Adverse events are an important cause of morbidity and mortality for pediatric inpatients, accounting for >4400 deaths per year.\(^1\)\(^{-3}\) Despite growing attention to patient safety, the rates of adverse events have remained unchanged.\(^4\) In addition, little is known about which patient populations are at the greatest risk for adverse events. In most studies, researchers estimate that approximately one-half of these events are preventable, but strategies to decrease harm are difficult to implement without first identifying patients who are at high risk.\(^5\)\(^{-7}\)

Adverse events are hard to detect, and research in this field has been hampered by the many different methodologies used across studies. Traditionally, the detection of adverse events has relied on voluntary event reporting by providers, which is subject to bias from providers and in which the true incidence of events is underestimated.\(^5\)\(^,\)\(^8\) There is a growing interest in the role of family-safety interviews in identifying harm to children during a hospital stay; this methodology may be used to counteract some of the bias in reporting and identify additional events not documented by providers.\(^5\)\(^,\)\(^8\) Administrative database reviews that include discharge codes have been used in lieu of individual chart reviews in the past, but this automated approach is limited regarding correctly identifying adverse events.\(^10\)\(^{-13}\) The recently validated Global Assessment of Pediatric Patient Safety (GAPPS) Trigger Tool is used to provide a more objective measure of adverse events in pediatric inpatient care and allows for providers to use focused chart review to identify adverse events in children who are hospitalized.\(^14\)

In their study “Racial, Ethnic, and Socioeconomic Disparities in Patient Safety Events for Hospitalized Children,” Stockwell et al\(^15\) used the GAPPS Trigger Tool to identify adverse events that occurred in a random selection of pediatric inpatients discharged from 16 hospitals (both academic and nonacademic) across all 4 regions of the United States. They identified 413 adverse events in 3790 reviewed medical records and found that the total number of adverse events, preventable adverse events, and high-severity adverse events was disproportionately higher in Latino children compared with in white children. Another key finding was that children with public insurance had higher rates of preventable adverse events compared with children with private insurance. The authors did not find differences in adverse-event rates between the other groups studied, which included children who were black or of other races and those with self-pay insurance or no insurance.

This study has several limitations. As acknowledged by the authors, their data include hospital admissions from 2007 to 2012 and therefore may not represent current demographics or practice patterns. Although the GAPPS Trigger Tool represents the most objective measure of adverse events currently available, like any safety event...
improved event detection at more hospitals. Electronic health record (EHR) would help facilitate feasibility of GAPPS tool use (e.g., by implementation studies on increasing the tool at many institutions. Dissemination and GAPPS tool with other prioritized needs. This administrators must balance the use of the barrier to implementing any safety initiative approaches. Resource usage is a common manual chart reviews, which are more time consuming, however, the GAPPS methodology is based on stock on data on disparities in adverse events that were identified by using the most objective event-detection methodology currently available, the GAPPS Trigger Tool. One important next step in the field of patient safety is to improve event detection at individual institutions so that locally relevant preventive measures can be implemented. Recent studies on the GAPPS methodology have revealed that it is used to capture more events than voluntary event reporting alone. Ideally, it would be widely implemented; however, the GAPPS methodology is based on manual chart reviews, which are more time consuming than most automated approaches. Resource usage is a common barrier to implementing any safety initiative because patient-safety leaders and administrators must balance the use of the GAPPS tool with other prioritized needs. This may limit the widespread use of the GAPPS tool at many institutions. Dissemination and implementation studies on increasing the feasibility of GAPPS tool use (e.g., by automating trigger detection within the electronic health record) would help facilitate improved event detection at more hospitals. Similarly, the GAPPS tool is commonly used to review a subset of patient charts and compare rates of harm over time. Additional studies on the optimal number and types of patients selected for review also have the potential to improve patient-safety monitoring at individual institutions.

Ultimately, the goal of patient-safety practices and research is not merely the identification but the prevention of adverse events. The efficient implementation of preventive strategies requires an understanding of which patients are at the highest risk of harm during hospitalization. Therefore, a second, important next step for the field is to develop risk-prediction models for different types of adverse events and identify optimal prevention strategies for each event type and population. Knowledge of disparities in the rates of adverse events is crucial for identifying patients at high risk of harm during hospitalization. As noted above, providers using the GAPPS tool may not capture all adverse events, and the current ideal for harm identification may be a composite of voluntary event reporting from providers, manual chart reviews conducted with a trigger tool, and patient-family safety interviews. However, all 3 of these methodologies may introduce biases in the events that are identified. For example, it is easy to imagine that family engagement and activation could influence the likelihood of an event being documented in a family-safety interview and, if a discussion with the family led to a change in clinician documentation within the medical record, possibly through voluntary event reporting and even trigger-tool review. Similarly, provider biases, including racial bias, weight bias, or others, could influence event identification and documentation. Limited data currently exist on patient, family, provider, and institutional factors that influence the detection of adverse events. Stockwell et al provide early data on patient demographics that may be associated with adverse events identified in chart reviews conducted with trigger tools. Most studies in which researchers have identified children at risk for adverse events have been focused on medical diagnoses or medical complexity. Other studies have revealed that obesity, race, insurance status, and age are potentially associated with patient safety, although some of these results have varied between studies. It is not surprising that socioeconomic status and race and/or ethnicity would increase a patient’s risk of adverse events because these factors are associated with numerous disparities in health care, including patient safety indicators. Similar data are needed for voluntary event reporting and patient-family interviews to improve institutional interpretations of local data, for which voluntary event reporting is still overwhelmingly relied on. A comprehensive understanding of the patient characteristics that are associated with different types of adverse events and detected by using different mechanisms will ultimately allow for us to predict which patients are likely to experience specific adverse events and to target preventive measures efficiently and appropriately to improve hospital safety.

In their study, Stockwell et al provide high-quality data collected from multiple, geographically diverse institutions on associations of patient race and insurance status with adverse event rates, as detected by using the validated GAPPS Trigger Tool. Their study represents an important first step in assessing a variety of potential patient and institutional characteristics associated with the occurrence of patient harm in children who are admitted to the hospital. Hopefully, it will motivate the pediatric community to gain a better understanding of the causative mechanisms through which these discrepancies in adverse event rates have been created and pursue further research to decrease harm in children of all races and economic statuses.

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## Identifying Pediatric Patients at High Risk for Adverse Events in the Hospital

Elizabeth Eby Halvorson, Danielle P. Thrule and Eric S. Kirkendall

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