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Endotoxin Overproduction of *Enterobacter cloacae* and Mortality Rate

To the Editor—We want to applaud the great work done by Arduino et al[1] in their article that established growth rates and endotoxin production in vitro in propofol using 10 clinically important microorganisms associated with outbreaks that have been implicated in extrinsic contamination of this intravenous anesthetic, as published by the Centers for Disease Control and Prevention in May and June 1990.[2] We would like to mention other studies that were reported after Arduino et al[1] to lend additional credence to their findings. According to the analysis by Arduino et al,[1] endotoxin was not detected in the gram-negative cultures at the start of the experiment, but after 24 hours, endotoxin production increased rapidly to a substantial level. *Enterobacter cloacae* was the best endotoxin producer of all of the microorganisms tested at all time points (2,412–4,820 ng/mL in 24 hours; 9,420–18,840 ng/mL in 48 hours; 7,360–14,720 ng/mL in 72 hours). Translating these results to clinical practice, 11 years later, Weist et al[3] reported outbreaks caused by multiple dose vials from 1983 to 2002, including 2 fatalities and 4 infected patients whose cases were associated with the administration of propofol contaminated by nothing more and nothing less than *E. cloacae.* Additionally, Mattner and Gastmeier[4] refer to *E. cloacae* and *Serratia marcescens* as the microbial species most commonly associated with death in the 7 reported outbreaks associated with propofol use.

We would again like to congratulate Arduino et al[1] for the practical knowledge generated by this study, which focused on specific strains that overproduce endotoxin, such as *E. cloacae.* Consequently, this species has been shown to be associated with a high mortality rate, as reported in several studies.[3,4]

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Different Compliance with Central Line Insertion Bundle between Intensivist and Nonintensivist Staff in Intensive Care Units

To the Editor—The use of central venous catheter (CVC) is increasing for monitoring hemodynamic status and providing venous access in the intensive care unit (ICU). However, as CVC use increases, complications of central line–associated bloodstream infection (CLABSI) after the insertion of CVCs increase as well and become another important cause of morbidity and mortality.[1,2] Therefore, several prevention efforts were developed to reduce the occurrence of CLABSI in the clinical setting of the ICU. "Insertion bundles" for reducing the risk of infection during the insertion of CVCs and "maintenance bundles' for minimizing the risk of infection for patients with CVCs are the 2 essential care bundles for prevention of CLABSI. CVC insertion is always performed by physicians in the ICU; however, ICU physicians may be intensivist or nonintensivist staff, and studies that compare CVC insertion bundle compliance of these 2 different types of physicians in the ICU are scarce. Therefore, this study was conducted to investigate the physician factors associated with CVC insertion compliance in the ICU.

TABLE 1. Comparison of Central Venous Catheter Insertion by Intensivists and Nonintensivists

Variable	No. (%) of compliant CVC insertions: By intensivists (n = 413)	No. (%) of compliant CVC insertions: By nonintensivists (n = 42)	P
Compliance with all 4 bundles	264 (63.9)	12 (28.6)	**<.001**
Bundle 1: hand hygiene	413 (100.0)	42 (100.0)	
Bundle 2: maximal barrier precautions upon insertion	326 (78.9)	30 (71.4)	.325
Bundle 3: CHG skin preparation	412 (99.8)	42 (100.0)	1.000
Bundle 4: optimal site selection	318 (77.0)	16 (38.1)	**<.001**

NOTE. Boldface type indicates statistical significance. CHG, chlorhexidine gluconate.

This study was performed at a regional teaching hospital that has 63 adult ICU beds (including 26 beds for the surgical ICU, 23 for the medical ICU, and 14 for the cardiac care unit) and 8 intensivists. Although most of the CVC insertions are performed by intensivists, insertion of CVC may occasionally be performed by cardiologists, surgeons, and trained residents by themselves in the ICU. In March 2013, the CVC insertion bundle was implemented in all of the ICUs. The bundle includes 4 components: hand hygiene, maximal sterile barriers upon insertion, use of chlorhexidine gluconate (CHG) for skin preparation, and avoiding the use of the femoral vein as an access site. Compliance was defined as the number of actions performed divided by the number of CVC insertions. Between March 1 and October 30, 2013, compliance with the CVC insertion bundle was observed. Categorical variables were compared using the χ^2 test or Fisher exact test. A P value of less than .05 was considered to represent statistical significance. All statistical analyses were conducted using the statistical package SPSS for Windows, version 19.0 (SPSS).

During the study period, a total of 456 CVC insertions were observed, and 413 insertions (90.6%) were done by intensivists. Additionally, 26 (5.7%), 13 (2.8%), and 3 (0.7%) were performed by cardiologists, surgeons, and trained residents, respectively. The overall compliance for all 4 components of the bundle was 60.7%. The compliance with each component was as follows: 100% for hand hygiene, 78.2% for maximal sterile barrier precaution, 99.8% for the use of CHG, and 73.4% for optimal site selection. Furthermore, we compared the CVC insertion compliance between intensivists and nonintensivist staffs (Table 1). We found that compliance with all 4 components and the selection of the optimal insertion site were significantly higher for intensivists than for nonintensivist staff (63.9% vs 28.6%; $P < .001$; 77.0% vs 38.1%; $P < .001$). However, the compliance rates for the 3 other components were similar in both subgroups.

In this 8-month observational study of 456 CVC insertions, the overall compliance for all CVC insertion bundles was only approximately 60% in our ICU, and the compliance was lowest for avoidance of femoral venous site and maximal sterile barrier. In contrast, the rates of compliance with hand hygiene and use of CHG were nearly 100% in this study. It indicated that we should devote more effort to enhancement of compliance with 2 components of the CVC insertion bundle: maximal sterile barrier and optimal site selection. Additionally, we found that the overall compliance with the CVC insertion bundle was significantly better for intensivist than for nonintensivist staff, especially with respect to site selection. The cause of this difference could be attributable to the fact that intensivists might be more familiar with the process of CVC insertion or more confident in performing nonfemoral venous insertions than nonintensivist staff. This observational study suggests that adherence to the CVC insertion bundle varied substantially according to physician characteristics. In conclusion, variability of CVC insertion compliance can be observed among different individual physicians. To determine the specific groups or bundles with lower compliance, a surveillance study is warranted.

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Sustaining High Influenza Vaccination Compliance with a Mandatory Masking Program

To the Editor—Influenza's ability to behave unpredictably and create serious illness still conflicts with the fact that a safe, effective vaccine is underutilized in healthcare settings. This underutilization led to the development of vaccination programs that involve negative consequences for lack of vaccination, usually by either termination of employment or a mandatory masking requirement.[1,2]

In July 2011, we reported a successful vaccination campaign that achieved greater than 90% compliance across clinical and nonclinical entities in our diverse health system.[3] The crux of our program was to crystallize a transparent, easily enforceable, and peer-pressured mandatory masking policy for those who chose to remain unvaccinated.

In 2012, the health system acquired 3 new acute care community hospitals with a total of 424 additional licensed beds. These hospitals ranged from 10 to 90 miles away from the main campus, and vaccination compliance rates approximated 60% at baseline. Each campus had a majority of private nonemployed physicians and a variety of electronic capabilities. The largest acquisition had a nursing union. One hospital was purchased just 3 months prior to the start of our flu campaign. Over this period of expansion, the health system grew from 12,363 employees to 19,985, and all campuses were immediately expected to adopt our vaccination program across clinical and nonclinical entities.

Our mandate was originally accomplished by full transparency regarding who was vaccinated, clarity on the masking policy, and engagement of leadership. An electronic password-protected database was available to all managers, showing the date any staff member received their vaccine. Employee badges displayed an annual campaign theme-based sticker upon vaccination. A clear protocol defined who paid for the mask, how often the mask needed to be changed, and even how it was to be worn. Additionally, the influenza vaccination program decentralized vaccine supplies by providing complete flu kits to appointed team captains for every department. The kit included prefilled vaccine syringes, consent forms, and stickers.

For the newer hospital acquisitions, however, some of this could not be done. Manual processes of recordkeeping, education, and compliance statistics had to be relied upon. Weekly stat facts were disseminated along with a more visible poster campaign. Flu masking rounds were incorporated into rounds that leadership made on a variety of patient safety issues, with participants alternating between the assistant chief medical officer, chief medical officer, and chief nursing officer along with infection prevention and regulatory performance improvement personnel.

As initially reported, the first 2 years of our mandatory masking program increased vaccination compliance from the baseline of 47% to 90% (system-wide, 2009–2010) and 92% (system-wide, 2010–2011). These numbers included all aspects of the health system, including all acute care hospitals,

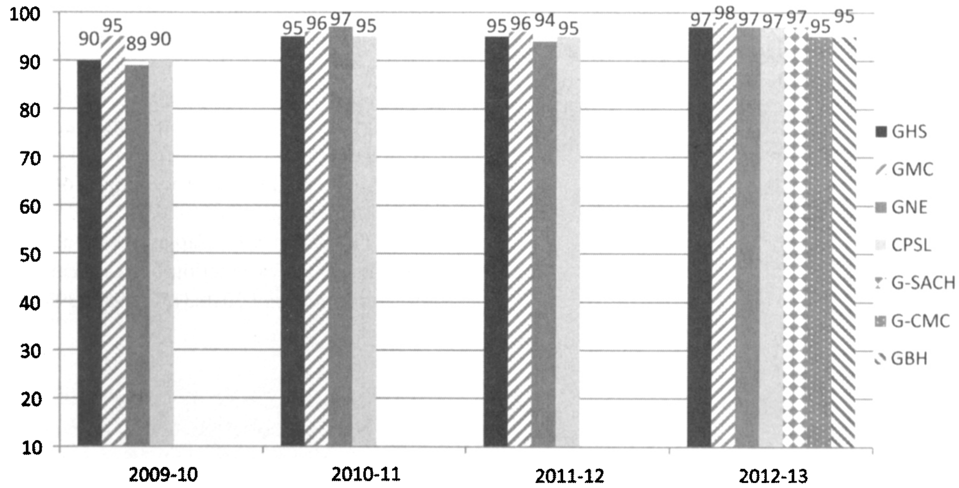

FIGURE 1. Influenza vaccination compliance rates, 2009–2013. CPSL, Community Practice Service Line; GBH, Geisinger Bloomsburg Hospital; G-CMC, Geisinger Community Medical Center; GHS, Geisinger Health System; GMC, Geisinger Medical Center; GNE, Geisinger Northeast; G-SACH, Geisinger Shamokin Area Community Hospital.

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