

Triage of Intermediate-Care Patients in Pediatric Hospitals

Christiana M. Russ, MD, DTMH, Michael Agus, MD

BACKGROUND: Hospitalized children have a wide range of acuity and risk of decompensation. The objective of this study was to determine where pediatric patients are triaged when they present to pediatric hospitals needing intense monitoring and nursing care, but do not require invasive monitoring or technology.

METHODS: We completed a telephone survey of pediatric hospitals in the United States with at least 2 non-neonatal pediatric wards and at least 50 acute inpatient beds. The survey consisted of a brief scripted portrayal of 6 hypothetical patients who may be admitted to a hospital's general floor, ICU, or an intermediate care unit (IMCU). The scenarios included severe asthma, bronchiolitis, croup, diabetic ketoacidosis, and patients dependent on home ventilation via noninvasive interface or tracheostomy. The hospital bed coordinator or emergency department charge nurse was asked where each hypothetical patient would be admitted in their hospital.

RESULTS: A total 192 hospitals met inclusion criteria and 164 hospitals (85%) responded. For all of the scenarios, most of the institutions triaged them to the PICU. Twenty-eight (17%) of the responding institutions triaged at least 1 of the patient scenarios to an IMCU. The presence of an IMCU decreased triage to the ICU for all scenarios when comparing hospitals with and without an IMCU ($P < .001$).

CONCLUSIONS: Inpatient triage practices among pediatric hospitals vary widely for patients who require intense nursing or frequent monitoring due to specific acute illnesses or respiratory technologies. Institutions that have an IMCU available are less likely to send these patients to the ICU.

ABSTRACT

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Hospitalized children have a wide range of acuity and risk of physiologic decompensation. Some pediatric patients require intense monitoring and nursing care, but do not require technology or invasive monitoring that typically is delivered in an ICU. These patients have an overall low risk of mortality, but require close monitoring and aggressive management to avoid disease progression and poor outcomes. Examples of acute illnesses that may require this level of care include severe asthma, bronchiolitis, diabetic ketoacidosis (DKA), or croup. Close monitoring and intense nursing care also is required by an increasing number of pediatric patients who are technology dependent at baseline, particularly those requiring respiratory technologies.

In some pediatric hospitals, such patients are being cared for in intermediate-care units (IMCU), which are also sometimes called high-dependency, step-up, or step-down units. In 1991, 33% of pediatric training programs reported having an IMCU.¹ In 2007, a cross-sectional telephone survey of 181 eligible pediatric hospitals in Canadian and American hospitals found that 55% had an IMCU.²

IMCUs in pediatrics have been described as caring for "Patients with a low risk of, but potential for, significant deterioration."³ This article noted that frequent monitoring of vital signs and nursing interventions were the added benefit of patient placement in an IMCU. A subsequent study by Vandenberg et al² found that "high-dependency unit" beds differed from ward beds by having higher acuity of patients, higher nurse/patient ratio, and occasionally the availability of additional therapies.

IMCUs provide flexibility in patient triage, allow for better tailoring of monitoring and therapies to severity of illness, and may be a cost-effective alternative to admission to the ICU.³ Although there are very general guidelines for admissions and discharge criteria for IMCUs and for ICUs, practice varies between hospitals.³⁻⁵ Variations in practice often indicate that evidence is lacking to build consensus on the best approach, with potential implications for cost and clinical outcomes.⁶ Identifying

variations in practice may thus be a springboard for systematic quality improvement endeavors.

The aim of this study was to determine where pediatric patients are triaged when they present to pediatric hospitals needing intense monitoring and nursing care, but do not require invasive monitoring or technology that necessitates admission to the ICU.

METHODS

We conducted a telephone survey of pediatric hospitals in the United States that have at least 2 non-neonatal pediatric wards and/or at least 50 acute inpatient beds for patients younger than 18 years. We generated a list of such hospitals by using the National Association of Children's Hospitals and Related Institutions hospital directory on its Web site.⁷ The survey was administered to the coordinator of patient placement for the hospital, or the emergency department charge nurse.

The survey consisted of a brief scripted portrayal of 6 hypothetical patients with common presenting problems that may be admitted to a hospital's general ward, ICU, or an IMCU, depending on a hospital's practice. The respondent was asked where each hypothetical patient would ideally be admitted in their hospital. If the description did not provide enough information for the respondent to determine where the patient would be triaged, we asked the respondent to describe what information would be needed to decide. The survey was piloted with charge nurses and a coordinator of patient placement and subsequently refined before study initiation.

Hypothetical cases included the following:

1. **ASTHMA:** A child with asthma requiring continuous albuterol nebulization.
2. **DKA:** A child with new-onset diabetes in DKA. The patient is awake with normal mental status.
3. **BRONCHIOLITIS:** An infant with viral bronchiolitis, needing suctioning and nebulizers every 1 to 2 hours, and requiring 2 L per minute of supplemental oxygen.
4. **HOME CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP):** A child with a past

history of brain injury resulting in significant neurologic compromise who is now admitted with pneumonia. He is requiring some oxygen and is breathing slightly fast but has a reassuring blood gas. He is fed via gastric tube, and requires CPAP at night at home for obstructive sleep apnea.

5. **HOME VENTILATOR:** A child with a neurodegenerative disorder who has a tracheostomy and is ventilator-dependent, now being admitted with a right toe cellulitis requiring intravenous antibiotics. She is otherwise at her baseline.
6. **PERSISTENT CROUP:** A toddler with croup and stridor. The patient's symptoms respond well to racemic epinephrine nebulization, but the patient requires a repeat dose after 1 hour.

Data were analyzed for variation in triage practices by diagnosis, region, number of hospital beds, and number of ICU beds by using χ^2 testing and linear regressions with Minitab Statistical Software version 16 (State College, PA).

Because human subject participation in this research was limited to anonymous and low-risk survey responses, this study was exempted from review by Boston Children's Hospital Institutional Review Board.

RESULTS

A total of 192 hospitals met inclusion criteria; 164 hospitals responded for an 85% response rate. In a few cases, the respondent was unable to decide where the patient would be triaged, resulting in a "no answer" response. Respondents were primarily emergency department charge nurses or nurse managers, with occasional responses by coordinators for bed placement, IMCU nurses, and, rarely, physicians.

For all of the cases in question, most of the institutions triaged them to the ICU (Figs 1 and 2).

A total of 28 (17%) of the responding institutions reported triaging at least 1 of the patient scenarios to an IMCU (Fig 1). The presence of an IMCU decreased rate of patient triage to the ICU for all scenarios

Percent of Institutions with Intermediate Care Units (IMCU)

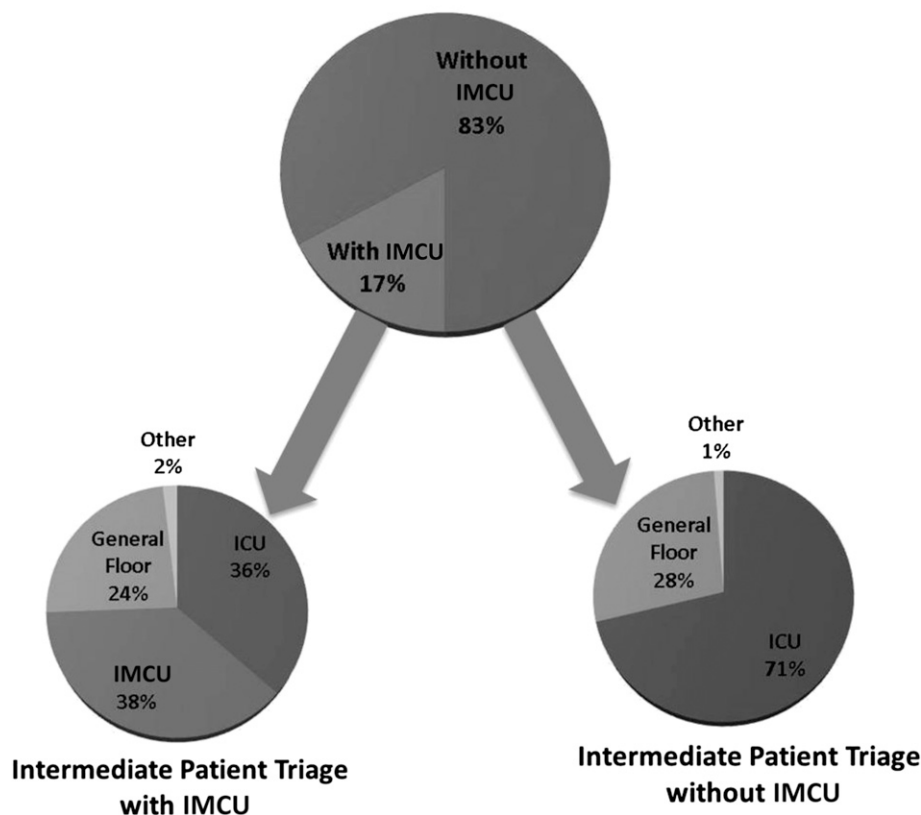


FIGURE 1 Triage of intermediate patients based on presence of IMCU.

when comparing hospitals with an IMCU with those without one ($P < .001$).

In comparing triage practices by diagnosis (Fig 2), the scenario most likely to be triaged to the ward was persistent croup, which was triaged to the ward by 38% of institutions overall. In 4% of institutions, respondents reported this patient would be triaged to an emergency room observation unit (reported as "other") to watch for subsequent improvement before admission.

For the 2 scenarios in which care was complicated by baseline requirement for respiratory technology, 37% of institutions overall triaged a mildly ill but significantly neurologically disabled patient on home CPAP to the ward, and 32% of institutions overall triaged a patient dependent on ventilation via tracheostomy but presenting with nonrespiratory illness to the ward.

The presence of an IMCU was associated with different triage practices for the

diagnoses of asthma ($P < .001$), bronchiolitis ($P < .001$), the patient on home CPAP ($P < .001$), and croup ($P = .02$). For patients with DKA or requiring home ventilation via tracheostomy, the presence of an IMCU was associated with a trend toward different triage ($P = .09$ and $P = .08$, respectively).

There was a significant association between geographic US region and whether the patient on home CPAP was triaged to the ICU versus non-ICU ($P = .001$, Fig 3), with increase in triage to the ICU in the Northeast. When controlling for the presence of an IMCU, this association persisted (in hospitals without an IMCU: $\chi^2(4, n = 136) = 13.11, P = .011$, in hospitals with an IMCU: $\chi^2(3, n = 28) = 10.64, P = .014$).

There were no significant associations in triage practices for the other scenarios by region, or according to the size of the

hospital (number of beds) or the size of the ICU.

DISCUSSION

Our study confirms significant variability in the triage of patients who require more intense nursing and monitoring.

For the scenarios that we chose, the patients presenting with acute, severe illness that have low risk of mortality but may require intensive management (asthma, DKA, bronchiolitis, croup) were triaged by the vast majority of institutions to the ICU. Although these scenarios were chosen primarily to reflect experience in IMCU at our institution, it is interesting to note that they correspond with diagnoses in the low-risk category for the Pediatric Index of Mortality 2 (PIM2) (asthma, bronchiolitis, croup, obstructive sleep apnea, and DKA).⁸ Of these diagnoses, croup was the most likely to be triaged by some institutions to the ward, with many respondents indicating

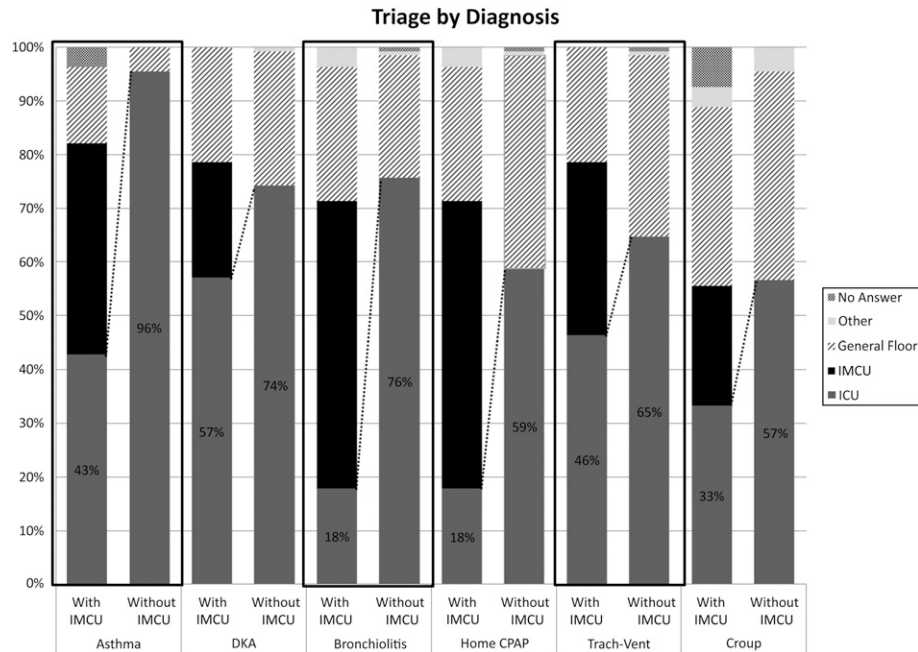


FIGURE 2 Hospital inpatient triage of intermediate-care patients by diagnosis.

that they expected patients with croup to improve substantially with therapy given in the emergency department.

Comparison of triage practices in pediatric institutions with and without an IMCU

supports that these units do, in fact, unburden ICUs from less severely ill patients. This is in keeping with data from adult literature that support the role of the IMCU in improving ICU utilization for sicker

patients.⁹⁻¹² In particular, Byrick et al^{13,14} described the impact of closure of an IMCU in 1 hospital, resulting in a fourfold increase in ICU admissions with a lower severity of illness. More recent literature describes

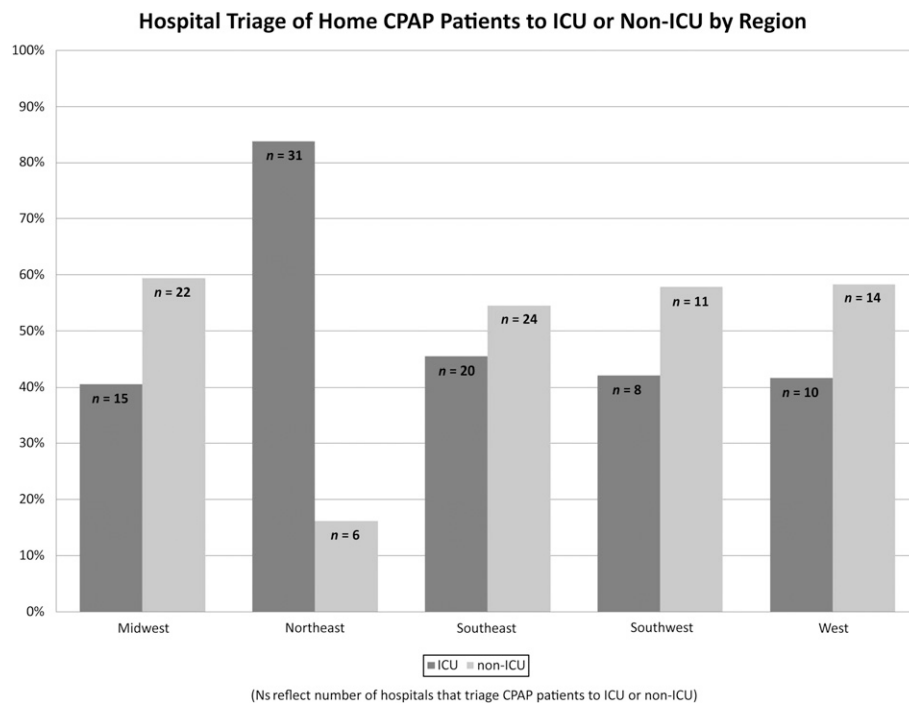


FIGURE 3 Hospital triage of home CPAP patients to ICU or non-ICU by region.

successful care for adult patients with specific diseases in IMCUs, including severe asthma and sepsis.^{15,16}

Interestingly, we found IMCUs in only 17% of responding institutions, which is significantly lower than the 33% and 55% noted in the literature previously.^{1,2} This is possibly a result of our query, which asked for triage practices for patients presenting in the emergency department, and thus would not capture any IMCUs that act exclusively as step-down units to ICUs. The survey did not explore triage of patients within the ICU to intermediate care status or onto teams specifically designed to care for moderate acuity patients. This survey also focused on medical patients and would not include any IMCUs that serve subspecialty patients, such as cardiac or surgical units.

Although most institutions sent patients requiring respiratory technology at baseline to the ICU despite presenting with relatively mild illness, a significant portion were triaged to the general wards (37% for home CPAP, 32% for ventilator-dependent patients). The safety of triaging pediatric patients dependent on ventilators via tracheostomy to the ward has been described in 1 institution; notably, however, that hospital maintained nurse-patient ratios of 1:2 or 1:3 and had a respiratory therapist available at all times.¹⁷ Our study is limited in that it did not assess the physician staffing, nursing ratios, or respiratory therapist support of patients in institutions that sent technology-dependent patients to the general ward. We know through personal communication that in some peer institutions the practice is to increase nursing ratios on wards for intermediate-care patients.

In adult medical literature, cost containment was seen as the driving force for creation of IMCUs. Multiple studies support the assertion that IMCUs reduce cost without negatively affecting outcomes.^{1,10,12,18,19} Although no definitive study exists in either adult or pediatric medical literature, results from our study support that IMCUs identified in this study care for patients who would often be triaged to an ICU at institutions with no IMCU. True cost implications of this

variation in triage would require further study. In our experience, triaging patients to a unit that develops nursing and unit-wide expertise in care of specific diagnoses has also allowed for improvement in quality of care and specifically in length of stay. Further studies regarding appropriate staffing for intermediate-care patients and effects on patient outcomes and costs of care are warranted.

The hypothetical nature of our scenarios is a potential limitation of the study in that institutional representatives were asked to react to a case description that provided a limited set of information that may or may not have addressed all of the usual factors determining the disposition of patients at a particular center.

CONCLUSIONS

Inpatient triage practices among pediatric hospitals vary widely for patients who require intense nursing or frequent monitoring due to specific acute illnesses or respiratory technologies. Institutions that have an IMCU available are less likely to send these patients to the ICU.

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