



Best Practices for Improving Flow and Care of Pediatric Patients in the Emergency Department

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This report provides a summary of best practices for improving flow, reducing waiting times, and improving the quality of care of pediatric patients in the emergency department.

abstract

CURRENT STATUS AND NEEDS

ED Use and ED Crowding in the United States

Approximately 800 000 children seek care in the emergency department (ED) each day in the United States. Additionally, it is estimated that 3.4% of US children use EDs as their source for sick care. The vast majority (92%) of these children are seen in community EDs, with a smaller percentage seen in pediatric EDs. The increase in ED utilization has saturated the capacity of EDs and emergency medical services in many communities. Increases in patient volume and decreases in resources, including fragmentation of resources and shortage of critical subspecialists, have resulted in EDs facing crowding and ambulance diversion.

The need for emergency medical services outstrips the available resources on a daily basis. This mismatch is reflected by the considerable increase in the number of patients visiting EDs. In 1993, 90.3 million patients visited EDs; in 2003 that number increased to 113.9 million patients.

Approximately 21% of these patients were younger than 15 years. Despite the increase in ED visits, the number of hospitals decreased by 703, the number of hospital beds decreased by 198 000, and the number of EDs decreased by 425.^{1,2} More recent data indicate that this trend continued between 2001 and 2008; the number of ED visits increased by 1.9% per year (95% confidence interval [CI]: 1.2%–2.5%), a rate 60% faster than population growth. Mean occupancy, defined as the number of patients in an ED at a single point in time divided by the number of standard

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treatment spaces, increased even more rapidly, at 3.1% per year.³

The Effect of Crowding on Safety and Quality of Pediatric Emergency Care and Throughput

ED crowding threatens patient safety, increases medical errors, prolongs length of stay, decreases patient satisfaction, and jeopardizes the reliability and ability of the US health care system to effectively care for patients.^{4–6} Specific examples of the effects of ED crowding on quality of ED care, including timeliness of care and patient safety, have been published.

Studies have shown an association between ED crowding and throughput measures, such as length of stay, in EDs.⁷ In a large urban children's hospital ED, boarding time and ED daily census showed independent associations with increasing overall length of stay, time to triage, time until seen by physician, and number of patient elopements (ie, patients leaving without being seen by a physician or leaving before treatment is initiated).⁸ Another study of 4 general EDs showed an association between measures of crowding and timeliness of emergency care. The delays affected even the patients with highest acuity. During crowded periods (ie, 90% higher than the average census), the adjusted median waiting room times of high-acuity level 2 patients, according to the 5-level Emergency Severity Index, were 3% to 35% higher than during normal periods.⁹ The percentage of patients in the ED who are seen by a physician within the time recommended by triage classification has been steadily declining and is at its lowest point in at least 10 years. Of all the patient triage levels in the ED, the more urgent patients are the least likely to be seen within the triage target time. Patients of all racial/ethnic backgrounds and payer types have been similarly affected.¹⁰ ED crowding has also been shown to be

associated with an increase in the rate of patients who leave without being seen by a provider.¹¹ Other studies have revealed that waiting time to see an ED provider was longer at hospitals in poorer neighborhoods.¹² These studies show that ED crowding may be associated with deficits in both the timeliness and equitability of patient care.

Other domains of the quality of ED care may also be affected by poor ED throughput and crowding. In a study in pediatric ED patients experiencing an acute asthma exacerbation, timeliness and effectiveness quality measures demonstrated an inverse, dose-related association with occupancy and time to see an attending physician. Patients were 52% to 74% less likely to receive timely care and were 9% to 14% less likely to receive effective care when the crowding measures were at the 75th rather than at the 25th percentile ($P < .05$).¹³

Crowding was also associated with delay in analgesic administration in pediatric patients with sickle cell pain crisis in a pediatric ED.¹⁴ ED crowding has also been associated with delay of and failure to administer antibiotics for adult patients admitted with community-acquired pneumonia^{15,16} and with delays in analgesic treatment in patients presenting with acute abdominal pain.¹⁷ Other studies have shown similar associations between ED crowding and quality of care in adult ED patients, including the treatment of patients with pain^{15,18} ED crowding is also associated with deficits in patient safety. A study conducted in 4 general-population EDs showed an association between ED crowding and preventable medical errors.¹⁹ Other investigators have also found an association between ED crowding measures in an adult and pediatric ED population and medication errors.²⁰ More recently, Sun et al²¹ demonstrated an association between ED crowding and

mortality, hospital length of stay, and costs in 187 California hospitals. The estimate of the costs attributable to ED crowding was 300 additional inpatient deaths, 6200 excess hospital days, and \$17 million in adult ED admissions. ED crowding and increased wait times are associated with decreased patient satisfaction with ED care.^{22,23} One study completed in 5 general teaching hospital EDs revealed that not feeling informed about prolonged waits in adult patients was associated with greater dissatisfaction (odds ratio [OR]: 0.48; 95% CI: 0.39–0.57).²⁴ Another study revealed that ED wait times correlated with patients' satisfaction with both their ED and inpatient care.²⁵ A study in pediatric ED patients showed that both parent and child satisfaction was correlated with wait time. This study also found that timely resolution of pain was important to both parents and children.²⁶ There is also evidence from studies in both adults and children that improvement in ED wait times leads to improved patient satisfaction.^{27,28}

In summary, ED crowding is a growing problem and is associated with increased lengths of stay in the ED, increased patient elopement rates, and significant deficits in the quality of care domains of safety and timeliness.²⁹ ED crowding has also been linked to deficits in patient satisfaction and the quality domains of efficiency and equitability. Improving ED throughput and relieving ED crowding is an essential component of improving the quality of ED care.

Calls to Improve ED Crowding and Delivery of Care

Regulators and payers have begun to recognize and address this problem. The Joint Commission views patient flow in the ED as a patient safety issue, specifically targeting patient boarding of psychiatric patients.³⁰ In 2014, the Centers for Medicare and Medicaid Services began requiring

that hospitals report 5 ED crowding measures,³¹ including median time from ED arrival to ED departure for discharged patients, door-to-diagnostic evaluation by a qualified medical professional, patients who leave before being seen, median time from ED arrival to ED departure for admitted patients, and median time from admit decision time to time of departure for admitted patients. While instituting process improvements for flow and efficiency, quality patient care needs to be the driving force. The Institute of Medicine (IOM) has challenged pediatric providers of emergency care as well as business coalitions, government and private individual purchasers, and employees^{32,33} to provide objective evidence that they are receiving high-quality health care services for the price paid.³⁴

In the IOM report *Emergency Care for Children: Growing Pains*, a challenge was made to providers of pediatric emergency care by asking for methods to improve ED flow, reduce ED waits, and establish a high standard for pediatric emergency care. The 3 main goals for this improved delivery of care included the following: coordination (to allow “the most appropriate care, at the optimal location, with the minimum delay”), regionalization (to develop evidence-based categorization systems for emergency medical services, EDs, and trauma centers), and accountability (the creation of evidence-based indicators of emergency and trauma care system performance measures, including the performance of pediatric emergency care). Specific challenges for pediatric emergency medicine include expanding and strengthening the pediatric workforce to enhance pediatric care, defining pediatric emergency care competencies as well as the requirement to achieve and maintain these competencies, updating clinical guidelines and standards of care, and developing

strategies for addressing pediatric needs in the event of a disaster.³⁵

Clinical Practice Pathways

Clinical pathways are multidisciplinary plans of care structured and designed to support the implementation of clinical guidelines and protocols for ED care and can be used to treat high-volume or high-risk pediatric patients. The use of these nurse-initiated clinical pathways does not suggest that such clinical care is the only appropriate course of treatment. The use of evidence-based nurse-initiated standing orders/protocols is supported by the Centers for Medicare and Medicaid Services as a method by which to enhance the quality and efficiency of patient care.³⁶ These nurse-initiated clinical pathways are not intended as a proxy for standard of care. Rather, they are intended, and have been proven, to increase efficiency, decrease variation, and minimize risk for pediatric patients.^{37–41} A study of more than 15 000 adult patients from 1 urban ED revealed that nurse-initiated triage diagnostic standing orders were associated with a 16% reduction in the time of in-room ED care.⁴² Commonly used examples of clinical pathways include those for asthma, bronchiolitis, dehydration, and fever in the neonate. Because of the unique risks related to the boarding of behavioral health patients, clinical pathways that include the utilization of a nurse practitioner to support their care is 1 example of how hospitals can address the medical and safety needs inherent to this population.⁴³ Such collaboration would also help hospitals meet the 2013/2014 guidelines from the Joint Commission in caring for these patients.⁴⁴

Many insurers are determining benchmarks for defining quality care and are instituting payment incentives for reaching these benchmarks.⁴⁵ Unfortunately, several of these benchmarks do not seem to

be appropriate when systematically reviewed.⁴⁶ More recently, providers of pediatric emergency care have been more proactive in addressing the issue of what determines quality pediatric emergency care.^{47–51}

The 2001 IOM report *Crossing the Quality Chasm* emphasized that evidence-based practice should be a combination of the best research, clinical expertise, and patient values. Practice guidelines are systematically developed statements to assist in the making of practitioner and patient decisions regarding appropriate health care for specific clinical circumstances. Practice guidelines should be based on scientific evidence of effectiveness or predictability. They counter the tendency for medical practice to be anecdotal and parochial by forcing health professionals to examine knowledge and practice patterns. By systematically influencing clinical decisions, practice guidelines can decrease unnecessary variations in care and improve quality.⁵² Well-developed practice guidelines crystallize research and make information available in a usable format.^{53,54} When there is not clear evidence to support 1 management strategy, guidelines can be written as acceptable alternative treatment options rather than as standardized practices that dictate specific treatments. Physicians need not be required to use the practical tools offered but must be held accountable to the quality and safety of patient care standards. Often, guidelines are translated into clinical pathways. The Cochrane group defines a clinical pathway as containing 5 key elements⁵⁵, as follows:

- a structured multidisciplinary plan of care;
- translation of guidelines or evidence into local structure;
- detailed management steps;
- time- or criteria-based progression; and

- aims to standardize care for a specific problem in a specific population.

Use of Guidelines

The use of guidelines and clinical pathways has clearly improved quality of care. Examples of published guidelines that have been shown to improve outcomes in pediatric emergency care include those for bronchiolitis, croup, asthma, imaging for appendicitis, and management of patients with acute exacerbations of inborn errors of metabolism.^{40,56–58}

However, even when guidelines exist, there is inconsistent application by providers, as noted in a study on managing fever in young children. The authors concluded that the variation in the use of the guidelines between emergency physicians affected both cost and quality of care.⁵⁹ It is important for guidelines to be presented as a tool used in conjunction with clinical judgment and not as a substitute for the provider's ability to treat each child as an individual. Physician "buy in" is one of the most significant barriers to implementing guidelines.^{60,61} The concept that guidelines limit the physician to think freely or mandate a specific intervention may limit physicians' acceptance of a guideline. Physician input early in the development of a guideline may assist acceptance from the practicing community. Guidelines strongly based on evidence are more likely to be used as well. Additionally, real-time reminders and effective leaders are more successful than passive education in aiding guideline utilization.⁶²

Implementation at the local level must incorporate issues related to the culture, ethnicity, and socioeconomics of the particular community. When feasible, all levels of providers who participate in the emergency care of children should be involved in the development of guidelines to ensure that the many factors influencing the

pediatric care outcomes are considered.⁶³ Advanced-practice nurses, physician assistants, nurses, health plan representatives, injury prevention professionals, and social services providers also should collaborate in guideline development.

STRATEGIES FOR IMPROVING ED PATIENT FLOW

ED flow, the roadmap for addressing efficiencies, is a combination of triage, efficiency of evaluation, resource utilization, patient length of stay in the ED, and inpatient bed availability.^{29,63–65} Published accounts of successfully improving ED throughput measures usually use a combination of the strategies discussed below.⁶⁶

LEAN methodology

LEAN, a set of business operating principles developed by Japanese auto manufacturers, operates on a set of core principles that included the following: evaluation of systems, identification of waste, elimination of waste, improvement of flow, and constant adaptation and improvement.⁶⁷ A critical aspect of the LEAN system is to involve those providing value-added steps in every level of process design and modification, or a "bottom up" management.⁶⁸ This methodology has been shown to be effective in improving ED process efficiencies in a study working specifically in the area of Rapid Triage and Treatment of an ED with both adult and pediatric patients.⁶⁹

Emergency Care Pathways

Emergency care pathways and the use of clinical practice guidelines in triage, in particular, have been shown to decrease length of stay, improve resource utilization, and facilitate efficient throughput.^{70–72} There are many more published examples of the effect of adult triage or general triage pathways versus pediatric-specific triage pathways. However, some

pediatric-specific pathways have been shown to have an effect on ED patient flow.^{73–75}

Developing emergency care pathways that adequately address pediatric issues and prioritize problems in accordance with those of adults is a priority. An increasing number and quality of pediatric-specific triage pathways are available, the most notable being the 5-level triage system.^{76–80} If there are inadequate triage categorizations or reevaluations, then children may not be receiving appropriate prioritization for care. Additionally, parents who have been waiting for very long periods of time may leave before treatment is complete because the wait time is too long.⁸¹

Innovative Staffing Models

Optimizing resources is one of the top priorities in improving crowding in the ED. Although the research on innovative staffing models is still evolving, the existing evidence indicates that utilizing nurse practitioners or physician assistants as part of the overall ED health care team can have positive effects on both patient flow^{82,83} and patient satisfaction.^{84–86}

Although a certain percentage of pediatric patients are acutely ill or injured, many patients are of lower acuity and arrive during predictable peak periods, most notably during evening and weekend hours. The use of nurse practitioners and physician assistants in lower-acuity settings during peak hours, for example, has been found to be particularly effective at alleviating the stress that higher-volume, lower-acuity patients have on the system.^{87,88} Utilizing the concept of fast track or urgent care during these time periods has been shown to increase patient satisfaction for adult patients.^{28,89}

Utilizing nurse practitioners or physician assistants (at triage or treatment area) to assess and/or treat patients also frees up the time of

emergency physicians for the more complex cases.⁹⁰ It can create a bottleneck in triage, however, if a patient with a seemingly minor issue turns out to be more complicated, thus requiring more time in the evaluation phase. This model requires flexibility in both scheduling and backup.^{91–93} Alternatively, physician-led team triage models have also been associated with improved throughput and quality of care. In 1 study, an emergency physician–led team triage model was compared with the traditional model of nurse first, physician second. This model used in adult and pediatric patients was associated with decreased length of stay in the ED, decreased rate of patients who left without treatment, decreased rate of patients who returned for an unscheduled visit, and decreased mortality within 7 days.⁹⁴ Rogg et al,⁹⁵ using a similar model, found a sustained improvement (over 3 years) in length of stay for all of their ED patients, whether they were actually seen by the physician-led triage team. They also saw a sustained improvement in the rate of patients leaving without being seen. Others have shown more modest benefits in throughput measures when using similar models.^{96,97} The increasing demand for ED care is expected to continue, and EDs will need to continue to adapt to meet the changing expectations of the populations they serve.⁹⁰

The Impact of Value-Based Reimbursement

Tightening health budgets and the introduction of value-based reimbursement have contributed to an increased focus on improving patient flow and patient satisfaction without compromising quality of care. In the ED environment, lower-acuity patients typically wait the longest to be seen by a physician. Wait times are known to be a key factor in patient satisfaction, and studies have shown

that patient satisfaction scores are often lowest among the lower-acuity patients.⁸⁴ The low-acuity environment has, therefore, become a focus for innovative care solutions that can reduce wait times for all patients, not just those with minor presentations.⁹⁸

A systematic search of the English and French literature included 66 papers on the use of physician assistants in EDs and studied several outcomes, including changes in patient flow and patient satisfaction, during the period of physician assistant utilization. The papers, which discussed the effects on patient length of stay during the period of physician assistant utilization, reported that length of stay was reduced when physician assistants were introduced, although the short time period of 1 study limited its generalizability. One of these studies was in a US hospital that implemented a fast-track unit staffed by physician assistants and also found that patient satisfaction was significantly higher after its introduction.⁸³

Traditionally, patient registration has occurred before or during triage. Although accurate identification of patients is essential for provision of safe and quality emergency care, completion of patient registration after triage in the examination room and the use of bar-coded patient identification bands have both been shown to improve patient throughput times while maintaining patient safety.^{99,100}

Staffing Patterns and “Fast Tracking”

Seasonal variation with peaks in the winter months for influenza and respiratory illnesses and in the summer months for trauma with fractures and lacerations is also predictable. ED management can optimize supply and demand by proactively planning for these peak periods with increased staffing and

surge space allowances.^{101,102} Computer modeling of patient flow has been used successfully to predict the effects of physician staffing patterns on patient throughput in a pediatric ED.¹⁰³

ED to Observation Units or Inpatient Transition

Observation units are another option for relieving high-volume stress in a crowded ED. Observation units have been shown to reduce ED crowding by decreasing inpatient admissions and length of ED stay, improving efficiency, and increasing rates of patient and staff satisfaction. The types of patients best served in these units include those with asthma, croup, gastroenteritis, dehydration, abdominal pain, and poisoning.^{104–108} If the ED space and staffing are insufficient to adequately justify either an urgent care or observation service, another model can be used. A hybrid unit can be successfully created by sharing or combining resources with general pediatric inpatient or other pediatric outpatient services.^{109,110}

The inability to transfer patients to inpatient beds quickly has been shown to be one of the most important factors influencing ED efficiency of flow in studies of adult and general EDs.^{111,112} There are fewer data on the effects of inpatient occupancy on throughput in pediatric EDs. However, 1 study at an urban children’s hospital showed an association between inpatient occupancy rate and ED crowding measures. High hospital occupancy directly correlated with longer length of stay for all patients treated in the ED. When inpatient occupancy was at or more than 80% of capacity, every 5% increase in hospital occupancy was associated with an increase in length of stay of 17.7 minutes for patients who were discharged (95% CI: 2.2–33.2 minutes) and 34.3 minutes for patients who were admitted (95% CI: 11.4–57.2 minutes). With the same 5% increase

in inpatient occupancy, there were increases in the odds of either a patient leaving without being seen (OR: 1.21; 95% CI: 1.12–1.31) or being treated in a hallway bed (OR: 1.18; 95% CI: 1.15–1.22).¹¹³

The development of an early alert system for housewide awareness of reduced bed availability is key to ensuring that all stakeholders can immediately be made aware when inpatient beds become scarce or are no longer available. This alert system can be tiered to the point at which there are no inpatient beds, the ED is full, and transfers can no longer be accepted. For this alert system to be most effective, it should include not only the admitting office or high-level nursing administrators but also charge nurses on all floors, operating rooms, same-day surgery, recovery room, and the ED; all inpatient physicians; and residents who may be the providers responsible for actually writing the discharge orders.¹¹⁴

In many hospitals, the ED accounts for the majority of admissions. Another avenue to help ED crowding is for hospitals to review and streamline processes for admission to the hospital, including the balance of ED space utilization for adequate flow to keep patients from leaving because there are no ED beds to be able to see the patients. Accurate patient placement at all levels will help improve ED overcrowding.

Hospital administration may examine all aspects of admission and discharge processes to streamline and decrease the time and resources required. Daily safety updates facilitated by hospital administration provide a venue whereby all key hospital areas give a brief update about the unit, staffing, and potential issues and are a quality and safety concept that have been working in many institutions in the Ohio Children's Hospital Solutions for Patient Safety network.¹¹⁵ Combining daily safety updates with available electronic dashboards to show

patient flow in the ED and inpatient units can help managers predict real-time unit needs. More intense efforts must be focused toward earlier inpatient discharges. Some have even suggested positive incentives for earlier rounding and discharges, with corresponding negative consequences for failure to comply. Play areas and child life-facilitated family or group waiting rooms can be highly advantageous for patients waiting for parents or rides as they free up a room to be cleaned and turned over to another patient.

Finally, ED managers may proactively consider the optimal use of return visits to the ED versus referral to urgent care and other outpatient sites. This ED return visit system includes a detailed list of availability and hours of service that address the access and service needs of the patients, community, and hospital system and requires coordination with the hospital, outpatient clinics, and community physicians to ensure efficient use of resources.

PERFORMANCE MEASURE DEVELOPMENT

Performance measures can be used to provide continuous measurement of health care delivery within the system, identify areas of excellence, provide a mechanism for early awareness of a potential problem, verify effectiveness of a corrective action, and compare performance with that of peers. Measures can be categorized as structural, process, or outcome indicators. Structural elements provide indirect quality-of-care measures related to a physical setting and resources. Process indicators provide a measure of quality of care and services by evaluating the method or process by which care is delivered, including both technical and interpersonal components. Outcome elements describe valued results related to lengthening life, relieving pain, reducing disabilities, and satisfying

the consumer. An alternate method for classifying performance measures utilizes 4 categories including condition-specific measures, such as those for otitis media, childhood asthma, and infectious diseases; measures of consumer satisfaction, such as satisfaction with the emergency medical technicians, nurses, or physicians; general measures of health status, such as limitations in social activities, physical activities, and general mental health; and system measures of access and use of services, such as rate of referrals to pediatric specialists and disenrollment. These classification structures for quality review are not mutually exclusive and bring valuable perspectives to the concept of performance measures.

Previous work has recommended several paradigms for determining performance measures. Outcomes used for emergency medicine performance measurement have included mortality and morbidity, ED length of stay, inappropriate admissions, unplanned return ED visits, unplanned primary care visits, use of diagnostic tests and imaging equipment, and use of ED personnel. Using this concept, a Canadian expert consensus panel met to (1) define a set of common conditions and outcomes by age group to assess pediatric ED care, (2) identify links between processes of care and outcomes for each of these conditions, (3) define an explicit set of process and outcome indicators for these conditions, and (4) determine the extent to which it is possible to measure these indicators by using an existing population-based administrative data set. The conditions identified are common, are treated in most EDs, encompass a range of patient acuity, and have evidence for best practices to improve outcomes or enhance clinical efficiency. Notably, however, the panel did not explicitly rate the level of evidence for each clinical condition.⁴⁹

The American College of Cardiology/American Heart Association guidelines for the identification of performance indicators likely to improve quality recommend consideration of the following: (1) the strength of evidence supporting the measure, (2) the clinical relevance of the outcomes associated with the performance measure, and (3) the magnitude of the relationship between the performance measure and outcome. The guidelines also emphasize a fourth consideration, the expense of implementing performance measurement, when selecting a measure with the greatest likelihood of providing meaningful benefit. Quality improvement programs identify performance measures and related interventions that are cost-effective.¹¹⁶

SUMMARY

In summary, ED care and flow can be improved by implementing best practices at several steps in the workflow. Several points of impact can reduce ED boarding, improve pediatric patient safety, and promote effective, efficient, timely, and patient-centered care. These points of impact include the 5-level triage system and nurse-initiated emergency care pathways at the point of initial assessment without delay in seeing a provider, fast tracking and cohorting of patients, clinical pathways, and responsive staffing as patients advance through the ED system. Specific plans may be in place for any patient boarded while awaiting care for an emotional illness and/or substance abuse issue.³⁰ Interdisciplinary collaborative research and education are needed to develop and implement new solutions and strategies to both prevent and manage ED crowding.¹¹⁷ All health care providers involved in the delivery of pediatric emergency care are actively engaged in defining what pediatric quality care is and how to translate best practices into

guidelines that are easily disseminated and simple to follow.

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