

Letters to the Editor

Correlation Between Healthcare Workers' Knowledge of Influenza Vaccine and Vaccine Receipt

To the Editor:

A recent study published in *Infection Control and Hospital Epidemiology* evaluated the correlation between healthcare workers' knowledge about influenza vaccine and acceptance of vaccination.¹ Professionals with greater knowledge about the usefulness of the vaccine, as demonstrated by correctly answering 5 questions, had higher vaccination rates than did those answering 1 or more of the questions incorrectly. Our research group performed a similar study using a questionnaire administered to 551 healthcare workers in primary healthcare centers in Catalonia, Spain, and found similar results. We also used a Likert scale of 0 (vaccination completely useless) to 5 (vaccination very useful) to establish how the vaccine was perceived by healthcare professionals.

As in the study by Martinello et al., those who believed that the vaccine worked were more likely to be vaccinated themselves (4.2 on the Likert scale vs 3.3 for those not vaccinated). Primary care physicians were the group who considered the vaccine most useful (average score, 3.77), followed by pediatricians (3.63). Significantly lower scores were recorded for nurses (3.44; $P < .01$).

REFERENCE

1. Martinello RA, Jones L, Topal JE. Correlation between healthcare workers' knowledge of influenza vaccine and vaccine receipt. *Infect Control Hosp Epidemiol* 2003;24:845-847.

Carl Llor, PhD
Luisa Morató, MD
Purificación Robles, MD
Ariadna Mas, MD
Catalan Institute of Health
Tarragona, Spain

The authors decline to reply.

An Estimate of the Incidence of Candiduria Among Hospitalized Patients in the United States

To the Editor:

Candida species are commonly isolated from the urine cultures of hospitalized patients.¹ *Candida* urinary isolates are second only to *Escherichia coli* in combined medical-surgical intensive care units (ICUs).² Because indications for treating it are often unclear, candiduria presents as a therapeutic dilemma to clinicians, who frequently treat with antifungal agents despite not knowing for certain whether *Candida* represents colonization or true infection.³ Whereas there is evidence that candiduria is becoming an increasing problem, little is known about its actual incidence. In this era of increasing attention toward developing cost-effective methods to manage infectious diseases,⁴ it is important to determine the incidence of candiduria so that the impact of interventions to manage it can be ascertained.

We performed a systematic review of the literature using PubMed with the keywords "candid*", "urinary," "infection," and "incidence" to identify published data on the incidence of candiduria. Additionally, we obtained the rate of urinary tract infections (UTIs) per 1,000 urinary catheter-days and the rate of urinary catheter-days per ICU patient-days from National Nosocomial Infections Surveillance (NNIS) System data pertaining to UTIs.⁵ Because the NNIS System reports pooled mean UTI rates according to individual ICU type, we calculated the overall mean UTI rate by (1) multiplying the pooled mean UTI rate by the number of urinary catheter-days of each ICU type to obtain the number of UTIs, (2) calculating the sum of UTIs, and (3) dividing the sum of UTIs by the sum of urinary catheter-days. The overall mean rate of urinary catheter-days was calculated in a similar fashion. The number of ICU beds in the United States (excluding neonatal beds) was obtained from the annual hospital survey of the

American Hospital Association.⁶ We estimated the number of ICU-days in the United States by applying the mean occupancy rate of ICUs reported by Groeger et al. to the number of ICU beds and multiplying by 365.25 days.⁷ To calculate the number of nosocomial UTIs, we multiplied the number of ICU-days by the number of catheter-days per ICU-days and by the number of UTIs per 1,000 catheter-days. We then multiplied the number of nosocomial UTIs by the percentage of UTIs caused by *Candida* species to obtain the incidence of candiduria.

In the United States, there were an estimated 5.3 UTIs per 1,000 ICU catheter-days from January 1995 to June 2001.⁵ The rate of urinary catheter-days per ICU patient-days was 0.73. According to the 2001 American Hospital Association survey, there were 69,593 ICU beds in the United States, with a mean occupancy rate of 84%.^{6,7} Because there were approximately 21.3 million ICU-days per year during this period, there are an estimated 82,000 nosocomial UTIs per year in ICUs in the United States. Given that approximately 31% of all nosocomial UTIs are caused by *Candida* species,¹ we estimate the incidence of candiduria in the intensive care setting to be approximately 25,000 cases per year in the United States.

We have demonstrated that candiduria is a common problem in ICUs in the United States. In our review of the literature, we found only one previous study specifically addressing the incidence of candiduria in the United States, but this study was limited to a single university hospital.⁸ Currently, there are no precise estimates of the incidence of UTIs because UTIs are not reportable diseases, and there are no large-scale surveillances of UTIs except in the ICU setting. However, treatment of candiduria is common. A multicenter U.S. study showed that 43% of *Candida* isolates in urine were treated, suggesting that candiduria is associated with significant antimicrobial use.⁹

Several factors limit the accuracy of our estimate of the incidence of candiduria. First, our estimate does not account for candiduria in non-ICU or neonatal ICU patients, because the NNIS System does not collect data from these settings. Second, there are currently limited data regarding non-

ICU nosocomial infections in the United States. In our survey of two local medical centers, 34% (185 of 543) of hospitalized patients with urinary isolates positive for *Candida* were in the ICU (93 of 236 and 92 of 307 at a public hospital and a tertiary-care facility, respectively; L. G. Miller, MD, unpublished data, July 15, 2003). Whereas candiduria occurs mostly in catheterized patients, a European study suggests that the percentage of nosocomial UTI in non-catheterized patients may be as high as 37%.¹⁰ These data suggest that the true incidence of candiduria may be 30% to more than 100% greater than our estimate. Third, the proportion of UTIs caused by *Candida* species is available only in the medical and combined medical-surgical ICUs. The proportion may be different in other ICUs. Finally, there are few data regarding outpatient candiduria, which is a rare finding in the outpatient setting and usually occurs in diabetic patients and patients receiving antibiotics. Most cases of candiduria still occur in hospitalized patients with indwelling urinary catheters.⁹

There are an estimated 25,000 cases of candiduria in ICUs in the United States per year. When candiduria among non-ICU patients and outpatients is considered, the incidence may be as high as or exceed 50,000 cases per year. Given the scope of this infection and the significant amount of antifungal treatment associated with candiduria, further research on identifying patients who would benefit from treatment of this common problem is warranted.

REFERENCES

- Richards MJ, Edwards JR, Culver DH, Gaynes RP. Nosocomial infections in medical intensive care units in the United States. *Crit Care Med* 1999;27:887-892.
- Richards MJ, Edwards JR, Culver DH, Gaynes RP. Nosocomial infections in medical-surgical intensive care units in the United States. *Infect Control Hosp Epidemiol* 2000;21:510-515.
- Sobel JD, Kauffman CA, KcKinsey D, et al. Candiduria: a randomized, double-blind study of treatment with fluconazole and placebo. *Clin Infect Dis* 2000;30:19-24.
- Roberts RR, Scott DS, Cordell R, et al. The use of economic modeling to determine the hospital costs associated with nosocomial infections. *Clin Infect Dis* 2003;36:1424-1432.
- Centers for Disease Control and Prevention. *National Nosocomial Infections Surveillance (NNIS) System Report: Data Summary From January 1992-June 2001, Issued August 2001*. Atlanta, GA: Centers for Disease Control and Prevention; 2001.
- American Hospital Association. *Healthcare QuickDisc, Summer 2002 Edition*. Chicago, IL: Health Forum, LLC; 2002.
- Groeger JS, Guntupalli KK, Strosberg M. Descriptive analysis of critical care units in the United States: patient characteristics and intensive care unit utilization. *Crit Care Med* 1993;21:279-291.
- Berrouane YF, Herwaldt LA, Pfaller MA. Trends in antifungal use and epidemiology of nosocomial yeast infections in a university hospital. *J Clin Microbiol* 1999;37:531-537.
- Kauffman CA, Vazquez JA, Sobel JD, et al. Prospective multicenter surveillance study of funguria in hospitalized patients. *Clin Infect Dis* 2000;30:19-24.
- Bouza E, San Juan R, Voss A, Kluytmans J. A European perspective on nosocomial urinary tract infections: II. Report on incidence, clinical characteristics and outcome (ESGNI-004 study). *Clin Microbiol Infect* 2001;7:532-542.

Anthony C. Shay, MD

Loren G. Miller, MD, MPH

Division of Infectious Diseases

Harbor-UCLA Medical Center and the

Los Angeles Biomedical Research

Institute at

Harbor-UCLA Medical Center

Torrance, California

Bacteria of Nosocomial Urinary Tract Infections at a University Hospital in Egypt: Identification and Associated Risk Factors

To the Editor:

Nosocomial urinary tract infection (UTI) is an important hospital-acquired infection. Recent studies have analyzed risk factors for nosocomial UTI due to different uropathogens.^{1,2} This study was conducted to determine the microbial etiology of nosocomial UTIs in Zagazig University Hospital and risk factors for infection with each pathogen. Zagazig University Hospital is a 1,030-bed, tertiary-care university hospital in Zagazig City, the capital of Sharkya Governorate, Egypt.

From January through September 2001, patients with nosocomial UTI were identified via prospective surveillance. Case-control studies were conducted. Nosocomial UTI was diagnosed according to criteria of the Centers for Disease Control and Prevention.³ Urine samples were collected from 557 randomly selected patients diagnosed as having nosocomial UTIs. Pathogenic bacteria were processed according to standard microbiologic procedures.⁴ Gram-posi-

tive isolates were identified by conventional methods,⁴ and gram-negative bacteria were identified by API20E (bioMérieux, Marcy l'Etoile, France).

For the case-control studies, each patient of the group having a nosocomial UTI with the same organism was considered a case-patient for infection with that particular organism. Each group of case-patients infected with a particular microorganism were compared with 200 control-patients. The same patient was compared more than once with control-patients when infected by more than one microorganism. When the same bacterial species was isolated from the same patient in more than one episode, it was introduced only once in the case-control study. Control-patients were randomly selected from a list of patients admitted during the study period who had no clinical, laboratory (organism isolated or pyuria), or radiologic evidence of a nosocomial UTI (ie, all control-patients had negative results on urinalysis and urine culture).

Data about gender, age, ward, indwelling urinary catheter, uro-surgery, instrumentation, malignancy, immunosuppressive therapy, body systems disorders, and diabetes were collected from case-patients and control-patients using a special worksheet. More than one worksheet was completed for the same patient when having more than one episode of nosocomial UTI with different organisms because each organism was evaluated separately. Backward, stepwise, multiple logistic regression analysis was performed to identify risk factors.

The 557 patients randomly selected for culture had 579 episodes: 541 patients had 1 episode, 10 patients had 2 episodes, and 6 patients had 3 episodes. Four hundred seventy-nine episodes were produced by 531 bacterial pathogens. Four hundred five episodes were produced by a single organism (367 patients had a single episode produced by a different single organism, 10 patients had the same organism in 2 separate episodes, and 6 patients had the same organism in 3 separate episodes). Seventy-four patients had episodes caused by 2 organisms (148 strains). Of the remaining 100 episodes, 71 were produced by fungi, and no organisms could be isolated from 29 episodes. Of the 531 isolates, 417 (78.5%) were gram-negative and