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in the ICU (93 of 236 and 92 of 307 at a public hospital and a tertiary-care facility, respectively; L. G. Miller, MD, unpublished data, July 15, 2003).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.

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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-positive 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, urosurgery, 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

TABLE
UNIVARIATE ANALYSIS (SIGNIFICANT VARIABLES) OF RISK FACTORS ASSOCIATED WITH NOSOCOMIAL URINARY TRACT INFECTIONS CAUSED BY VARIOUS PATHOGENS

	Odds Ratio (CI_{95})								
Characteristic*	*Escherichia coli* (n = 178)	*Klebsiella pneumoniae* (n = 100)	*Pseudomonas aeruginosa* (n = 78)	Enterococci (n = 50)	*Staphylococcus aureus* (n = 32)	*Staphylococcus epidermidis* (n = 32)	*Proteus* Species (n = 30)	*Enterobacter cloacae* (n = 17)	*Serratia marcescens* (n = 10)
Age > 45 y		9 (3.7–24.9)			6.37 (1.78–34.3)				
Female	1.97 (1.28–3.03)								
Catheter									
Short term	20.8 (8.9–55.5)			46.6 (16–142.3)	23 (6.93–79.8)	24.3 (8.7–67.8)	12.5 (2.5–54.6)		
Long term	2.78 (1.36–5.69)	50.3 (20.7–126.5)	9.7 (4.7–19.9)	4.5 (1.45–13.9)	5.24 (1.64–16.5)	4.5 (1.88–11.19)	14.5 (5.2–41.5)	11.1 (3.19–39.5)	7.78 (1.39–39.1)
Ward									
Urology	3.13 (1.79–5.48)				5.4 (2.2–13.2)	7 (2.9–17)	7 (2.8–17.4)	3.8 (1.05–12.4)	
Medical			2.64 (1.4–4.96)						
Intensive care unit				3.29 (1.5–7.24)			3.5 (1.35–9)		
Neurology		2.44 (1.26–4.76)							
Surgical procedure					3.8 (1.6–8.7)	6.4 (2.87–14.3)	2.7 (1.1–6.6)		
Instrumentation	18.1 (7.6–43.2)			32.3 (11.2–103.3)	19.4 (6.5–57.2)	97 (31–303.3)		9.9 (2.4–39.7)	
Malignancy			3.1 (1.7–5.5)						
Immunosuppressive therapy			5.9 (3.18–11)						
Disorder									
Urologic	2.58 (1.65–4.04)	2.7 (1.6–4.6)	9 (4.9–16.3)	10 (4.9–20.6)		3.5 (1.6–7.6)	2.4 (1.1–5.2)		
Neurologic	1.83 (1.08–3.12)	10.4 (5.9–18.4)	1.9 (1.02–3.8)						
Gastrointestinal				6.4 (3.2–12.8)					
Diabetes	9.4 (4.8–18.2)	25.5 (12.5–51.9)	5 (2.31–11)	6.7 (2.89–15.5)	6.1 (2.3–16.1)	7.1 (2.75–18.3)	17.9 (7.1–45.1)	10.9 (3.5–33.8)	

CI_{95} = 95% confidence interval.
*Only those characteristics that had data are presented.

114 (21.5%) were gram-positive bacteria. The frequency distribution of uropathogens is shown in the figure.

Risk factors for infection with each organism are listed in the table. Catheterization and diabetes were independent risk factors for infections by all organisms, except for *Serratia marcescens* regarding the former and enterococci and *Serratia marcescens* regarding the latter. Independent risk factors for *Escherichia coli* were female gender, hospitalization in the urology ward, and instrumentation; for *Klebsiella pneumoniae*, urologic and neurologic disorders; for *Pseudomonas aeruginosa*, malignancy, immunosuppressive therapy, and urologic disorders; for enterococci, ICU stay, instrumentation, and urologic and gastrointestinal disorders; and for *Staphylococcus aureus* and *Staphylococcus epidermidis*, admission to the urology ward and instrumentation.

Gram-negative bacteria constituted most of the isolates, with *Escherichia coli* being the most frequent uropathogen, as in other reports.[5,6] However, the proportions affected varied among these reports. Such variation may be due to differences in study duration, study population, hospital

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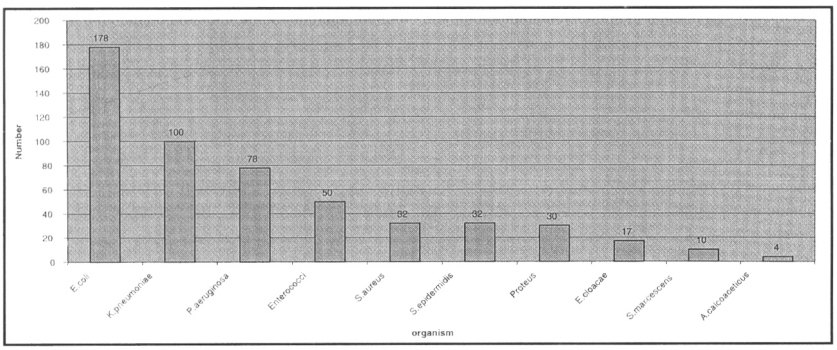

FIGURE. Microorganisms isolated from patients with nosocomial urinary tract infections.

care practices, and implementation of infection control measures.

A common exogenous risk factor for all of the organisms causing nosocomial UTIs was catheterization. Inadequate infection control measures comprise another likely contributing factor. Inappropriate disconnection of the catheter-collecting tube junction can favor infection[7] and may have been a risk factor in this hospital.

Exogenous risk factors related to *Escherichia coli*, enterococci, *Staphylococcus aureus*, and *Staphylococcus epidermidis* nosocomial UTIs and the association between infections by these organisms and *Proteus* species and specific patient care areas could not be compared with prior data because surveillance of nosocomial infection has not been performed in this hospital on a routine basis. These results could provide baseline data for future comparisons, perhaps for assessing the influence of interventions.

Contrary to prior reports emphasizing only *Klebsiella* as a more frequent cause of nosocomial UTI among diabetic patients,[8,9] diabetes mellitus was an endogenous risk factor for most pathogens in the current study.

The relative lack of independent risk factors for nosocomial UTIs with *Serratia marcescens* could be due to the small number of cases studied. Because only four cases of nosocomial UTIs were due to *Acinetobacter calcoaceticus*, a case–control study was not conducted for this pathogen.

The distribution of microorganisms causing nosocomial UTI among our patients was similar to those from reports from other countries. Identification of risk factors for infection by various organisms may allow future risk-adjusted comparisons of infection rates.

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Assessment of a Novel Approach to Evaluate the Outcome of Endoscope Reprocessing

To the Editor:

In the April issue of *Infection Control and Hospital Epidemiology*, Sciortino et al.[1] proposed a novel method to detect contamination of reprocessed endoscopes. Although bioluminescence could qualify as an economical method for this purpose, the study leaves several questions unanswered regarding the validity of this test.

Briefly, a portable luminometer system was used to compare 15 reprocessed endoscopes with microbiological culture, the currently accepted gold standard. Interpretative criteria for bioluminescence were established beforehand by comparing serial dilutions of bacteria with the assay under investigation. A total of 94 endoscopes were then examined only by bioluminescence in different stages of reprocessing and declared sterile, clean, or contaminated. The results showed that some endoscopes without bacterial growth had negative results on Charm LUMinator-T (LUM-T) (Charm Sciences, Inc., Malden, MA) assay; reprocessing gradually decreased relative light unit (RLU) counts on most, but not all, endoscopes; and by bioluminescence, few of the reprocessed endoscopes could be declared sterile.

Since the early 1980s, many articles about bioluminescence have been published. The conclusions vary,[2-6] resulting mainly in the fact that bioluminescence has not evolved into a standard for validation of endoscope reprocessing methods. The current study was initiated as part of a broad investigation at one center in response to inadequate techniques for endoscope reprocessing. However, the authors claim the evaluation of a test as the main objective of their study.

The interpretative criteria derived from serial dilutions of bacterial suspensions, as shown in Figure 1 of the article (which appears on the next page), are suitable for the authors' intention, but some data are not reported. The results shown in the figure do not correspond to the numbers reported in the text. The lower limits of detec-