RESEARCH BRIEFS

July Effect: Impact of the Academic Year-End Changeover on the Incidence of Healthcare-Associated Infections

All organizations experience turnover when employees leave and are replaced. In most organizations, such transitions occur throughout the year and typically affect only a small number of workers. However, in teaching hospitals there is an influx of new trainees (residents and subspecialty residents) at the start of the academic year in July. At the University of North Carolina Hospitals (UNC-H), 30% of our total trainees turn over with the onset of the new academic year (June 24 and July 1). This massive annual personnel shift, experienced in many US teaching hospitals, has been postulated to result in a higher frequency of medical errors, increased patient morbidity and mortality, and/or decreased efficiency (ie, longer length of hospital stay, increased duration of procedures, and/or increased hospital charges).[1] The potential adverse effect of staff turnover in academic hospitals has been called the "July effect" or the "July phenomenon."

A recent article that assessed the July effect on patients undergoing spinal surgery identified in the Nationwide Inpatient Sample, 2001–2008, reported that neither in-hospital mortality nor postoperative wound dehiscence was related to the influx of new residents or fellows. However, this study, which used *International Classification of Diseases, Ninth Revision* codes to ascertain surgical site infections (SSIs), reported a significantly higher likelihood of postoperative infections (odds ratio, 1.11; 95% confidence interval, 1.05–1.17; $P = .0341$). We report here an analysis of healthcare-associated infections (HAIs) at an academic teaching hospital to determine whether the July effect results in increased HAIs in the months following the influx of new trainees.

In an effort to identify the July effect in our institution regarding HAIs, this study was conducted at UNC-H, an 806-bed academic tertiary care medical facility with 781 residents and subspecialty residents in 67 Accreditation Council for Graduate Medical Education–accredited residency training programs. Comprehensive hospital-wide surveillance at UNC-H is conducted by 4 infection preventionists supervised by 3 professional academic staff using definitions published by the Centers for Disease Control and Prevention's National Healthcare Safety Network (NHSN) and ascertained by daily review of microbiology reports.[2] All data are entered into an electronic database. Denominator data are collected for device-days using NHSN-recommended methods. Patient-days are obtained from our census-tracking system. We analyzed our HAI data from 2010 to 2012 using a before-after design in which we compared the incidence of HAI for April–June with that for July–September. For SSIs, the incidence was determined as infections per 100 operative procedures per year. For device-related infections (ventilator-associated pneumonia [VAP], central line–associated bloodstream infections [CLABSIs], and catheter-associated urinary tract infections [CAUTIs]), the incidence was infections per 1,000 device-days per year. The overall HAI incidence was determined as the total number of all HAIs per 1,000 patient-days per year. This study was approved by the UNC Institutional Review Board.

Our data from 2010 to 2012, which compared HAIs from April–June with those from July–September, did not reveal any evidence of a July effect, as the 95% confidence intervals overlapped between these 2 time periods for SSIs, VAP, CLABSIs, CAUTIs, and overall HAIs (Table 1). A comparison of these 5 outcome measures by year (ie, 2010, 2011, and 2012) also did not reveal any evidence of a July effect (Figure 1).

The July effect has been hypothesized to occur as a result of the influx of new and inexperienced house-staff resident physicians to teaching hospitals at the start of each new academic year. While resident physician clinical inexperience could certainly play a role, many other factors accounting for errors or other undesirable patient outcomes are present as well. In addition to the influx of new trainees, there are also new supervisory roles for residents transitioning to higher levels of authority. Communication may be impaired as new teams with unfamiliar members are formed, requiring those team members to learn to work together. To our knowledge, only 1 study has analyzed whether the July effect might result in increased HAIs, and it reported an ~11% increase in wound infections after spinal surgery.[3] For this reason, we undertook our study.

A recent systematic review that analyzed the effects of trainee turnover (July effect) and included 39 published studies reported that the 13 studies of higher quality (5 rated as good quality and 8 rated as very good quality) often showed increased mortality and decreased efficiency at the time of house-staff changeover.[1] Studies examining morbidity and

TABLE 1. Incidence of Selected and Overall Healthcare-Associated Infections (HAIs) for the Indicated Time Periods, 2010–2012

	Infection rate (95% CI)	
Infection	April–June	July–September
SSI	9.33 (8.10–10.69)	10.31 (9.02–11.73)
VAP	2.64 (1.85–3.65)	1.99 (1.29–2.94)
CLABSI	1.64 (1.34–1.98)	1.42 (1.14–1.73)
CAUTI	2.50 (2.06–3.01)	2.59 (2.14–3.11)
All HAIs	4.89 (4.58–5.23)	4.84 (4.52–5.16)

NOTE. CAUTI, catheter-related urinary tract infection; CI, confidence interval; CLABSI, central line–associated bloodstream infection; SSI, surgical site infection; VAP, ventilator-associated pneumonia.

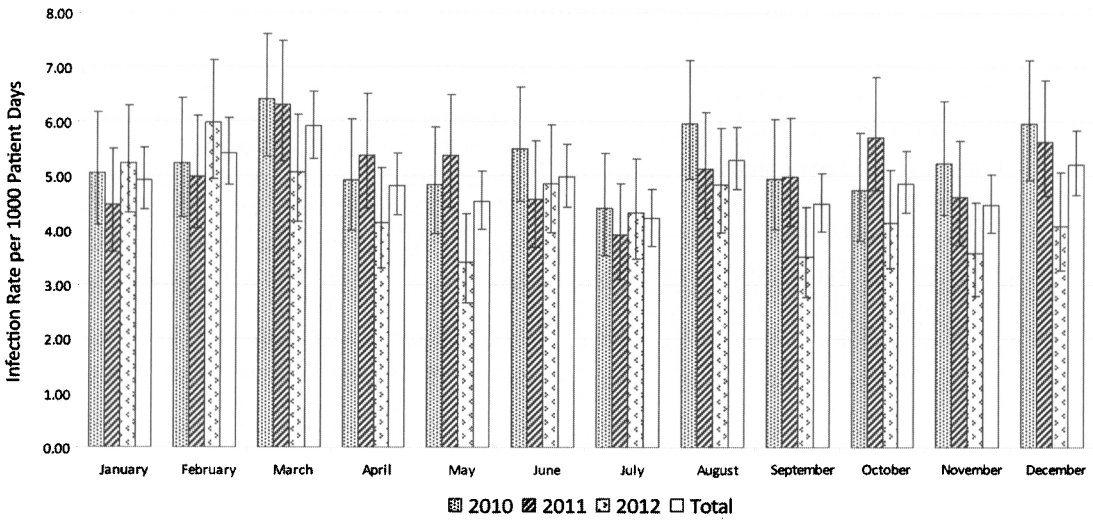

FIGURE 1. Overall infection rate (cases per 1,000 patient-days) by month at the University of North Carolina Hospitals, 2010–2012. Error bars are point prevalence 95% confidence intervals.

medical error outcomes were of lower quality and produced inconsistent results. Importantly, neither the systematic review[1] nor the 13 good-quality or very-good-quality studies assessed HAI as an outcome. It should be noted that the study by McDonald et al[3] reporting an increased rate of wound infections following spinal surgery is more recent and was not included in the systematic review.

In our study, we used a before-after design to assess the presence of a July effect. This method has been widely used in the literature, along with comparing monthly rates of HAIs in teaching versus nonteaching hospitals.[1] Our choice of comparing the 3 months before and after July 1 has been used in other studies, although before-after studies have also used other time periods, including 1-month, 2-month, and other intervals before and after July 1. Our data did not reveal any evidence of a July effect for SSIs, VAP, CLABSIs, CAUTIs, or all HAIs. In our analysis, we combined data for 3 years to improve the power of our study. As with other hospitals, we have achieved dramatic decreases in the incidence of HAI over time.[4,5] However, regardless of whether we analyzed our data by year or cumulatively (ie, 2010–2012), there was no evidence of a July effect.

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