1, 2 and 3 CC.
7.		The PCCMDS should be reviewed regularly by the HRG Expert Working Group and modified as required to ensure it remains a valid tool. It is imperative that additional interventions identified by the EWG are added to PCCMDS and the HRG Grouper so that CC activity can be accurately measured.
8.		The body responsible for supporting updates to PCCMDS and the PCC HRGs should be identified. This would include providing the funds required to allow updates.
9.		The current system of 7 critical care Healthcare Resource Groups (HRGs) should continue to be used (Basic, Intermediate, Advanced [5 levels]), with Basic and Intermediate critical care HRGs describing activities that are undertaken in Level 1 and Level 2 units respectively.
Networks		
10.		Operational Delivery Networks (ODNs) for paediatric critical care should be established. Many of the recommendations contained in this report will not be deliverable without a paediatric critical care ODN.
11.		Each Paediatric Critical Care ODN should have responsibility for Level 1, 2 and 3 CC, long term ventilation (LTV), retrieval/transport and ECMO services within its network (and beyond where relevant).
12.		Each PCC ODN, working with commissioners, should agree the designation of Level 1, Level 2 and Level 3 PCCUs within their network.
13.		Each PCC ODN, working with commissioners and host providers, should be responsible for monitoring adherence to critical care standards.
14.		Each PCC ODN should mandate PCCMDS data collection and submission to Secondary Users Service (SUS) and PICANet from both Level 1 and Level 2 units within their network to allow them to monitor activity and outcomes.

15.		Each PCC ODN, working with commissioners and host providers, will be responsible for the labelling or 'badging' of the PCCUs within its network, that is to say the terms to be used on the sign above the door.
Clinical pathways		
16.		Each PCC ODN should develop clear guidelines and agree clinical pathways to ensure that patient care is co-ordinated and provides equity of access to PCC services.
17.		This should include trigger points for discussing the case with the network transport service for potential escalation of critical care support.
18.		A single standardised paediatric early warning score or system should be used across all paediatric wards and PCCUs within a PCC ODN.
Advice/Triage/Transportation		
19.		Existing paediatric critical care transport services, should be responsible for providing advice, decision support and triage to their critical care ODN, to include children receiving Level 1 and level 2 critical care.
20.		A paediatric critical care transport service should be responsible for co-ordinating and undertaking the transfer of a child to Level 2 and Level 3 PCCUs.
21.		The same standards (staff, training, equipment) expected of teams transporting patients to a Level 3 unit (PICU) will apply to the transport of children to Level 2 units (PICS Standards 2010).
Workforce - general		
22.		Staff working in a Level 1 PCCU should meet the relevant training competencies laid out in this document.
23.		Staff working in a Level 2 PCCU should meet the relevant training competencies laid out in this document. Staff working in a specialty-specific Level 2 PCCU must also meet all of the level 2 training competencies.
24.		Staff working in Level 1 and Level 2 PCCUs should keep up to date and refresh their knowledge and skills relating to care of the critically ill child. Each member of staff should plan their CPD as part of their annual appraisal/personal development plan.
25.		Paediatric critical care ODNs should ensure that suitable educational and training opportunities are available for staff working in the Level 1 and Level 2 PCCUs in their network. This should include appointment of a critical care nurse educator to support the network.
Workforce – nursing		
26.		A framework of critical care skills is proposed, with Level 2 unit skills set at a higher level to reflect the interventions being delivered and greater patient complexity. These skills should be acquired by staff within 12 months of working in a Level 1 or Level 2 PCCU. The recommendations apply to all PCCUs, including specialty–specific PCC areas within a tertiary children's centre.
27.		Nurses new to critical care should work a minimum of 75 hours of supervised practice in a Level 1/2 critical care area, to gain the essential skills required.
28.		Level 1 unit: there should be a minimum of one nurse on every shift, who is directly involved with caring for the critically ill child, who has successfully completed all the required Paediatric Critical Care (PCC) skills, or has completed an in house education and training programme covering similar learning outcomes. Level 2 unit: there should be a minimum of one nurse on every shift, who is directly involved with caring for the critically ill child, who has successfully completed a validated / accredited education and training programme of study addressing all the required Paediatric Critical Care (PCC) skills to Level 2.

29.		All PCCU staff should have up to date basic life support (BLS) training.
30.		At least one nurse on each PCCU shift should have up to date advanced resuscitation training.
31.		70 % of nursing staff should hold a Qualification in Specialty (Defining Staffing Levels for Children and Young People's Services RCN, 2012).
32.		A course of study should be quality controlled and ideally Quality Assurance Accredited (QAA) for Higher Education. Course content, delivery and assessment should be consistent with the recommendations in Appendix 5.
33.		The recommended nurse:patient ratio for Level 1 and Level 2 PCCUs should be 1:2, though this will be influenced by a number of factors, including patient diagnosis and complexity, severity of illness (PEWS score), and nursing skill-mix and seniority.
Workforce – resident medical (or equivalent) cover		
34.		24/7 middle grade, or equivalent, cover for a Level 1 unit should be provided by a paediatrician in training who has achieved all Level 1 RCPCH competencies and passed the MRCPCH exam (typically ST 4 or above), and has up to date advanced resuscitation training (APLS, EPLS).
35.		24/7 middle grade, or equivalent, cover for a Level 2 unit should be provided by a paediatrician in training who has achieved all Level 2 RCPCH competencies (typically ST6 or above), and has up to date advanced resuscitation training (APLS, EPLS).
36.		Alternative models of providing an equivalent level of cover/competence should be considered. This might include the use of advanced nurse practitioners, specialty doctors, and doctors in training who have already completed a 6 month full time posting in a PICU. On call models based on 24/7 on-site paediatric consultants will also deliver the required level of cover.
37.		The responsibility for assessing and monitoring the level of cover provided for each PCCU should rest with the Trust hosting the PCCU and the relevant paediatric critical care ODN.
38.		There is recognition that some of the proposed staff competency and training standards may prove challenging to achieve in the immediate term. These recommendations should be seen as developmental and a timescale for their adoption should be agreed by each PCC ODN. It is expected that all PCCUs should be compliant by 2018 and beyond.
39.		We recommend RCPCH consider introduction of a separate section within the competency framework to describe competencies pertaining to acute illness and care of the critically ill child.
Workforce – medical – consultant		
40.		We recommend discriminating the level of critical care training and experience expected for Consultant Paediatricians working in hospitals with Level 1 and Level 2 PCCUs.
41.		We recommend no significant change for those appointed to a hospital with a Level 1 PCCU ie the requirement would be a CCT in paediatrics without any specific critical care training beyond that delivered as part of regular run-through training.
42.		We recommend that those providing Consultant cover for a Level 2 PCCU should have undertaken relevant training in paediatric critical care and have enhanced critical care competencies.
43.		We recommend that the competency framework in Appendix 7 (A framework of competence for a Special Study Module in Paediatric Critical Care) be adopted by RCPCH for this purpose.
44.		We recommend that prior to taking up a consultant post in a Level 2 PCCU an individual should have completed a period of 6 months working in PICU as well as 6 months working in a hospital with a Level 2 PCCU.
45.		We strongly recommend flexibility about when the PICU module is delivered. Whilst the goal should be for it to be delivered during run-through

		training it should also be available post-CCT, allowing those who have not had the opportunity to complete a PICU attachment to do so before taking up a consultant post in a centre with a Level 2 PCCU.
46.		These recommendations should be seen as developmental and a timescale for their adoption should be agreed by each PCC ODN. It is expected that general paediatricians appointed to consultant posts in 2018 and beyond will have completed this training.
47.		Existing consultants who provide cover for a Level 2 PCCU are not expected to undertake additional training but should aim to use CPD opportunities to maintain and enhance their knowledge and skills relevant to critical care.
48.		Where a Level 2 PCCU is anaesthesia led the skills and experience of both Consultant and middle-grade anaesthetists fulfilling these roles should be appropriate to the tasks involved and follow the same general principles, standards and competencies described for paediatric staff, supported by appropriate Royal College-based competencies and training modules as appropriate .
49.		Staff working in Level 1 and Level 2 PCCUs should keep up to date and refresh their knowledge and skills relating to care of the critically ill child. Each member of staff should plan their CPD as part of their annual appraisal / personal development plan.
50.		PCC ODNs should ensure that suitable educational and training opportunities are available for staff working in the Level 1 and Level 2 PCCUs in their network. This should include appointment of a critical care nurse educator to support the network.
51.		Anaesthetic staff, general / adult ICU and the ED team are essential components of the critical care pathway and should receive support for their educational and training needs.
Setting standards / defining quality		
52.		The recommendations contained in this report should be used to refine the existing PICS Standards relating to high dependency care.
53.		We recommend development of a service specification and quality dashboard for critical care, to include Level 1 and Level 2 care.
54.		The PCC ODN working closely with commissioners should ensure that the required standards are met, and that the data to inform the quality dashboard are collected.
Audit and governance		
55.		The remit of PICANet should be expanded to include collection of all critical care activity occurring in designated PCCUs. Funding will be required for this to happen. One option would be to add in collection of data from Level 2 PCCUs in the first instance.
56.		Each PCC ODN should co-ordinate the collection of CC activity across all hospitals in the network (Level 1, 2 and 3 PCCUs).
57.		Each PCC ODN should audit all CC activity that occurs within its network.
58.		Each PCC ODN should develop a robust governance structure and monitor performance across all PCCUs in the network. It must ensure that all providers in the network support a) delivery of care and access to treatment in line with local and nationally agreed protocols, b) training and audit requirements of the network, and c) critical incident reporting across the network.
59.		The host of the PCC ODN, together with the Local Area Team, will have responsibility for ensuring the effective functioning of the network, including Level 1 and Level 2 critical care units in the network.
60.		Each PCC ODN should publish an annual report that describes the activity and outcomes of all children meeting critical care criteria.
61.		Each PCC ODN should host educational and training events for staff working in the network and hold an annual meeting to share the performance of the network with all stakeholders and discuss network strategic direction.

62.		Each Trust with a PCCU will be responsible for meeting the required critical care standards as described in the most recent version of PICS Standards for Care of the Critically Ill Child.
63.		Each Trust with a PCCU will be responsible for meeting the required service specification as described by the PCC CRG and for submitting data required by the quality dashboard.
64.		The governance responsibility for the delivery of safe, high quality CC services across the network should lie principally with the individual service providers, supported by the Local Area Team and the host of the PCC ODN.
Commissioning and funding		
65.		We recommend that the commissioning of all paediatric CC activity should be hosted by one agency to avoid the commissioning disconnects of the past. We recommend that this be NHS England rather than CCGs.
66.		Should CCGs and NHS England remain responsible for commissioning different components of the critical care pathway it would be helpful if one agency had oversight of the whole pathway, most logically NHS England.
67.		A service specification and quality dashboard should be developed and refined for Level 1 and Level 2 PCCUs and should be implemented as soon as possible.
68.		Every designated PCCU should collect the PCCMDS and return their activity through the SUS.
69.		Every designated PCCU should return Reference Costs for Basic, Intermediate and Advanced CC HRGs on an annual basis.

Appendix 14: Drugs and equipment for critical care areas

Immediate Drug Availability

Adenosine	3mg/ml
Adrenaline	1:10,000
Adrenaline	1:1,000
Aminophylline	25mg/ml
Amiodarone	50mg/ml
Antibiotics according to local microbiology protocols	
Atracurium	10mg/ml
Atropine sulphate	Check Label – variations.
Calcium Gluconate 10%	100mg/ml
Chlorphenamine	10mg/ml
Dextrose 10%	
Diazepam inj.	5 mg/ml
Dinoprostone (prostaglandin E2)	1microg/ml
Dobutamine	250mg vials
Dopamine	40mg/ml
Flumazenil	100mcg/ml
Frusemide	20mg/ml
Hydrocortisone injection	
Ketamine	10mg/ml
Lidocaine 1%	10/mgml
Lorazepam inj.	4 mg/ml
Mannitol	10% and 20%
Midazolam	5mg/ml
Morphine	10mg/ml
Naloxone	400mcg/ml

Nebulisable beta-agonist (salbutamol or terbutaline)	(Various preparations)
Nebulised Budesonide	250 or 500 microg/ml
Noradrenaline	2mg/ml
Paraldehyde	Neat or dissolved in olive oil. Check Label.
Phenytoin sodium	50mg/ml
Propranolol	1mg/ml
Rectal diazepam	5mg and 10mg
Rocuronium	10mg/ml
Salbutamol inj.	500 mcg/ml
Sodium Bicarbonate	4.2% and 8.4%
Sodium Chloride (HYPERTONIC)	3% or 5% (For raised ICP)
Suxamethonium	100mg/2ml
Thiopental	500mg vials powder (mix with 20ml water)

Equipment List	For Critical Care area	
General Items		
	Level 1	Level 2
Dry White board and markers	•	•
Advanced Paediatric Life Support algorithms	•	•
Organized emergency trolley	•	•
Printed drug doses/tape	•	•
Weighing scale	•	•
Heating source (for infant warming)	•	•
Clock	•	•
Monitoring Equipment		
ECG monitor & defibrillator with paediatric paddles 0–400 joules and hard copy capabilities	•	•
Pulse oximeter (adult/paediatric probes)	•	•
Noninvasive blood pressure monitoring (infant, child, adult cuffs)	•	•
Rectal thermometer probe (28–42ºC)	•	•
Otoscope, ophthalmoscope, stethoscope	•	•
Cardiopulmonary monitor	•	•
Invasive arterial and central venous pressure transducers & connections		•
Portable capnograph		•
Arterial/capillary blood glucose monitor	•	•
Access to blood gas machine	•	•
Access to 12 lead ECG	•	•
Airway Control/Ventilation Equipment		
Bag-valve-mask device: paediatric (500 mL) & adult (1000/2000 mL) with oxygen reservoir bags	•	•

Infant, child, and adult masks	•	•
Oxygen delivery device with flow meter	•	•
Clear oxygen masks, standard and	•	•
non-rebreathing (neonatal, infant, child, adult)		
Nasal cannulae (infant, child, adult)	•	•
Oral airways (sizes 0–5)	•	•
Suction devices-catheters 6–14 FG Yankauer-tip	•	•
Nasal airways (infant, child, adult)		•
Nasogastric tubes (sizes 6-16 fr)	•	•
Laryngoscope handle and blades: Macintosh curved		•
2,3; Robertshaw/Seward straight 1,2		
Endotracheal tubes + tape for securing:		•
uncuffed (2.5-5.5), cuffed (3.0-9.0)		
Stylets for endotracheal tubes (paediatric, adult)		•
Lubricant, water soluble		•
Magill forceps (various sizes)		•
Laryngeal masks (size 0–3)		•
Tracheal guide		•
Tracheostomy tubes (Sizes 3-6mm ID)		•
Oxygen blender		•
Ventilators (capable down to 5 Kg Infant)		•
Chest drain set		•
Cricoidotomy set		•
Vascular Access		
Butterflies (19–25 gauge)	•	•
Needles (18–27 gauge)	•	•
Intraosseous needles	•	•
Catheters for intravenous lines	•	•

(16–24 gauge)		
IV administration sets and extension tubing	•	•
with calibrated chambers		
Paediatric infusion pumps	•	•
Syringe drivers	•	•
I.V. fluids	•	•
Lumbar puncture set	•	•
Urinary catheters: Foley 6–14 Fr	•	•
Fracture immobilisation		
Cervical Collar (hard) Various Sizes	•	•
Head blocks & Tape		•
Femur & Pelvic splint		•
Extremity splints		•

The following equipment should be available in all services providing care for children and young people needing long-term ventilation.

For each child:

Level 1 Care

- One ventilator

Level 2 Care

- Two ventilators
- One back-up battery
- One SATS monitor
- One hand-held monitor
- Ambu-bag

Level 3 Care

- Two ventilators
- Two back-up batteries
- Two SATS monitors
- One hand-held monitor
- Ambu-bag
- Mobile phone and access to a land-line

Condition-Dependant

- Tracheostomy kit
- Humidification
- Call systems
- Oxygen
- Nebuliser
- Suction
- Profiling Bed

All children:

- Physiotherapy equipment as advised for the child
- Chairs for staff
- Back-up lighting
- Access to a phone

Additional equipment that may be required:

- Sleep system
- Video monitoring to watch the child while staff or parents are out of the room
- Consumables
- Storage
- Wheelchair

High (Level1):	Is able to breathe unaided during the day but needs to go onto a ventilator for supportive ventilation. The ventilation can be discontinued for up to 24 hours without clinical harm.
Severe (Level2):	Requires ventilation at night for very poor respiratory function; has respiratory drive and would survive accidental disconnection, but would be unwell and may require hospital support.
Priority (Level3):	This includes those with no respiratory drive at all who are dependent on ventilation at all times, including those with no respiratory drive when asleep or unconscious who require ventilation and one-to-one support while asleep, as disconnection would be fatal.

Taken from WMQRS Quality Standards for services providing long-term ventilation for children and young people (2013).