



Executive Summary: Criteria for Critical Care of Infants and Children: PICU Admission, Discharge, and Triage Practice Statement and Levels of Care Guidance

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This is an executive summary of the 2019 update of the 2004 guidelines and levels of care for PICU. Since previous guidelines, there has been a tremendous transformation of Pediatric Critical Care Medicine with advancements in pediatric cardiovascular medicine, transplant, neurology, trauma, and oncology as well as improvements of care in general PICUs. This has led to the evolution of resources and training in the provision of care through the PICU. Outcome and quality research related to admission, transfer, and discharge criteria as well as literature regarding PICU levels of care to include volume, staffing, and structure were reviewed and included in this statement as appropriate. Consequently, the purposes of this significant update are to address the transformation of the field and codify a revised set of guidelines that will enable hospitals, institutions, and individuals in developing the appropriate PICU for their community needs. The target audiences of the practice statement and guidance are broad and include critical care professionals; pediatricians; pediatric subspecialists; pediatric surgeons; pediatric surgical subspecialists; pediatric imaging physicians; and other members of the patient care team such as nurses, therapists, dietitians, pharmacists, social workers, care coordinators, and hospital administrators who make daily administrative and clinical decisions in all PICU levels of care.

BACKGROUND INFORMATION

Pediatric critical care medicine has evolved over the last 3 decades into a highly respected, board-certified specialty that has become an

abstract

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TABLE 1 Recommendations Summary

Recommendations
<p>Recommended PICU level of care admission criteria</p> <p>Patients who are appropriately triaged according to level of illness and services provided in community, tertiary, or quaternary PICU facilities will have comparable outcomes and quality of care. The specifics of each PICU level of care described above serve as a reference for minimum standards of quality care to guide appropriate PICU admissions and promote optimal patient outcomes.</p> <p>Individual hospitals and their PICU leadership team should develop admission criteria to assist in the placement of critically ill children that are aligned with their PICU level of care.</p> <p>Pediatric patients requiring specialized service interventions such as cardiac, neurologic, or trauma-related surgery have improved outcomes when cared for in a quaternary or tertiary ICU, and early interfacility transfer to the appropriate regional facility should be the standard of care.</p> <p>Congenital heart surgery should only be performed in a hospital that has a PICU with a dedicated pediatric cardiac intensive care team, including but not restricted to pediatric intensivists and nurses with expertise in cardiac intensive care, cardiovascular surgeon with pediatric expertise, pediatric perfusionists, pediatric cardiologists, and pediatric cardiac anesthesiologists.</p>
<p>Recommended ICU structure and provider staffing model</p> <p>Expertise in the care of the critically ill child is required in all PICU levels of care.</p> <p>All critically ill children admitted to any PICU should be cared for by a pediatric intensivist who is board eligible, board certified, or undergoing maintenance of certification as primary provider while in the ICU setting.</p> <p>Trauma patients should be cared for by both the trauma service (including trainees) and the PICU service in a collaborative manner. The ACS requires that surgeons be the primary provider on all patients admitted with traumatic injuries. Programs in which the attending surgeon has training and certification in surgical critical care may (institution specific) allow for the primary attending to be a surgeon with such expertise working with the PICU attending.</p> <p>Burn patients should be comanaged by the burn surgeon of record (discipline may be pediatric surgery, general surgery, or plastic surgery) and the PICU service.</p> <p>In a PICU that supports an ACS-verified children's surgical center, an ICU team that demonstrates direct surgeon involvement in the day-to-day management of the surgical needs of the patient is essential. Both PICU and surgery services must be promptly available 24 h per d.</p> <p>Any level of PICU that supports advanced ACGME training programs such as pediatric residency, general surgery residency, pediatric critical care medicine fellowships, pediatric surgery fellowships, and pediatric surgical critical care fellowships (among others) will promote the participation of trainees in interprofessional care of patients providing appropriate communication and collaboration. Clear delineation of responsibilities will be sought on each patient. This requirement reflects the common program requirements outlined by the ACGME.</p> <p>A qualified medical provider (in quaternary facility PICUs, the qualified medical provider should be a critical care specialist) who is able to respond within 5 min to all emergent patient issues (eg, airway management or cardiopulmonary resuscitation) is necessary for optimal patient outcomes in all levels of PICU. Specialized or quaternary facility PICUs have a minimum of an in-house critical care fellow.</p> <p>A qualified surgical provider who is able to respond readily to emergency surgical issues in critically ill patients should be available. The designation of qualified is defined by the surgical problem, and availability should be commensurate with the level of care of the PICU and level of ACS Children's Surgery Verification of the institution.</p> <p>Night coverage response requirement for pediatric intensivists who are not in house, primarily in community and tertiary PICUs, includes being readily available by telephone and present in the PICU within 30 min of request.</p>
<p>Recommended ICU personnel and resources</p> <p>The ICU structure and care delivery model components that are essential in all PICU levels of care include nursing staff and respiratory therapists with PICU expertise as well as multidisciplinary rounds. In tertiary and quaternary facility PICUs, 24/7 in-house coverage, a dedicated clinical pharmacist, a social worker, a child life specialist, and palliative care services are necessary.</p> <p>All PICUs should have access to an on-site pediatric pharmacist who is available for daily rounds, pharmacy support, and ongoing educational activities.</p> <p>All providers, including pediatric hospitalists, nurse practitioners, and physician assistants who provide first-line night coverage in PICUs, must be skilled in advanced airway, intravenous and intraosseous line placement, and ventilator management.</p> <p>All PICUs must have access to a transfer and transport program that can ensure the safe and timely movement of a critically ill or injured child from a community hospital to an institution with a higher PICU level of care.</p>

indispensable service for inpatient programs of most children's hospitals as well as a highly valued resource supporting most community-based programs. The earlier published guidelines for pediatric critical care medicine were used to help establish the basic needs for a state-of-the-art PICU. These guidelines were used by both physician leadership and policy makers to advocate for personnel, supplies, and space that were unique to PICUs. However, there has been a tremendous transformation of pediatric critical care medicine over the past 10 years, with explosive growth in specialized PICUs in pediatric cardiovascular medicine, transplant, neurology, trauma, and oncology as well as improvements of care in general PICUs. This has led to the evolution in both human and material resources and training in more highly specialized areas such as cardiovascular medicine, neurosurgical ICUs, and trauma care.^{1,2}

STATEMENT OF PROBLEM

To provide a 2019 update of the American Academy of Pediatrics and Society of Critical Care Medicine's 2004 *Guidelines and levels of care for PICUs*.³

EVIDENCE BASIS

Methodology

A group of nationally and internationally recognized clinical experts in pediatric critical care medicine made up the pediatric critical care admission guidelines task force. The task force reviewed the work of the previous guidelines and made decisions regarding topic selection inclusion. The topic selection for the guidelines addressed PICU characteristics and interventions by the PICU level of care, including quaternary or specialized, tertiary, and community. Interventions addressed included PICU admission, team structure, transport and transfer mechanisms, outreach programs, and quality metrics.

TABLE 1 Continued

Recommendations
Quaternary facilities or specialized PICUs have access to a critical care transport program with a dedicated trained pediatric team and specialized equipment.
When PICUs require outsourcing of critical care transport activities, the transport service team members must all have training in pediatric emergency and critical care.
Recommended performance improvement and patient safety
Quaternary facilities and tertiary levels of PICUs should participate in academic pursuits.
All quaternary facilities and tertiary levels of PICUs should be involved in providing peer community outreach education such as educational conferences, technical skill competencies, stabilization, and resuscitation (eg, PALS education).
Community and tertiary PICUs should be involved in providing community outreach through educational events that focus on technical skills needed for stabilization, resuscitation, and communication for the triage and transport of critically ill and injured children. These activities might include case conferences.
All levels of PICU should provide feedback to referral centers after transfer of a patient to a PICU, which is essential for both quality improvement and education.
Recommended equipment and technology
Some emergency resuscitative therapies such as invasive and noninvasive respiratory support and central line access can be safely performed in community PICUs.
Renal replacement therapies (peritoneal dialysis, continuous hemofiltration and hemodialysis, and intermittent hemodialysis) may be offered in a community-based PICU when appropriately trained support personnel, which must include a nephrologist, are present.
All PICU levels must have access to helium-oxygen. In selected PICUs, epoprostenol sodium, nitric oxide, and anesthetic agents may be used if appropriate personnel and equipment are available for the safe delivery and monitoring of these agents.
The following are appropriate indications for PICU transfer from a community to a tertiary or quaternary level of care: intracranial pressure monitoring, acute hepatic failure leading to coma, congenital heart disease with unstable cardiorespiratory status, need for temporary cardiac pacing, head injury with initial GCS ≤ 8 , multiple traumatic injuries, or heart failure requiring an interventional cardiologist. For complicated burns $>10\%$ TBSA, access to a specialized burn unit or burn center is recommended.
Recommended PICU discharge and transfer criteria
Each PICU should have clearly defined criteria for escalation and de-escalation of resources and, therefore, level of PICU required on the basis of the physiologic status of the patient.
All levels of PICU should have policies and protocols in place that specify when the patient's physiologic status requires escalation of care, with transfer to a more appropriate level of care as expeditiously as needed.
When a patient's physiologic status improves, discharge from the PICU can occur in many ways:
Transfer to an appropriate acute care bed within that facility
Return transfer to the referring facility
Transfer to a skilled nursing or rehabilitation facility
Discharge from the PICU to home
After discharge from the PICU, the following should take place:
Appropriate communication with the accepting facility, including oral handoff, a clear and concise written summary, and exchange of necessary health information
Discharge planning and communication with the family or caregivers if going home
Communication with the primary care physician who will assume care of the child once the patient is returned to the community
Communication with subspecialists caring for the child and appropriate follow-up arranged as necessary
As needed, careful care coordination with outpatient services such as but not limited to:
Delivery and instruction in the use of durable medical equipment
Home pharmacy and nutrition support
Ongoing rehabilitation needs such as occupational or physical therapy
Ancillary support as required

ACGME, Accreditation Council for Graduate Medical Education; ACS, American College of Surgeons; GCS, Glasgow Coma Scale; PALS, Pediatric Advanced Life Support; TBSA, total body surface area.

A comprehensive literature search on the topics and agreed-on questions determined by the task force was performed by a dedicated Society of

Critical Care Medicine librarian in selected biomedical databases. The 2004 guidelines and levels of care for PICUs served as the starting point for

searches in Medline (Ovid), Embase (Ovid), and PubMed on articles published from 2004 to 2016. Members of the task force received the set of citations and abstracts relevant to the section of the guidelines; references not directly related to the content area were excluded from the review. The full-text articles were retrieved and reviewed to determine appropriate inclusion for appraisal.

The admission to the PICU literature search identified 832 articles. The review of article titles resulted in 299 relevant articles, of which all abstracts were reviewed. The full text of 75 articles and 12 additional articles obtained by hand searching reference lists were reviewed. Twenty-one relevant pediatric studies in which outcomes related to pediatric level of care, specialized PICU, patient volume, or personnel were evaluated were found. The discharge and unplanned readmission literature search yielded 68 articles. The full text of 24 articles and 6 additional articles obtained by hand searching reference lists were reviewed. No articles were found in which PICU discharge criteria were evaluated, and only 14 relevant studies were found in which outcomes related to unplanned PICU readmissions were evaluated. Since publication of the 2004 revised guidelines, evidence on evaluating the impact of the level of PICU care on patient outcomes remains limited. After deliberation, the task force determined that the strength and quality of the current pediatric evidence for the selected topics was insufficient to use the Grading of Recommendations, Assessment, Development, and Evaluation system in supporting evidence-based recommendations. The sparse literature and the nature of the questions under review did not lend itself to the use of the population, intervention, comparison, and outcome format. Therefore,

TABLE 2 PICU Resources by Level of Care

Resources by Organ System	Quaternary or Specialized Facility	Tertiary	Community
Cardiovascular			
Hemodynamic monitoring			
Noninvasive	Essential	Essential	Essential
Invasive	Essential	Essential	Essential
Inotropic support	Essential	Essential	Essential
Echocardiogram (24-h availability)	Essential	Essential	Essential
ECMO or ECLS	Essential	Optional	NE
VADs	Essential	Optional	NE
Transplant: heart	Desirable	Optional	NE
Gastrointestinal			
Upper and lower endoscopy	Essential	Essential	Desirable
Transplant: liver	Desirable	Optional	NE
Hematologic			
Plasmapheresis or leukapheresis	Essential	Essential	Desirable
Transplant: bone marrow	Essential	Optional	NE
Neurologic			
Intracranial pressure monitoring	Essential	Essential	Desirable
External ventricular drain	Essential	Essential	Desirable
Lumbar drain	Essential	Essential	Desirable
Continuous EEG	Essential	Essential	Optional
Video EEG	Essential	Essential	Optional
Respiratory			
Noninvasive ventilation (HFNC, CPAP, BIPAP, NPV)	Essential	Essential	Essential
Conventional mechanical ventilation	Essential	Essential	Essential
Advanced mechanical ventilation (HIFV, HFOV)	Essential	Essential	Desirable
Conventional inhalation therapies (heliox or continuous albuterol)	Essential	Essential	Essential
Nitric oxide	Essential	Essential	Desirable
Advanced inhalation gases (flolan or anesthetic agents)	Essential	Desirable	Optional
Bronchoscopy	Essential	Essential	Desirable
Transplant: lungs	Desirable	Optional	NE
Renal			
Continuous renal replacement therapy	Essential	Essential	Optional
Hemodialysis	Essential	Essential	Optional
Peritoneal dialysis	Essential	Essential	Optional
Charcoal hemofiltration	Essential	Essential	Desirable
Transplant: kidney	Essential	Optional	NE
Radiology			
Diagnostic imaging, including CT (24-h availability)	Essential	Essential	Essential
Advanced Diagnostic Imaging, including MRI (with sedation)	Essential	Essential	Desirable
Interventional neuroradiology	Essential	Desirable	Optional
Interventional cardiology	Essential	Desirable	Optional
Cardiac MRI	Essential	Desirable	Optional

BIPAP, biphasic positive airway pressure; CPAP, continuous positive airway pressure; CT, computed tomography; ECLS, extracorporeal life support; ECMO, extracorporeal membrane oxygenation; HFNC, high-flow nasal cannula; HFOV, high-frequency oscillatory ventilation; HIFV, high-inspiratory flow ventilation; NE, not expected; NPV, negative pressure ventilation; VAD, ventricular assist device.

a modified Delphi process was undertaken, seeking expert opinion to develop consensus-based recommendations where gaps in the evidence exist.

Modified Delphi Methodology

Members were selected to be on the panel on the basis of their experience as PICU directors, administrators, or other leadership roles and were chosen to represent a variety of

hospital settings, from academic centers to community hospitals. The American Academy of Pediatrics also appointed a hospitalist and critical care physician liaison to serve on the panel and to assist in the development of the guideline. An American College of Critical Care Board of Regents member served as a liaison to the committee to support its work.

The guidelines panel consisted of 2 groups: a voting group consisting of

30 members and a writing group of 20 members. The voting panel used an iterative collaborative approach to formulate 30 statements on the basis of the literature review and common practice. Five of the 30 statements were multicomponent statements specific to PICU level of care, including team structure, technology, education and training, academic pursuits, and indications for transfer to a tertiary or quaternary PICU.

TABLE 3 PICU Level of Care Matched to Personnel

Staff	Qualifications	Roles	Quaternary or Specialized	Tertiary	Community
Leadership Medical director	<ul style="list-style-type: none"> Board certified for pediatric critical care medicine after completion of an ACGME-accredited pediatric critical care medicine fellowship Participates in training to meet ongoing education and certification requirements 	<ul style="list-style-type: none"> Primary attending physician Provides consultation for PICU patients Participates in development, review, and implementation of policies Supervises quality control and assessment activities Supervises and coordinates all medical staff education and competencies Participates in program development, including budgetary preparation and policy implementation Available to the PICU 24 h per d, 7 d per wk for both clinical and administrative issues (or similar qualified physician) 	Essential	Essential	Essential
Nurse manager or director	<ul style="list-style-type: none"> Training and expertise in pediatric critical care Master's degree in pediatric nursing or nursing administration Participates in education and training to meet ongoing education and certification requirements 	<ul style="list-style-type: none"> Ensures appropriate nurse to patient ratios Participates in development, review, and implementation of unit and nursing policies and procedures Assurance of nursing orientation and competency, performance reviews Participates in program development, including budgetary preparation and policy implementation Participates in development of quality improvement projects Available to PICU for clinical and administrative issues 24 h per d (or qualified designee) 	Essential; nurse to patient ratios: 1:1, 1:2, 2:1	Essential; nurse to patient ratios: 1:1, 1:2	Essential; nurse to patient ratios: 1:1, 1:2
Surgical director or leader	<ul style="list-style-type: none"> Board certified for pediatric surgery after completion of an ACGME-accredited pediatric surgery fellowship. Additional certification in surgical critical care is desirable but not required. 	<ul style="list-style-type: none"> A children's surgeon who serves within the medical leadership structure of the PICU (who may be designated as the surgical director) and is responsible for setting policies and defining administrative needs related to PICU patients with general or subspecialty pediatric surgical needs 	Essential	Essential	Desirable (a general surgeon with pediatric interest would be an alternative)
Trauma director	<ul style="list-style-type: none"> Board certified for pediatric surgery after completion of an ACGME-accredited pediatric surgery fellowship 	<ul style="list-style-type: none"> A children's surgeon who serves within the medical leadership structure of the PICU (who may be designated as the trauma director) and is responsible for setting policies and defining administrative needs related to PICU patients with traumatic injuries (the surgical director or leader may serve in this capacity for nontrauma centers) 	Essential	Essential	Desirable (a general surgeon with pediatric interest would be an alternative)

TABLE 3 Continued

Staff	Qualifications	Roles	Quaternary or Specialized	Tertiary	Community
Primary medical and surgical providers Pediatric intensivist or equivalent	<ul style="list-style-type: none"> • Board eligible or board certified in pediatric critical care medicine after training in an ACGME-accredited program • Participates in training to meet ongoing education and certification requirements for pediatric critical care 	<ul style="list-style-type: none"> • Physician in-house 24 h per d • Available in ≤ 30 min (24 h per d) • Provides medical care and oversight for care all PICU patients • Participates in development of quality improvement projects • Available in ≤ 1 h to the PICU 	Essential	Essential (desirable: physician in-house 24 h per d)	Essential (optional: physician in-house 24 h per d)
Pediatric surgeon	<ul style="list-style-type: none"> • Board certified for pediatric surgery after completion of an ACGME-accredited pediatric surgery fellowship. Additional certification in surgical critical care is desirable but not required • Participates in training to meet ongoing education and certification requirements for pediatric surgery 	<ul style="list-style-type: none"> • Provides surgical care and oversight for care provided by physicians in training, NPs, and PAs • Participates in development of quality improvement projects 	Essential	Essential	Desirable (a general surgeon with pediatric interest would be an alternative)
Other physicians: hospitalists, pediatric trainees, surgical trainees	<ul style="list-style-type: none"> • Postgraduate year 2 level or higher assigned to PICU • ACGME-accredited pediatric or surgery critical care with focus on pediatric critical care residency program <p>Participate in training to meet ongoing education and certification requirements</p>	<ul style="list-style-type: none"> • In house PICU coverage 24 h/d within ACGME restrictions • Participates in monitoring of quality improvement projects 	Essential (may include combination of hospitalists and NPs)	Essential (may include combination of hospitalists and NPs)	Desirable (may include combination of hospitalists and NPs)
APPs or NPs	<ul style="list-style-type: none"> • Training and expertise in pediatric critical care • Pediatric NP certification; preferred acute care • Master of science in nursing or doctorate in nursing practice • Participates in training to meet ongoing education and certification requirements 	<ul style="list-style-type: none"> • Provide collaborative, comprehensive management of PICU patients • Performance of advanced therapeutic procedures • Participate in development of quality improvement projects 	Desirable (may include combination of hospitalists and NPs)	Desirable (may include combination of hospitalists and NPs)	Desirable (may include combination of hospitalists and NPs)
PA	<ul style="list-style-type: none"> • Training and expertise in pediatric critical care • Graduate of PA program • Participates in training to meet ongoing education and certification requirements 	<ul style="list-style-type: none"> • Direct patient management with physician supervision • Performance of advanced therapeutic procedures • Participates in monitoring of quality improvement 	Desirable (may include combination of hospitalists and PAs)	Desirable (may include combination of hospitalists and PAs)	Desirable (may include combination of hospitalists and PAs)

TABLE 3 Continued

Staff	Qualifications	Roles	Quaternary or Specialized	Tertiary	Community
Additional medical and surgical providers Pediatric medical subspecialists	<ul style="list-style-type: none"> • Cardiologist • Pulmonologist • Neonatologist • Nephrologist • Hematologist and/or oncologist • Endocrinologist • Gastroenterologist • Neurologist • Infectious disease specialist 	<ul style="list-style-type: none"> • Available 24 h per d • Available 24 h per d • Available 24 h per d 	Essential	Essential	Essential
	Interventional cardiologist	• Available 24 h per d	Essential	Desirable	Optional
	<ul style="list-style-type: none"> • Allergist • Geneticist • Rheumatologist • Child advocacy • Cardiovascular surgeon • Neurosurgeon • Otolaryngologist • Orthopedic surgeon • Ophthalmologist • Plastic surgeon • Urologist • Anesthesiologist 	• Available in ≤ 1 h to the PICU	Essential	Desirable (essential: nonpediatric)	Optional (desirable: nonpediatric)
Pediatric surgical subspecialists	<ul style="list-style-type: none"> • Radiologist • Interventional radiologist • Neuroendovascular 	<ul style="list-style-type: none"> • Available in ≤ 1 h to the PICU • Available 24 h per d • Available 24 h per d 	Essential	Essential	Desirable (essential: nonpediatric)
Pediatric anesthesia	<ul style="list-style-type: none"> • Bachelor of science in nursing degree preferred • Hospitals with magnet designation require $<10\%$ non-BSN RNs • Completion of PICU orientation • Continuing education requirements for licensure renewal • BLS and PALS • Pediatric CCRN certification • Maintenance of designated PICU competencies 	<ul style="list-style-type: none"> • Provision of continuous care based on the needs and characteristics of the patient • Provision of physiologic assessments, implementation, and evaluation of responses to treatment plan • Skilled in advanced technology monitoring • Appropriate No. nurses trained in highly specialized therapies such as CRRT and roles, including: <ul style="list-style-type: none"> Charge nurse Arrest team nurse 	Essential	Essential (desirable: pediatric CCRN certification)	Essential (desirable: pediatric CCRN certification)
Pediatric radiologists	<ul style="list-style-type: none"> • Radiologist • Interventional radiologist • Neuroendovascular 	<ul style="list-style-type: none"> • Available 24 h per d • Available 24 h per d • Available for consultation 	Essential	Essential	Desirable (essential: nonpediatric)
Psychiatrist or psychologist			Essential	Desirable	Optional
Nursing staff			Essential	Essential	Essential
RNs			Essential	Essential	Essential

TABLE 3 Continued

Staff	Qualifications	Roles	Quaternary or Specialized	Tertiary	Community
Nurse educator or clinical nurse specialist	<ul style="list-style-type: none"> • Training and expertise in pediatric critical care • Master of science in nursing or education or doctorate or DNP prepared • Pediatric nursing expertise • Pediatric CCRN certification • BLS and PALS 	<ul style="list-style-type: none"> • Transport team nurse • Trauma team nurse • Preceptor for novice nurses • Participates in development and monitoring of quality improvement projects • Participates in and coordinates nursing staff education • Clinical resource for nursing staff • Participates in development of quality improvement projects • Participates in clinical research efforts 	Essential	Essential	Desirable
Nursing assistants or unlicensed personnel		<ul style="list-style-type: none"> • Assists RNs in patient care tasks • Supervised by nursing staff 	Desirable	Desirable	Optional
Respiratory therapy staff Supervisor	<ul style="list-style-type: none"> • Registered respiratory therapist with training and expertise in pediatric critical care 	<ul style="list-style-type: none"> • Responsible for training therapists 	Essential	Essential	Essential
Respiratory therapists	<ul style="list-style-type: none"> • Registered respiratory therapist • BLS and PALS • Demonstrate competence with pediatric mechanical ventilation • Adjunctive respiratory therapies including gases 	<ul style="list-style-type: none"> • Clinical resource for therapists • Therapist assigned to PICU 24 h per d • Skill in management of pediatric patients with respiratory disease • Maintenance of equipment and quality control and review 	Essential	Essential	Essential
Other team members Pediatric pharmacist	<ul style="list-style-type: none"> • Pediatric clinical doctor of pharmacy 	<ul style="list-style-type: none"> • Available 24 h per d 	Essential	Essential	Desirable (essential: nonpediatric)
Rehabilitation services	<ul style="list-style-type: none"> • Physical therapist, occupational therapist, and speech therapist 	<ul style="list-style-type: none"> • Available for consultation 	Essential	Essential	Essential
Nutritionist or clinical dietician		<ul style="list-style-type: none"> • Available for consultation 	Essential	Essential	Essential
Social worker		<ul style="list-style-type: none"> • Available for consultation 	Essential	Essential	Essential
Clergy		<ul style="list-style-type: none"> • Available for consultation 	Essential	Essential	Essential
Child life specialist		<ul style="list-style-type: none"> • Available for consultation 	Essential	Essential	Desirable
Pain team		<ul style="list-style-type: none"> • Available for consultation 	Essential	Essential	Desirable
Palliative care		<ul style="list-style-type: none"> • Available for consultation 	Essential	Desirable	Desirable
Rapid response team		<ul style="list-style-type: none"> • Available 24 h per d 	Essential	Essential	Essential
Transport team		<ul style="list-style-type: none"> • Available 24 h per d 	Essential	Essential	Desirable
Ethics committee		<ul style="list-style-type: none"> • Available for consultation 	Essential	Essential	Essential
Quality and safety		<ul style="list-style-type: none"> • Available for consultation 	Essential	Essential	Essential
Legal or risk management		<ul style="list-style-type: none"> • Available for consultation 	Essential	Essential	Essential
Biomedical technician		<ul style="list-style-type: none"> • In-hospital or available within 1 h, 24 h per d 	Essential	Essential	Essential
Radiology services		<ul style="list-style-type: none"> • Available in ≤ 1 h 	Essential	Essential	Essential
Laboratory services		<ul style="list-style-type: none"> • Available 24 h per d 	Essential	Essential	Essential

TABLE 3 Continued

Staff	Qualifications	Roles	Quaternary or Specialized	Tertiary	Community
Blood bank services Neurodiagnostic services Unit clerk		<ul style="list-style-type: none"> • Provide basic hematologic, chemistry, blood gas, and toxicology analysis • Available 24 h per d • EEG available on call for emergencies • Staffed 24 h per d 	Essential Essential Essential	Essential Essential Essential	Essential Desirable Desirable

ACGME, Accreditation Council for Graduate Medical Education; APP, advanced practice provider; BSN, bachelor of science in nursing; CCRN, critical care registered nurse; CRRT, continuous renal replacement therapy; DNP, doctor of nursing practice; NP, nurse practitioner; PA, physician assistant; PALS, Pediatric Advanced Life Support; RN, registered nurse.

These statements were then presented via an online anonymous voting tool to a voting group by using a 3-cycle interactive forecasting Delphi method. With each cycle of voting, statements were refined on the basis of votes received and comments. Consensus was deemed achieved once 80% or higher scores from the voting group were recorded on any given statement or when there was consensus after review of comments provided by voters. Of the 25 final statements, 17 met the consensus cutoff score. The writing panel evaluated the survey data and together with literature findings formulated admission recommendations.

RECOMMENDATIONS

Critically ill or injured pediatric patients should be cared for in a child- and family-centered environment by a multidisciplinary pediatric critical care team. Three levels of care are described in these recommendations on the basis of the results of the Delphi survey and expert panel consensus: community-based PICU, tertiary PICU, and quaternary or specialized PICU.

Community medical center PICUs play an important role in health care systems that provide care to infants and children. In the previously published guidelines, these centers were categorized as level II PICUs. These units provide a broad range of services and resources that may differ on the basis of institution, hospital size, and referral base. The majority of these will be located in general medical-surgical institutions with the capability of treating pediatric patients. Tertiary PICUs provide advanced care for many medical and surgical illnesses in infants and children. In the previously published guidelines, these units were categorized as level I PICUs, as distinguished from level II PICUs. Tertiary PICUs should provide

advanced ventilatory support such as high-frequency oscillatory ventilation and inotropic management but would not be expected to provide extracorporeal membrane oxygenation support. There would be ready access to most pediatric medical subspecialties but there may not be in-house coverage. A quaternary or specialized PICU facility provides regional care and serves large populations or has a large catchment area. The center should provide comprehensive care to all complex patients. Uniquely, a specialized PICU provides diagnosis-specific care for select patient populations. This highest level of PICU facility should have readily available resources to support an American College of Surgeons (ACS) verified Level I or Level II Children’s Surgical Center or Level I or Level II Pediatric Trauma Center. Of note, premature newborns are not addressed in these guidelines unless they require complex cardiovascular surgical interventions.

Specific recommendations are detailed in Table 1 regarding the PICU level of care admission criteria, the structure and provider staffing model, the personnel and resources, the quality metrics and education, the equipment and technology, and the discharge and transfer criteria. Table 2 reveals the necessary resources needed for each level of care. Table 3 reveals the personnel needed, including the qualifications, competencies, roles, and responsibilities based on each level of PICU.

This practice statement and guidance address important specifications for each PICU level of care, including the team structure and resources, technology and equipment, education and training, quality metrics, admission and discharge criteria, and indications for transfer to a higher level of care. The sparse high-quality evidence led the panel to use a modified Delphi process to seek

expert opinion to develop consensus-based recommendations where gaps in the evidence exist. Despite this limitation, the members of the task force believe these recommendations provide guidance to practitioners in making informed decisions regarding pediatric admission or transfer to the appropriate level of care to achieve best outcomes. Additional well-designed clinical investigations are needed to determine and address the confounding factors that impact

admission, discharge, and transfer of children in all levels of PICUs.

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consider, constraints to evaluate rapidly available new evidence, human fallibility, and other considerations, readers should use their judgment on how best to apply our suggestions and recommendations.

ABBREVIATION

ACS: American College of Surgeons

^qPediatrics, Critical Care Medicine, College of Medicine, Medical Center, University of Nebraska, Omaha, Nebraska; ^rPICU, Medical City Children's Hospital, Dallas, Texas; ^sPediatric Critical Care Medicine, Children's Hospital of Wisconsin, Wauwatosa, Wisconsin; ^uPediatrics and Pediatric Intensive Care, Grand Strand Medical Center, Myrtle Beach, South Carolina; ^wPediatrics and Pediatric Critical Care Medicine, Jacobi Medical Center, the Bronx, New York; and ^xDivision of Medical Critical Care, Boston Children's Hospital and Harvard Medical School, Harvard University, Boston, Massachusetts

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