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## How Does Pediatric Quality Measure Development Reflect the Real World Needs of Hospitalized Children?

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Infants, children and adolescents experience more than six million hospitalizations each year in the United States (US), with healthcare costs exceeding 47 billion dollars annually.<sup>1</sup> More than half of these hospitalizations occur at the time of birth, while the remaining represent medical, surgical, and mental health hospitalizations beyond the immediate neonatal period.<sup>1</sup> The burden of pediatric hospitalization is disproportionately borne by children with chronic physical and mental health conditions, those insured by Medicaid, and those experiencing social risk factors including poverty and housing insecurity.<sup>2–6</sup> Recognizing the increasing complexity and costs of pediatric inpatient care, and the vulnerability experienced by children during hospitalization, a national focus on hospital-based quality improvement is well justified. Fortunately, funding provided by the Centers for Medicare and Medicaid Services (CMS) to support the Pediatric Quality Measures Program (PQMP) has enabled evaluation of many aspects of pediatric healthcare quality using robust and valid quality measures. But to what extent do these measures reflect the real world needs of hospitalized children? To address this question, we describe recent advances in pediatric quality measurement in the context of the current epidemiology of pediatric hospitalization in the US.

The PQMP was launched in 2011, supported by Congress through the Children's Health Insurance Program Reauthorization Act (CHIPRA).<sup>7</sup> During the first phase (2011-2016), the Agency for Healthcare Research and Quality administered cooperative agreement grants to seven academic medical centers to support the development of an initial set of evidence-based quality measures designed to improve children's quality of care. Several of these quality measures are specific to pediatric hospitalization, including measures focused on access to high-risk obstetrical services, timely sepsis management, family experience of care, medication reconciliation, patient safety, transitions of care, mental

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Conflicts of Interest:

The authors have no conflicts of interest to report.

health care, and readmission following hospital discharge.<sup>8–16</sup> (A comprehensive list of PQMP Measures is available at <https://www.ahrq.gov/pqmp/measures/index.html>).<sup>7</sup> In addition, the first phase of the PQMP supported the development of two algorithms based on International Classification of Diseases codes (9<sup>th</sup> and 10<sup>th</sup> revisions) to identify children with disabilities and chronic diseases, which enable the identification of children with special healthcare needs for focused quality improvement initiatives or for the purpose of risk stratification.<sup>17,18</sup> During the second phase of the PQMP (2016–2020), six institutions were funded to implement and disseminate these quality measures, with a goal of determining their feasibility and usability. The results of this second phase of work are forthcoming, and will provide valuable information about the application of these measures to improve pediatric healthcare delivery.

To date, the majority of pediatric quality measure development and implementation efforts have occurred at large children's hospitals, where the majority of federal funding for pediatric research is received, and where high patient volumes enable relatively efficient data collection.<sup>19</sup> However, the usability of quality measures must also take into account the diverse settings where hospital-based pediatric care is delivered. Of non-birth pediatric hospitalizations in the US, less than 30% occur at freestanding children's hospitals with the remainder occurring at more than 3000 general hospitals across the country.<sup>2</sup> All freestanding children's hospitals in the United States are located in urban or suburban regions, leaving more than 1500 US rural hospitals under-represented in quality measure field-testing and implementation.<sup>2</sup> One-in-five American children live in rural areas, and one-quarter of these children – 2.95 million - have chronic health conditions.<sup>20</sup> Survey data indicate several urban-rural disparities in healthcare quality: rural-residing children are more likely to report unmet healthcare needs and less likely to receive preventive healthcare than children who live in urban areas.<sup>20–22</sup> In a study of freestanding children's hospitals, rural-residing children had a higher prevalence of complex chronic conditions, higher inpatient costs, and greater risk of readmission than their urban-residing peers.<sup>23</sup> Studies of healthcare quality in rural hospitals are needed to inform quality improvement efforts and the decisions of families and healthcare providers about where they seek or refer for hospital-based care.

Although, in aggregate, the majority of hospitalized children receive their care at general hospitals, meaningful pediatric quality measurement in this setting is challenged by the relatively low volume of pediatric hospital admissions at any one hospital. Across all general hospitals that admit children, 80% have pediatric volumes of less than 375 hospitalizations a year.<sup>2</sup> These relatively low numbers juxtapose with the need for sufficient patient volumes and statistical power to detect clinically meaningful differences in quality measure performance. Past analyses have shown that more than 85% of pediatric hospitalizations occur at hospitals with sufficient volumes to detect meaningful differences in several all-condition quality measures over a three year study period, while relatively few hospitals have volumes to meaningfully evaluate differences in condition-specific measures.<sup>24</sup> This calls for unique strategies at general hospitals to evaluate healthcare quality, including a focus on all-condition quality measures that may be applicable to both neonatal and general pediatric populations, collating data across longer periods of time, or joint measurement across several hospitals in a healthcare system. Illustrating the feasibility of multi-site collaboration and performance measurement, several recent quality

improvement collaboratives representing both children's hospitals and general hospitals have demonstrated significant improvements in quality of care for several common conditions, including bronchiolitis, asthma, and community acquired pneumonia.<sup>25–27</sup> Ongoing support for such quality improvement collaboratives is one means to support general hospitals' quality improvement efforts.

Several recent studies also demonstrate that a growing number of children who present for care at smaller general hospitals are transferred to children's hospitals for ongoing management of their condition.<sup>28,29</sup> Our knowledge of healthcare quality associated with inter-hospital transfer and regionalization of pediatric healthcare delivery is limited, as many studies of healthcare quality exclude transferred patients due to the inability to evaluate their full course of disease management. Of studies focused specifically on children experiencing inter-hospital transfer, some suggest that the majority of inter-hospital transfers are potentially unnecessary, given high rates of rapid discharge from the accepting facilities.<sup>30,31</sup> Other studies indicate that inter-hospital transfer is associated with longer lengths of hospitalization, greater odds of receipt of critical care services, and higher risk of in-hospital mortality.<sup>32,33</sup> Accordingly, evaluation of healthcare quality related to inter-hospital transfer of care is needed, and should take into account families' experiences and priorities as well as those of healthcare providers in lower-volume hospitals. Recognizing that inter-hospital transfer may result in substantial hardships for many families related to direct costs, lodging, transportation and childcare, quality measurement should take into account financial burdens and social complexity.<sup>34</sup> Families of rural-residing children may experience particular financial hardships, given the often substantial distances from their homes to regional referral centers, and the relatively higher rates of poverty experienced by rural-residing children.<sup>20,35</sup>

In conclusion, the PQMP has greatly advanced the field of pediatric quality measurement for hospitalized children, providing clinicians, researchers, and healthcare administrators access to a large number of quality measures to evaluate all phases of pediatric hospitalization, from admission through hospital discharge. Important next steps include the application of these measures across the structurally diverse hospitals where children receive their care, and attention to how inter-hospital transfer and regionalization of care are associated with healthcare quality. Future quality measure development and implementation efforts should also take into account the growing recognition of associations between social complexity and pediatric hospitalization, the financial burden of hospitalization on families, and the consequences of systemic racism in pediatric healthcare delivery. Recognizing and addressing social complexity and health disparities within a quality improvement framework will further advance the quality of pediatric hospital-based care.

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## Acronyms:

|               |   |
|---------------|---|
| <b>CMS</b>    | Centers for Medicare and Medicaid Services              |
| <b>CHIPRA</b> | Children’s Health Insurance Program Reauthorization Act |
| <b>PQMP</b>   | Pediatric Quality Measures Program                      |
| <b>US</b>     | United States   |

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**What's new:**

The Pediatric Quality Measures Program can support evaluation of many aspects of pediatric healthcare quality. This article describe recent advances in quality measurement in the context of current epidemiology of pediatric hospitalization in the United States.

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