COMMENTARY

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

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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.[6,9] 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

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detection tool, it cannot be used to capture every harm.[9] It is also possible, as suggested by the authors, that there are systematic biases (eg, based on patient race, medical diagnosis, or other characteristic) in the entry of an adverse event into the medical record or in the recognition of that event by a human reviewer during data collection using the GAPPS tool. As implemented in this study, the tool relies on random sampling; it subsequently cannot be used to surveil entire patient populations or detect all adverse events. Finally, there are likely many other patient and provider factors that could influence the rate of adverse events and were not included in this study's analysis. The authors discussed language barriers as a potential causative factor; others include underlying medical conditions, weight status, additional measures of socioeconomic status, and institution type.[4,6,16]

Stockwell et al[15] add geographically diverse 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 (eg, 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.[9] 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.[17–20] Limited data currently exist on patient, family, provider, and institutional factors that influence the detection of adverse events. Stockwell et al[15] 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.[4,6] 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.[16,21,22] 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.[21,23] 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[15] 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.

REFERENCES

1. Miller MR, Zhan C. Pediatric patient safety in hospitals: a national picture in 2000 [published correction appears in *Ann Emerg Med*. 2004;114(3):907]. *Pediatrics*. 2004;113(6):1741–1746
2. Kronman MP, Hall M, Slonim AD, Shah SS. Charges and lengths of stay attributable to adverse patient-care events using pediatric-specific quality indicators: a multicenter study of freestanding children's hospitals. *Pediatrics*. 2008; 121(6). Available at: www.pediatrics.org/cgi/content/full/121/6/e1653
3. Steering Committee on Quality Improvement and Management and

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Committee on Hospital Care. Policy statement–principles of pediatric patient safety: reducing harm due to medical care [published correction appears in *Pediatrics*. 2011;128(6):1212]. *Pediatrics*. 2011;127(6):1199–1210

4. Stockwell DC, Landrigan CP, Toomey SL, et al; GAPPS Study Group. Adverse events in hospitalized pediatric patients. *Pediatrics*. 2018;142(2):e20173360
5. Stockwell DC, Bisarya H, Classen DC, et al. A trigger tool to detect harm in pediatric inpatient settings. *Pediatrics*. 2015;135(6):1036–1042
6. Khan A, Furtak SL, Melvin P, Rogers JE, Schuster MA, Landrigan CP. Parent-reported errors and adverse events in hospitalized children. *JAMA Pediatr*. 2016;170(4):e154608
7. Berchialla P, Scaioli G, Passi S, Gianino MM. Adverse events in hospitalized paediatric patients: a systematic review and a meta-regression analysis. *J Eval Clin Pract*. 2014;20(5):551–558
8. Classen DC, Resar R, Griffin F, et al. 'Global trigger tool' shows that adverse events in hospitals may be ten times greater than previously measured [published correction appears in *Health Aff (Millwood)*. 2011;30(6):1217]. *Health Aff (Millwood)*. 2011;30(4):581–589
9. Khan A, Coffey M, Litterer KP, et al; The Patient and Family Centered I-PASS Study Group. Families as partners in hospital error and adverse event surveillance. *JAMA Pediatr*. 2017;171(4):372–381
10. Zhan C, Miller MR. Administrative data based patient safety research: a critical review. *Qual Saf Health Care*. 2003;12 (suppl 2):ii58–ii63
11. Hougland P, Xu W, Pickard S, Masheter C, Williams SD. Performance of International Classification of Diseases, 9th revision, clinical modification codes as an adverse drug event surveillance system. *Med Care*. 2006;44(7):629–636
12. Masheter CJ, Hougland P, Xu W. Detection of inpatient health care associated injuries: comparing two ICD-9-CM code classifications. In: Henriksen K, Battles JB, Marks ES, Lewin DI, eds. *Advances in Patient Safety: From Research to Implementation (Volume 1: Research Findings)*. Rockville, MD: Agency for Healthcare Research and Quality (US); 2005
13. West AN, Weeks WB, Bagian JP. Rare adverse medical events in VA inpatient care: reliability limits to using patient safety indicators as performance measures. *Health Serv Res*. 2008; 43(1, pt 1):249–266
14. Landrigan CP, Stockwell D, Toomey SL, et al. Performance of the Global Assessment of Pediatric Patient Safety (GAPPS) tool. *Pediatrics*. 2016;137(6): e20154076
15. Stockwell DC, Landrigan C, Toomey S, et al. Racial, ethnic, and socioeconomic disparities in patient safety events for hospitalized children. *Hosp Pediatr*. 2019; 9(1)
16. Halvorson EE, Irby MB, Skelton JA. Pediatric obesity and safety in inpatient settings: a systematic literature review. *Clin Pediatr (Phila)*. 2014;53(10):975–987
17. FitzGerald C, Hurst S. Implicit bias in healthcare professionals: a systematic review. *BMC Med Ethics*. 2017;18(1):19
18. Garcia JT, Amankwah EK, Hernandez RG. Assessment of weight bias among pediatric nurses and clinical support staff toward obese patients and their caregivers. *J Pediatr Nurs*. 2016;31(4): e244–e251
19. Hall WJ, Chapman MV, Lee KM, et al. Implicit racial/ethnic bias among health care professionals and its influence on health care outcomes: a systematic review. *Am J Public Health*. 2015;105(12): e60–e76
20. Sabin JA, Greenwald AG. The influence of implicit bias on treatment recommendations for 4 common pediatric conditions: pain, urinary tract infection, attention deficit hyperactivity disorder, and asthma. *Am J Public Health*. 2012;102(5):988–995
21. Berdahl T, Owens PL, Dougherty D, McCormick MC, Pylypchuk Y, Simpson LA. Annual report on health care for children and youth in the United States: racial/ethnic and socioeconomic disparities in children's health care quality. *Acad Pediatr*. 2010;10(2):95–118
22. Kaushal R, Bates DW, Landrigan C, et al. Medication errors and adverse drug events in pediatric inpatients. *JAMA*. 2001;285(16):2114–2120
23. Coffey RM, Andrews RM, Moy E. Racial, ethnic, and socioeconomic disparities in estimates of AHRQ patient safety indicators. *Med Care*. 2005;43(suppl 3): I48–I57

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