POLICY STATEMENT Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

American Academy of Pediatrics

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Guidance for Structuring a Pediatric Intermediate Care Unit

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The purpose of this policy statement is to update the 2004 American Academy of Pediatrics clinical report and provide enhanced guidance for institutions, administrators, and providers in the development and operation of a pediatric intermediate care unit (IMCU). Since 2004, there have been significant advances in pediatric medical, surgical, and critical care that have resulted in an evolution in the acuity and complexity of children potentially requiring IMCU admission. A group of 9 clinical experts in pediatric critical care, hospital medicine, intermediate care, and surgery developed a consensus on priority topics requiring updates, reviewed the relevant evidence, and, through a series of virtual meetings, developed the document. The intended audience of this policy statement is broad and includes pediatric critical care professionals, pediatric hospitalists, pediatric surgeons, other pediatric medical and surgical subspecialists, general pediatricians, nurses, social workers, care coordinators, hospital administrators, health care funders, and policymakers, primarily in resource-rich settings. Key priority topics were delineation of core principles for an IMCU, clarification of target populations, staffing recommendations, and payment.

BACKGROUND INFORMATION

To clarify the type of unit that should be subject to these recommendations, the term intermediate care unit (IMCU) will be used. "Intermediate care is provided in acute care hospitals to a patient population with a severity of illness that does not require intensive care but does require greater services than those provided by routine inpatient general pediatric care."[1] IMCUs have also been defined as high-dependency, progressive, or step-up units that provide close observation, monitoring, and therapies to children who are, or have a significant potential to be, physiologically unstable and for whom care

abstract

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is beyond the capability of a general pediatric floor.[2,3] IMCUs may also function as step-down units, primarily caring for patients during recovery from critical illness or surgical intervention that required ICU admission. This policy statement acknowledges that many facilities may not have an IMCU. In such facilities without an IMCU, many of the patient populations discussed in this document will likely be cared for in a PICU rather than on the general pediatric floor.

STATEMENT OF PROBLEM

The purpose of this policy statement is to update and replace the American Academy of Pediatrics (AAP) and Society of Critical Care Medicine's 2004 clinical report "Admission and Discharge Guidelines for the Pediatric Patient Requiring Intermediate Care,"[1] and to serve as a follow-up publication filling a gap regarding the administration of Intermediate Care Units that was identified in the 2019 publication "Criteria for Critical Care of Infants and Children: PICU Admission, Discharge, and Triage Practice Statement and Levels of Care Guidance."[4,5] Since 2004, there have been significant advances in pediatric medical, surgical, and critical care that have resulted in an evolution in the acuity and complexity of children requiring hospital admission.

NEW INFORMATION

Literature from studies in adults supports that IMCUs may allow for better ICU bed utilization,[6,7] improve patient flow,[8] decrease costs,[9] and improve general patient outcomes on the basis of the lower ICU mortality rate, presumably because of reductions in ICU staff workload.[10] However, the evidence on IMCUs for adults is sparse, difficult to interpret, and challenged by significant heterogeneity in unit structure and function.[11] Research evaluating pediatric IMCUs is even more limited in volume. A multiinstitutional clinical PICU database study revealed that 36 of 108 North American PICUs had an IMCU. In that study, IMCUs did not significantly decrease PICU length of stay (LOS), and admission to the IMCU was associated with a time delay of 3.1 hours once medically cleared to transfer out of the PICU.[12] Because pediatric IMCUs are financially most viable in hospitals that function with higher bed occupancy rates overall, it is difficult to generalize these results. In addition, as noted by Geneslaw et al, "having an IMCU might be advantageous for other PICU, hospital, or patient-centered metrics … … such as costs, throughput for other hospital locations, or patient/family comfort/satisfaction,"[12] none of which have yet been studied comprehensively in pediatrics.

In a review of adult IMCUs, 21% were staffed by intensivists, and the remaining 79% were staffed by hospitalists, of which 43% consulted with intensivists, and 36% had no intensivist involvement.[13] Two adult studies suggest that IMCUs staffed by hospitalists showed a beneficial impact on in-hospital mortality and may decrease LOS.[14,15] No similar data are available in pediatrics. Two single-institution reports on pediatric IMCUs indicate they were staffed primarily by pediatric hospitalists.[16,17]

Nurse-to-patient ratios are integral to the function of IMCUs. In the United Kingdom's National Health Services, a set of recommendations by a Royal College of Pediatrics and Child Health working group in 2014 redefined "high-dependency care" into National Health Services level 1 and level 2 critical care,[2] with different interventions corresponding to each level of critical care (https://www.kingsfund.org.uk/publications/critical-care-services-nhs#different-types-and-levels). The importance of differentiating these levels was affirmed by follow-up observational research demonstrating both groups consumed higher staff resources,[18] with nurse-to-patient ratios of 1:2 for level 1 critical care and 1:1 for level 2 critical care. In the United States, IMCU nurse-to-patient ratios of 1:2 to 1:2.5 have been reported in pediatric and adult literature.[11,16,17]

METHODS

A group of 9 clinical experts in pediatric critical care, pediatric hospital medicine, intermediate care, and pediatric surgery was tasked by the AAP with reviewing the 2004 clinical report in light of the 2019 AAP PICU admission guidelines, developing consensus on priority topics requiring updating or clarifying, and reviewing any relevant evidence on these topics to inform the recommendations. Key priority topics were core unit principles, target populations, staffing recommendations, and payment.

For this policy update, the authors reviewed PubMed, Medline, and Embase for relevant publications from 2004 to the present. Publications of observational studies, clinical trials, implementation studies, and practice guidelines focused on IMCUs admitting patients younger than 18 years were included. Members of the working group were assigned to review citations and abstracts relevant to their designated topic content areas. Where specific pediatric evidence was not available, adult studies were reviewed but did not directly inform final policy recommendations. The available evidence on each of the relevant topic areas was summarized, the working group reviewed the

document electronically, and the working group agreed on the practice recommendations through a series of 5 virtual meetings. In keeping with AAP policy,[19] and, because of the paucity of pediatric evidence, where the recommendation is rationalized by some evidence in critically ill patients and there was strong group consensus, the word "must" is used; where evidence was not available but consensus on the recommendation was strong based on experience and expert opinion, the words "should" or "may" are used.

With this document, the authors aim to provide enhanced guidance for institutions in the development and operation of a pediatric IMCU. The 2004 AAP clinical report[1] was an organ system-based list of admission criteria as well as a list of specific medical criteria to be "safe" for transfer to a lower-acuity unit or to discharge home. To provide more helpful direction for institutions, administrators, and providers, this policy update has included delineations by organ system and has also added focus on several specific areas: recommendations for core operating principles in the development of an IMCU, recommendations for patient population-based admission criteria to an IMCU, recommendations related to IMCU staffing, and recommendations regarding financial payment for IMCU-level care.

RECOMMENDATIONS

1. Core Operating Principles When Considering the Development of a Pediatric IMCU

(a) Hospitals or health systems should design triage guidelines to guide admission to the IMCU (vs admission to the general pediatric floor or to the PICU).

(b) Policies and procedures should clearly delineate ongoing assessment of patients and what interventions may be performed in the IMCU versus when PICU-level care is required.

(c) There should be clear thresholds and efficient processes for rapid transfer to a PICU.

Rationale: IMCUs may be beneficial to the functioning of pediatric hospitals with a tertiary or quaternary PICU, as defined by the 2019 PICU admission guideline,[5] and should only be established in hospitals without a PICU in the same institution with caution, extensive planning, and great care. All IMCUs should have a well-established relationship, administratively and geographically, with a PICU, including delineating a clear plan to cover routine and emergency airway issues, policies and procedures for consultation with a pediatric intensivist or neonatologist when medically indicated, and clear triggers to prompt PICU consultation in patients not responding to therapies or whose disease state is worsening.

2. Target IMCU Patient Populations

Patient populations well-served by an IMCU model may include children with acute critical illness, children with complex chronic disease, and a range of pediatric surgical patients.

(a) In institutions with an IMCU, children with acute critical illness and a low risk of mortality contingent on aggressive management should be admitted to an IMCU.

Rationale*:* Children and adolescents with acute critical illness and a low risk of mortality contingent on aggressive management who do not require invasive technologies for that care should be well served in an IMCU. Specific potential examples are listed in Table 1. To cohort patients with some of these diagnoses into an IMCU may allow for more effective quality improvement initiatives and protocol development for improving outcomes. In addition, some patients with complex disorders, such as those with inborn errors of metabolism, may have recurrent decompensations that do not require invasive monitoring or care and may have highly individualized protocols for management. These children may also benefit from placement in an IMCU that is able to care for them throughout such episodes, avoiding multiple transfers between the general pediatric floor and PICU.

Noninvasive positive pressure ventilation (NIPPV) is increasingly used to manage acute respiratory failure in typically developing children.[20] Therefore, there may be a more prominent role for IMCUs in managing the subgroup of patients with acute respiratory failure that is at low risk of requiring intubation. Similar protocols have been successfully implemented in adult IMCUs.[21] At 1 tertiary pediatric hospital, a guideline for initiation of NIPPV for acute respiratory failure in the IMCU enabled 69% of those patients to remain in the IMCU.[16] The guideline was predicated on appropriate nurse and respiratory therapy staffing with strong interdisciplinary team communication, processes for frequent reevaluation, and clear criteria for transfer to the PICU. Evidence in adult literature suggests that IMCUs integrated with, or adjacent to, ICUs may manage higher-acuity patients more readily.[11]

(b) In institutions with an IMCU, children with medical complexity (CMC) admitted with acute on chronic illness who are inappropriate for a regular floor admission should be admitted to an IMCU. The IMCU may be their "inpatient medical home," unless the severity of presentation or trajectory of illness necessitates PICU admission.

TABLE 1 Examples (by Organ System) of Pediatric Patient Populations With Acute Critical Illness and a Low Risk of Mortality Potentially Suitable for an IMCU

Organ System	IMCU Care Element Likely Not Available on a General Pediatric Floor
Respiratory	
Patients with acute or acute-on-chronic respiratory failure with a low risk of requiring intubation (eg, asthma, bronchiolitis, croup, obstructive sleep apnea, pneumonia, tracheitis)	Need for noninvasive positive pressure ventilation
Patients requiring work-up of apnea	Presence of a tracheostomy +/− ventilator
Patients with impaired airway clearance requiring frequent suctioning	Close (q2–q4h) cardiorespiratory monitoring $F_iO_2 \geq 50\%$ Requiring frequent (q2–q4h) respiratory treatments/ nebulizations/suctioning
Cardiovascular	
Patients with non-life-threatening cardiac dysrhythmias without need for cardioversion	Close (q2–q4h) cardiorespiratory monitoring
Patients with non-life-threatening cardiovascular disease requiring low dose intravenous inotropic or vasodilator therapy and without need for frequent titration (eg, chronic heart failure on long term milrinone therapy)	Low dose inotropic or vasodilator therapy without need for frequent titration
Patients recovering from acute cardiac surgery or cardiac catheterization with low probability of postoperative hemodynamic or respiratory compromise	
Neurologic	
Patients with seizures/epilepsy (acute or chronic) who are responsive to therapy, who may require short term electroencephalographic monitoring and who require continuous cardiorespiratory monitoring, but with low risk for cardiac arrest or intubation and/or low risk for requiring continuous electroencephalographic monitoring	Close (q2–q4h) neurologic and cardiorespiratory monitoring
Patients with acute encephalopathy who require close cardiorespiratory monitoring but with low risk for cerebral herniation, cardiac arrest, or intubation	Need for noninvasive positive pressure ventilation
Patients with acute inflammation/infection of the central nervous system but with low risk for cerebral herniation, cardiac arrest, or intubation	Short term electroencephalographic monitoring
Patients with chronic neuro-muscular disorders requiring respiratory support at or above baseline but with low risk for requiring intubation.	
Hematologic/Oncologic	
Patients with severe anemia requiring acute transfusions without serious hemodynamic compromise	Close (q2–q4h) neurologic and cardiorespiratory monitoring
Oncologic patients with anemia, thrombocytopenia, and/or neutropenia at risk for or experiencing tumor lysis syndrome but with appropriate, stable renal function and with low risk for requiring emergent dialysis	Frequent laboratory monitoring ($\geq$ q2h)
Oncologic patients with chronic chemotherapy-related heart failure requiring low-dose inotropic or vasodilator therapy with low risk for further cardiorespiratory compromise and without need for frequent titration	Low dose inotropic or vasodilator therapy without need for frequent titration
Endocrine/Metabolic	
Patients with mild or moderate diabetic ketoacidosis requiring continuous insulin infusions but without acute severe encephalopathy and with low risk of clinically significant cerebral edema	Continuous insulin infusions and frequent glucose checks

(c) IMCUs should have care managers and social workers well versed in the practical medical complexities of home care for families with CMC.

Rationale: CMC are children who meet one or more of the following characteristic patterns: (1) substantial health care needs, (2) chronic medical conditions, (3) significant functional limitations, and (4) high projected health care utilization.[22] These children are often cared for with an episode-based model of care[23] because of their technology dependence and/or complexity of care when ill. CMC, particularly those dependent on technology, may require more nursing or respiratory therapy care at baseline than is available on general pediatric floors. For those patients, an IMCU may become their "inpatient medical home." Bidirectional communication with the patient's primary care pediatrician and/or true medical home is essential. See Table 1 for examples of CMC potentially appropriate for an IMCU.

A major subpopulation of CMC is children with tracheostomies. In a national survey of US hospitals with at least 2 nonneonatal pediatric wards, children with a tracheostomy and a ventilator being admitted to the hospital for mild nonrespiratory infection were triaged to a PICU in 65% of hospitals with no IMCU versus 46% in hospitals with an IMCU, with the IMCU accepting a significant percentage of such patients.[24] However, in a separate large multiinstitutional retrospective cohort study examining PICU admission and discharge efficiency metrics in hospitals with or without an IMCU, the authors were unable to demonstrate improvements to median PICU LOS for patients in the study or patients with CMC when comparing hospitals with an IMCU

TABLE 1 Continued

Organ System	IMCU Care Element Likely Not Available on a General Pediatric Floor
Patients with mild to moderate electrolyte disturbances potentially requiring intravenous replenishment and frequent laboratory monitoring but without significant hemodynamic, neurologic, or respiratory compromise	Close (q2–q4h) neurologic and cardiorespiratory monitoring
Patients with inborn errors of metabolism requiring correction and close cardiorespiratory monitoring but without cardiorespiratory compromise	Frequent laboratory monitoring (≥ q2h)
Gastrointestinal	
Patients with acute gastrointestinal bleeding requiring transfusions or intravenous therapy, but without significant hemodynamic or respiratory compromise	Close (q2–q4h) neurologic and cardiorespiratory monitoring
Patients with acute or acute-on-chronic gastrointestinal or hepatobiliary insufficiency but without neurologic or cardiorespiratory compromise	Frequent laboratory monitoring (≥ q2h)
Renal	
Patients with acute or acute-on-chronic hypertension who may require continuous or frequent intermittent intravenous therapy but without any neurologic sequelae	Close (q2–q4h) neurologic and cardiorespiratory monitoring
Patients with acute or acute-on-chronic renal failure who do not require continuous renal replacement therapy	Continuous or frequent (q2–q4h) intermittent intravenous antihypertensive therapy Peritoneal dialysis or intermittent hemodialysis
Multisystem/Other	
Patients with uncomplicated toxic ingestions without significant cardiorespiratory compromise	Close (q2–q4h) neurologic and cardiorespiratory monitoring
Pediatric palliative care patients requiring continuous infusions to treat end-of-life dyspnea or anxiety	Need for noninvasive positive pressure ventilation

This list contains representative examples and should not be considered exhaustive.

versus hospitals that did not have an IMCU in their adjusted model.[12]

Another major subpopulation of CMC is patients dependent on chronic NIPPV.[21] For children with chronic NIPPV needs, 1 study found that if a child with a home continuous positive airway pressure requirement were admitted with a mild respiratory exacerbation, 59% of providers would admit the child to the PICU in hospitals with no IMCU, whereas in hospitals with an IMCU, 18% would admit to the PICU and a majority of providers would admit to the IMCU.[24]

The authors also want to emphasize the growing literature for CMC surrounding the critical importance of discharge care coordination with the patient's true medical home and the need in this population for experienced care coordinators[25–31] because this is often not only a significant barrier to discharge for CMC but also a significant source of stress for families.[26]

(d) Select healthy pre- or postoperative patients requiring higher intensity monitoring or interventions may be safely observed in an IMCU.

Rationale: Healthy pre- and/or postoperative surgical patients who may not meet the formal definition of critical illness but may be at risk for decompensation and require more frequent monitoring or nursing interventions for successful recovery, may be safely cared for in an IMCU. Specific potential examples are listed in Table 2.

Pediatric surgeons and subspecialty surgeons must be involved in the perioperative care of their patients, either as the admitting service of record or as a consultant.[32,33] Many hospitals that house an IMCU may also be pediatric trauma centers. Pediatric trauma patients admitted to a verified American College of Surgeons level I pediatric trauma center must have care rendered by pediatric surgeons who are members of the trauma service.[32,33] Some trauma or burn patients who do not require the acuity of the PICU may be well served in an IMCU.

(e) Patients may be discharged from the hospital when suitable or transferred to a general pediatric floor, as appropriate, when their acute process has improved enough that the intensity of their care needs (interventions, laboratory monitoring, respiratory treatments, etc.) may be met with general pediatric floor staffing, with particular attention to nursing and respiratory therapist ratios (eg, does not require more than 1:4 nurse-to-patient staffing).

3. IMCU Staffing

(a) IMCU nurse-to-patient ratios should be 1:2 or 1:3 depending on nursing needs, the acuity of patients in the IMCU, and the judgment of the team caring for the patient.

Rationale: Close nursing care is integral to the function of an IMCU, with more intensive nursing as one of the primary benefits over general floor care. IMCU nursing staff should attain competencies commensurate with the acuity of the patient population served and the therapies delivered.

(b) Pediatric hospital medicine fellowships should ensure that their trainees graduate with appropriate competencies to provide care for patients who meet IMCU levels of care, including general knowledge of surgical conditions.

TABLE 2 Surgical Subpopulations Who May Be Appropriate for an IMCU

Surgical Subpopulation	Indication for IMCU Admission
Select hemodynamically stable preoperative pediatric general surgery patients requiring ongoing fluid resuscitation and/or electrolyte correction	Frequent (q2–q4h) assessment and correction of fluid/electrolyte status before operative interventions
Select extubated postoperative patients after major surgery	At risk for postoperative bleeding or challenges with pain control May require close postoperative monitoring and aggressive postoperative pulmonary toilet to prevent decline
Patients with complex wounds	Require frequent, extensive and/or advanced wound care/dressing changes
Patients with postsurgical limb- or anastomosis-viability concerns	Require close (≥ q2h) neurovascular monitoring
Hemodynamically stable patients after percutaneous interventional procedures	Require frequent (≥ q2h) neurovascular checks and/or continuous anticoagulation infusions Close (q2–q4h) neurologic and cardiorespiratory monitoring
CMC who undergo elective or semielective surgery (eg, spinal fusion surgery) who are otherwise near their baseline level of needs	Require close (q2–q4h) postoperative monitoring and aggressive postoperative pulmonary toilet to prevent decline Requiring frequent (q2–q4h) respiratory treatments/nebulization
Select hemodynamically stable pediatric trauma patients	High-grade solid organ injury at risk for serious or ongoing bleeding
Hemodynamically stable patients with extremity trauma and concern for vascular injury	Require frequent (≥ q2h) pulse or neurovascular checks
Moderate traumatic brain injury not requiring an advanced airway or hyperosmolar therapy	Require frequent (q2h–q4h) neurologic assessments and close (q2h–q4h) cardiorespiratory monitoring to prevent decline
Hemodynamically stable nonintubated burn patients	Require moderate sedation for daily dressing changes

(c) An IMCU may allow for triage based on staffing needs and the development of expertise among all staff (physicians, advanced practice providers, nurses, respiratory therapists, etc) who acquire these added skill sets, which in turn may decrease stress and workload on both general floors and PICUs.

Rationale: The recent development and expansion of pediatric hospital medicine as a distinct pediatric subspecialty may allow for additional training for pediatric hospitalists in providing higher-acuity care.

4. IMCU Payment

(a) In resource-rich countries such as the United States, there should be the formal national creation of a third level of hospital care for pediatrics, reflecting the intensity of services offered between the PICU and the general floor, Intermediate Care.

Rationale: The current payment considerations for physicians and facilities in the intermediate care setting are complex and potentially at odds. According to guidelines from the Centers for Medicare and Medicaid Services (CMS), a physician may render services and bill associated charges in response to the severity of illness of the patient and the therapies they are managing. Services rendered range from hospital care codes levels 1 to 3, intensive care initial day and subsequent day codes depending on patient age and weight, and critical care services represented by either time-based or daily global codes depending on patient age. Location of services and physician training or board certification are not factors in determining whether critical care services may be delivered and charged.

By contrast, hospitals are offered only 2 CMS choices when seeking payment for care provided: general floor charge or PICU-level charge. In the "percentage of charge" model, the same care delivered in a PICU may charge twice as much as that delivered in an IMCU if the latter is charged as a general floor bed. On the other hand, in the all patient refined-diagnosis related groups model, in which institutions are reimbursed a flat fee for the admission on the basis of patient diagnosis and severity of illness, it is against the hospital's interests to care for the patient in a setting more intensive or expensive than is medically appropriate.[34] Depending on how a hospital charges for an IMCU bed and which payment scheme is operative for a particular institution, an IMCU may be inherently averse or beneficial to the financial interests of the institution, independent from questions of hospital bed efficiency.

In light of the malalignment of these hospital incentives, there should be a formal national creation of a third level of hospital care, intermediate care, reflecting the intensity of services offered between the PICU and the general floor. Recognizing intermediate care as its own level of care would align institutional incentives with patient care interests. Several states have already established guidelines for design and/or nurse staffing ratios in IMCUs, including Massachusetts, New York, California, Connecticut, Rhode Island, and New Jersey. However, CMS is the only national body authorized to establish an associated charge for payers.

SUMMARY AND CONCLUSIONS

Identified Priorities for Future Investigation and Advocacy

(a) Describe pediatric IMCU structures and staffing models present nationally and any corresponding associations with patient outcomes, including quality and safety metrics. Explore the role of pediatric hospitalists in the provision of intermediate-level care in a variety of hospital settings.

(b) Benchmark quality and safety outcomes for patient populations who require intermediate-level care (likely disease- and/or technology-specific given the heterogeneity of IMCU care models [eg, outcomes for asthmatic patients requiring continuous albuterol or outcomes for acute on chronic respiratory failure in patients with a tracheostomy/ventilator]).

(c) Explore IMCU health care value based on regionalization of pediatric care.

(d) Advocate for CMS recognition of the IMCU level of care with associated hospital payment.

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ABBREVIATIONS

AAP: American Academy of Pediatrics
CMC: children with medical complexity
CMS: Centers for Medicare and Medicaid Services
IMCU: intermediate care unit
LOS: length of stay
NIPPV: noninvasive positive pressure ventilation

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