Editorial

Clinical and financial impact of HACs: a commentary on clinical and financial costs of hospital-acquired conditions

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In recent years, some aspects of hospital care have become increasingly scrutinized by insurance companies, the general public, and even healthcare providers themselves as all groups aspire to create an efficient, safe, and successful system. One area of particular focus is length of hospitalization, also known as length of stay (LOS), viewed by insurance companies through a financial lens and by providers from a clinical effectiveness standpoint. However, it is clear that prolonged LOS increases the risk of additional harm, sometimes unrelated to the original reason for hospitalization, from certain hospital-acquired conditions (HACs). Some important HACs include central line-associated blood stream infections (CLABSI), catheter-associated urinary tract infection (CAUTI), venous thromboembolism (VTE) (comprised of both deep vein thrombosis and pulmonary embolism), and pressure ulcers (PU). Significant preventative efforts have reduced the occurrence of these serious conditions, such as surgical site infections (1), among hospitalized adults but less is known about safe, productive, and financially-feasible strategies in pediatric care.

Efforts to rectify the dearth of available pediatric information are underway, however, and have been since an initial group of six Ohio children's hospitals joined forces in the 1980's, and as of 2014 had expanded to over 80 children's hospitals nationwide as the Children's Hospitals Solutions for Patient Safety hospital engagement network (2). Through intensive collaborative efforts some noteworthy progress has been made in just the last three years with a decrease in CAUTI incidence by 45 percent to 1.4 infections per 1,000 catheter days, 27 percent decrease in PU to 0.1 per 1,000 patient days, and a 0.3 percent decrease in VTE to 0.3 events per 1,000 patient days (2).

In a recent issue of *Pediatrics*, Goudie *et al*. (3) report pediatric-specific incidence and costs of VTE, CAUTI, and PU in financial terms of increased inpatient charges, as well as in clinical terms of increased LOS. In their report incidence analysis demonstrated 32 (VTE), 130 (CAUTI), and 3 (PU) incidents per 10,000 at-risk patient discharges. Compared to matched controls, VTE imparted 8.1 additional inpatient days [95% confidence interval (CI): 3.9-12.3] and average excess costs of $27,686 (95% CI: $11,137-44,235), while CAUTI imparted 2.4 additional inpatient days (95% CI: 1.2-3.6) and average excess costs of $7,200 (95% CI: $2,224-12,176). No statistically significant differences were found for LOS or costs for patients with PU compared to matched controls.

One major aspect of this study's significance is its status as one of the first estimates of epidemiology and financial impact of HACs in pediatric populations, joining a similar report of catheter-associated blood stream infections (4). Another is the definition of several key factors needed for standardization of future studies in this area, such as the exclusion of patients with LOS of less than 2 days (because events prior to this time would be more likely to be community-acquired than hospital-acquired) and suggestions for surrogate markers to aid with identification of events that may otherwise be difficult to track, such as the use of major surgery codes as proxy for bladder catheterization.

The use of propensity risk scores was well-suited for this study with rare outcomes and may serve as an example

for other similar studies in the future in which traditional multivariable regression analysis is not feasible due to complexity of matching on multiple covariates.

The authors acknowledge one potential weakness of the study which stems from the use of International Classification of Diseases, Ninth Revision discharge diagnosis codes to identify events. Use of these designations as the sole means of identifying events may yield poor sensitivity and specificity, as has been shown previously for VTE in particular (5). They made a strong effort to minimize any negative impact of this approach by using HAC definitions from published ICD-9 based algorithms with high positive predictive values. It is not clear what impact, if any, the recent update to the tenth edition will have (6). The codes themselves are consistent with those published previously for VTE clinical research (7) but it is unclear whether the electronic health records of patients identified in this manner were reviewed for diagnostic validation to ensure true positivity of event occurrence rather than coding error. Additionally, this discharge diagnosis code-based approach may underestimate total HAC incidence because no consistent method exists for identifying events that are either asymptomatic or don't become symptomatic after hospital discharge. Finally, it is important to consider that while not all HAC-related patient harm events may be preventable, current efforts to create and validate specific risk scores for various clinical subgroups will likely help to reduce those events that are.

No specific items contributing to the increased overall cost are reported in the publication, but it is likely driven by additional facility and healthcare provider costs. An additional concern is that the increased LOS demonstrated in this study exposes patients with VTE or CAUTI to risk of even more HACs, as hospital days have been shown previously to be independent risk factors for HAC development, in particular for VTE (8-11).

It was also noteworthy that VTE had a much higher increase in LOS and cost (nearly four-fold in each case) than either PU or CAUTI. Also, VTE imparted higher LOS and excess costs in younger patient groups, as opposed to CAUTI in which LOS differences were higher in the older age group. Taken together, these findings may reflect the state of VTE prevention in which robust data on safe and effective prevention strategies are sorely lacking in pediatrics, likely leading to clinician reluctance to implement aggressive prevention strategies such as pharmaceutical thromboprophylaxis with low-dose anticoagulation, especially in the youngest age groups, particularly because there is not yet any evidence that this strategy will be effective. However, another approach that has been discussed among pediatric healthcare providers and quality improvement workers is thromboprophylaxis with sequential compression devices to reduce lower extremity venous stasis in bedridden patients with mobility status below their baseline. A major point of resistance to these devices has been the concern of pressure ulcer development without careful monitoring. It is interesting, therefore, to note the lack of a statistically significant increase in LOS or cost with PU reported in this study.

Overall, this well-designed and well-written study is a welcome addition to the literature as one of what will hopefully become many studies of the epidemiology and financial impact of many HACs in the pediatric inpatient population.

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Footnote

Conflicts of Interest: The author has no conflicts of interest to declare.

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