

REFERENCES

1. Srinivasan A, Song X, Ross T, et al. A prospective study to determine whether cover gowns in addition to gloves decrease nosocomial transmission of vancomycin-resistant enterococci in an intensive care unit. *Infect Control Hosp Epidemiol* 2002;23:424-428.
2. Slaughter S, Hayden MK, Nathan C, et al. A comparison of the effect of universal use of gloves and gowns with that of glove use alone on acquisition of vancomycin-resistant enterococci in a medical intensive care unit. *Ann Intern Med* 1996;125:448-456.
3. Puzniak LA, Leet T, Mayfield J, et al. To gown or not to gown: the effect on acquisition of vancomycin-resistant enterococci. *Clin Infect Dis* 2002;35:18-25.
4. Hospital Infection Control Practices Advisory Committee (HICPAC). Recommendations for preventing the spread of vancomycin resistance. *MMWR* 1995;44(RR12):1-13.
5. U.S. Department of Labor, Occupational Safety and Health Administration. Occupational exposure to bloodborne pathogens: final rule. *Federal Register* 1991;56:64004-64182.
6. Belkin NL. Gowns: selection on a procedure-driven basis. *Infect Control Hosp Epidemiol* 1994;15:713-716.

Nathan L. Belkin, PhD
Clearwater, Florida

The authors decline to reply.

Nosocomial Infections in a Turkish University Hospital: A 2-Year Survey

To the Editor:

Nosocomial infections represent an important problem worldwide as a major cause of morbidity, mortality, and economic consequences.^{1,2} Epidemiologic and etiologic characteristics of nosocomial infections have varied among countries and even among different hospitals in the same country. In this study, we determined the epidemiologic and etiologic characteristics of nosocomial infections in a Turkish university hospital for 2 years.

The study was conducted in Pamukkale University Hospital from January 2000 to December 2001. Criteria for defining nosocomial infections were those published by the Centers for Disease Control and Prevention.³ All data, including admission date, services, risk factors, infection sites, isolated microorganisms and their susceptibility patterns, and treatment, were recorded using SPSS software (SPSS, Inc., Chicago, IL).

TABLE 1
NOSOCOMIAL INFECTION RATES BY CLINICS

Clinic	No. of Patients	No. of Nosocomial Infections	%
Anesthesiology Intensive Care Unit	434	113	26
Neonatal Intensive Care Unit	240	46	19.2
Neurosurgery	466	58	12.4
Pediatrics	671	63	9.4
Dermatology	48	4	8.3
Internal medicine	940	50	5.3
General surgery	793	38	4.8
Orthopedic surgery	657	31	4.7
Cardiovascular surgery	134	4	3
Neurology	137	4	2.9
Urology	816	19	2.3
Plastic surgery	305	7	2.3
Chest diseases	152	2	1.3
Pediatric surgery	270	3	1.1
Obstetrics and gynecology	2920	29	1
Otorhinolaryngology	869	6	0.7
Others	1,173	3	0.3

A total of 666 nosocomial infections were detected in 480 (4.35%) of 11,025 patients hospitalized during 2000 and 2001 (6.04 infections per 100 patients). The relative frequency of nosocomial infection was highest in the Anesthesiology Intensive Care Unit (26%), followed by the Neonatal Intensive Care Unit and the Neurosurgery Unit (Table 1).

The most frequent types of nosocomial infections were urinary tract infections (n = 167 [25.1%]), pneumonia (n = 155 [23.3%]), bacteremia (n = 117 [17.6%]), and surgical-site infections (n = 95 [14.3%]). One hundred thirty-two other infections accounted for an additional 19.8%.

A total of 801 microorganisms were isolated from 480 patients. The most frequently isolated microorganisms were *Staphylococcus aureus* (18.7% [with 65% of these being methicillin-resistant *S. aureus*]), *Pseudomonas aeruginosa* (16%), coagulase-negative staphylococci (13.1%), and *Acinetobacter baumannii* (10.1%) (Table 2).

The observed attack rate of 6 infections per 100 patients in this study was consistent with the rates of 3.5% and 11.6% reported from multiple other countries.^{4,9}

In this study, the highest infection rates involved intensive care unit patients for whom the most common nosocomial infection was pneumonia, followed by urinary tract infections. In other services, urinary tract and surgical-site infections were

TABLE 2
DISTRIBUTION OF ISOLATED MICROORGANISMS

Microorganism	No.	%
<i>Staphylococcus aureus</i>	150 (98 MR)	18.7
<i>Pseudomonas aeruginosa</i>	128	16
Coagulase-negative staphylococci	105 (69 MR)	13.1
<i>Acinetobacter baumannii</i>	81	10.1
<i>Klebsiella pneumoniae</i>	77	9.6
<i>Enterobacter cloacae</i>	73	9.1
<i>Escherichia coli</i>	68	8.5
<i>Candida</i> species	63	7.9
Others	56	7
Total	801	100

MR = methicillin resistant.

more frequent. The relative frequency distribution of etiologic agents for this Turkish hospital was similar to what has been observed in multiple other countries.

A Korean study reported that the most commonly isolated microorganisms were *S. aureus* (17.2%), *P. aeruginosa* (13.8%), and *Escherichia coli* (12.3%).⁴ A prevalence study done in Switzerland found that the leading pathogens were *S. aureus* (13%), *E. coli* (12%), and *P. aeruginosa* (11%).⁸ Of note, *S. aureus* was the most frequent cause of nosocomial infections in our hospital and 65.3% were resistant to methicillin, suggesting the need for improved control measures.

REFERENCES

- Spencer RC. Prevalence studies in nosocomial infections. *Eur J Clin Microbiol Infect Dis* 1992;11:95-98.
- Yalcin AN, Hayran M, Unal S. Economic analysis of nosocomial infections in a Turkish university hospital. *J Chemother* 1997;9:411-414.
- Garner JS, Jarvis WR, Emori TG, Horan TC, Hughes JM. CDC definitions for nosocomial infections, 1988. *Am J Infect Control* 1988;16:128-140.
- Kim JM, Park ES, Jeong JS, et al. Multicenter surveillance study for nosocomial infections in major hospitals in Korea: Nosocomial Infection Surveillance Committee of the Korean Society for Nosocomial Infection Control. *Am J Infect Control* 2000;28:454-458.
- Scheel O, Stormark M. National prevalence survey on hospital infections in Norway. *J Hosp Infect* 1999;41:331-335.
- Gikas A, Padiaditis I, Roubelaki M, Troulakis G, Romanos J, Tselentis Y. Repeated multi-centre prevalence surveys of hospital-acquired infection in Greek hospitals. *J Hosp Infect* 1999;41:11-18.
- The French Prevalence Survey Study Group. Prevalence of nosocomial infections in France: results of the nationwide survey in 1996. *J Hosp Infect* 2000;46:186-193.
- Pittet D, Harbarth S, Ruef C, et al. Prevalence and risk factors for nosocomial infections in four university hospitals in Switzerland. *Infect Control Hosp Epidemiol* 1999;20:37-42.
- Gastmeier P, Kampf G, Wischnewski N, et al. Prevalence of nosocomial infections in representative German hospitals. *J Hosp Infect* 1998;38:37-49.

Nasal Carriage of Methicillin-Resistant *Staphylococcus aureus* Among Healthcare Workers of an Iranian Hospital

To the Editor:

Staphylococcus aureus causes important infections in hospitalized patients that can have severe consequences despite antibiotic therapy.¹ Its main ecological niche is the nose, but the prevalence of nasal carriage has varied according to the population studied. Approximately one-third of the general population carry *S. aureus*, but healthcare workers (HCWs) may be an especially important reservoir, even if transiently colonized. Several studies have reported rates of nasal carriage ranging from 17% to 56% in HCWs.²

Methicillin-resistant strains of *S. aureus* (MRSA) were identified immediately after the introduction of methicillin into clinical practice. The first MRSA outbreaks occurred in European hospitals in the early 1960s. Since then MRSA has spread worldwide, causing problems with therapy and higher mortality rates.¹ Colonized patients have been the primary reservoir for spread, although it can also occur from colonized HCWs. The aim of this study was to determine the frequency of nasal carriage of MRSA among HCWs in Imam Khomeini Hospital of Urmia, West Azarbayjan, Iran.

This is a general, 300-bed, university-affiliated teaching hospital with more than 400 employees, including service and technical staff. For this study, 230 consenting staff members (115 men and 115 women)

had cultures using moistened cotton swabs rotated five times in both anterior nares.³ Samples were carried within 2 hours to the microbiology laboratory and processed as previously described.⁴ The agar screen test was used to detect MRSA by inoculating 10⁴ colony-forming units onto Mueller-Hinton agar supplemented with 4% NaCl and containing 6 mg of oxacillin per milliliter according to the National Committee for Clinical Laboratory Standards guideline.⁵ No change in the method of identifying MRSA occurred during the study. Antibiotyping was performed by using the disk-diffusion method according to the National Committee for Clinical Laboratory Standards guideline.⁶

This study revealed that 92 (40%) of the participants had nasal colonization with *S. aureus* and 32 (35%) of these were MRSA (ie, 13.9% of all study participants). Of 92 HCWs carrying *S. aureus*, 53 (57.6%) were male and 39 (42.4%) were female. The mean age was 31.3 years (standard deviation \pm 6.3 years). Carriage rates for *S. aureus* and MRSA differed for various professional groups (Table). Paramedical staff had more carriage of MRSA than did other groups. There was not an association between gender, age, or years of healthcare service and nasal carriage. Resistance rates to other antibiotics were as follows: penicillin, 67.4%; cotrimoxazole, 42.3%; gentamicin, 25%; clindamycin, 18.3%; ciprofloxacin, 14.18%; erythromycin, 8.7%; and vancomycin, 0%.⁷ A previous study in this hospital had shown that 53.6% of clinical *S. aureus* isolates from patients were MRSA.⁷ The antibiograms of isolates in this study were compared with those from patients in the prior study and rates of resistance to all antibiotics tested were significantly higher

Ata Nevzat Yalcin, MD
Huseyin Turgut, MD
Banu Cetin, MD

Department of Infectious Diseases and
Clinical Microbiology
Hakan Erbay, MD
Simay Serin, MD
Department of Anesthesiology
and Reanimation
Pamukkale University
Medicine Faculty
Denizli, Turkey

TABLE

FREQUENCY OF *STAPHYLOCOCCUS AUREUS* CARRIAGE AND METHICILLIN-RESISTANT *S. AUREUS* (MRSA) AMONG HEALTHCARE WORKERS

Healthcare Worker	No.	No. With Carriage of <i>S. aureus</i>	Frequency of MRSA
Physician	28	12 (42.8%)	1 (3.5%)
Nurse	54	22 (40.7%)	7 (12.9%)
Paramedical staff	108	43 (39.8%)	22 (20.3%)
Staff not involved in patient care	40	15 (37.5%)	5 (12.5%)