Abstract:
Emergency medicine continues to suffer from information gaps that limit progress on measurement and action on quality of care. Important progress has been made in defining structure, process, and short-term outcome measures that occur within the time boundary of the emergency department (ED) visit itself for ill and injured children. However, true progress toward value-based care requires insight into outcomes beyond the walls of the ED. Existing measures such as return visits are not uniformly endorsed as a reliable and actionable measure of quality. The advent of concepts such as learning networks and patient-reported outcomes, and changes in technology use and connectivity at the population level offer potential strategies for ED systems to consider in the creation of scalable and sustainable information strategies to drive our progress toward value-based care.

Keywords:
clinical informatics; quality of care; outcomes measurement; pediatric emergency medicine

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Information Engineering for Value in Pediatric Emergency Medicine

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OVERVIEW

The field of emergency medicine, and pediatric emergency medicine (PEM) in particular, continues to suffer from information gaps that limit progress on measurement and action on quality of care. Important progress has been made in defining structure, process, and short duration outcome measures that occur within the time boundary of the emergency department (ED) visit itself for ill and injured children.[1,2] However, true progress toward value-based care requires insight into outcomes beyond the walls of the ED. Existing measures such as return visits are not uniformly endorsed as a reliable and actionable measure of quality. Summative patient-level reports on ED experience are often administrated by large survey organizations and represent a "stand alone" and late-arriving version of feedback that is not often linked to data within the electronic health record (EHR). The advent of concepts such as learning networks and patient-reported outcomes, and changes in technology use and connectivity at the population level offer potential strategies for ED systems to consider in the creation of scalable and sustainable information strategies to drive our progress toward value-based care.[3]

A MODEL TO INFORM INFORMATION ENGINEERING FOR VALUE IN PEM

A recently published model of acute, unscheduled care proposed by Pines et al[4] presents important considerations for

how best to engineer novel information solutions to drive value-based care in emergency medicine. This model defines a continuum from the following: (1) care decision making instigated by an acute injury or illness that leads into, (2) care delivery in different settings—including the "episodic" setting of the ED—and ultimately creates, (3) outcomes for individual and community health. Care transitions across episodic settings, longitudinal settings, and home/community are specifically emphasized. The Pines model also highlights the importance of a channel for system feedback and improvement. Notably, the proposed outcomes include those related to care experience, diagnostic accuracy, coordinated care, recovery, and function (see Table 1 for list of target measures and their potential applicability to PEM.)

Care transitions as a process step has not been previously "owned" as a quality measure by the ED provider or the ED system. To best inform value, distal outcomes for ill and injured patients, with attention to the trajectory of recovery and factors that will influence success, deserve emphasis. What responsibility the site of episodic care should assume for signaling or coordination of follow-up needs is an open question. "Aftercare" certainly influences the trajectory of recovery, and higher-risk conditions are more likely to benefit from coordinated follow-up post–ED care.[5]

CURRENT STATE OF MEASUREMENT FOR QUALITY IN PEM

Pediatric emergency care as a field has witnessed important progress on measurement for quality of care over the last decade since the Institute of Medicine reported on the unevenness of emergency care for children.[6] A review by Alessandrini et al[1,2] in 2011 summarized the end results of an important Delphi process for considering how meaningful PEM measures (both condition-specific and general) map to Institute of Medicine domains and the Donabedian framework. These measures, such as effectiveness of pain control for a fractured extremity, speak to a key short-term, within-ED outcome for quality of care, but not to the larger context of treatment decisions and the diagnostic process on final recovery. For example, pain can be treated effectively, but the optimal treatment path for a minimally displaced radius fracture (splinting) may not have been followed resulting into delayed recovery and increased costs from the application of a cast. True outcomes of care demand that our health care systems generate information regarding how ill and injured children return to health after an ED visit.

TABLE 1 Target measures for individual health outcomes.

Proposed Measure	Applicability to PEM	Existing Validated Measure For ED Care
Survival	Low	Yes
Patient experience	High	Yes
Diagnostic accuracy	High	No
Correct treatment	High	Condition specific
Quality of life	Medium	Condition specific
Ability to function	High	Condition specific
Symptom relief	High	Condition specific
Return to work/school	High	Yes

Disease severity is an important consideration for inclusion in quality robust measurement of PEM practice, as the range of patient-level acuities deserve attention.[7] Although thankfully mortality after pediatric emergency care is very uncommon, the increasing prevalence of pediatric patients with complex conditions and technology-dependence should be accompanied by measurement of potential morbidities experienced by this patient population during acute episodic care.

A consideration of the current state of measurement should also consider the sources of data readily available to support an automated approach to capture, analysis, and reporting. Recent efforts to generate a collaborative administrative data structure across multiple pediatric academic EDs highlighted the need for natural language processing in addition to standard data fields from the EHR to successfully define specific conditions such as long bone fractures.[8] Across the most common EHRs deployed in hospital-based EDs, there is limited functionality within the patient portals to support an EHR-embedded solution to data capture from the patient/family perspective for episodic care. A solution to postvisit measurement of quality, therefore, is unlikely to be realized through the EHR in isolation without additional channels of information exchange as part of the overall data model.

THE ED AS A LEARNING NETWORK

How can an ED reimagine itself as a learning network? Emergency departments are sites of episodic care, not longitudinal care. Historically, the patient discharged from emergency care who