Nosocomial and Community-Acquired *Staphylococcus aureus* Bacteremias from 1980 to 1993: Impact of Intravascular Devices and Methicillin Resistance

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The rate of nosocomial bacteremia due to *Staphylococcus aureus* has increased over the past decade, but trends in community-acquired *S. aureus* bacteremia are less certain. This hospital-based observational study compares nosocomial and community-acquired *S. aureus* bacteremias during 1980–1983 and 1990–1993. The rate of nosocomial *S. aureus* bacteremia increased from 0.75 to 2.80 cases per 1,000 discharges, while the rate of community-acquired *S. aureus* bacteremia increased from 0.84 to 2.43 cases per 1,000 discharges. The number of nosocomial device-related bacteremias increased eightfold; 56% of *S. aureus* bacteremias were associated with devices during 1990–1993. Intravascular devices were associated with no community-acquired *S. aureus* bacteremias during 1980–1983 but with 22% during 1990–1993. Methicillin-resistant *S. aureus* (MRSA) seldom caused bacteremia during 1980–1983. From 1990 to 1993, MRSA caused 32% and 18.5% of nosocomial and community-acquired *S. aureus* bacteremias, respectively. The rates of both community-acquired and nosocomial *S. aureus* bacteremias have increased significantly since 1980. In addition to their role in nosocomial infections, MRSA and intravascular device–related *S. aureus* bacteremias are emerging problems in the nonhospital setting.

In the 1980s, gram-positive organisms, including *Staphylococcus aureus,* reemerged as the leading causes of nosocomial bacteremia [1, 2]. From 1980 to 1989, the National Nosocomial Infections Surveillance System (NNIS) of the Centers for Disease Control and Prevention (CDC) reported increases in the rates of primary bacteremia due to *S. aureus* of 122% to 283% [1]. During the late 1980s, *S. aureus* caused 16% of nosocomial bacteremias reported to the NNIS, second only to coagulase-negative staphylococci [3]. An increase in the rate of *S. aureus* bacteremias also has been observed abroad. In Denmark, the annual incidence rate of *S. aureus* bacteremia increased from 2.7 cases per 100,000 population in 1960 to 19.2 cases per 100,000 population in 1990, with nosocomial bacteremias accounting for most of this increase [4].

A larger population of immunocompromised individuals and increased use of intravascular devices are among the factors causing this resurgence of staphylococcal bacteremias. In addition, the emergence of methicillin-resistant *S. aureus* (MRSA) contributes to the upward trend in *S. aureus* infections. Changes in community-acquired *S. aureus* bacteremia are less well char-

acterized. The objectives of this study are to describe trends in nosocomial and community-acquired *S. aureus* bacteremias since 1980 and to examine risk factors for *S. aureus* bacteremia including the impact of intravascular devices.

Methods

Crawford Long Hospital of Emory University is a 500-bed acute care hospital in downtown Atlanta. Community-based physicians and full-time university faculty utilize the facility, which serves as both a community hospital and a referral center.

All bloodstream infections were identified by the infection control department as part of routine surveillance. For this study, we compared bloodstream infections due to *S. aureus* during 1980–1983 with those during 1990–1993. Clinical information, including the presence of underlying diseases and source of bacteremia, was obtained by chart review. Nosocomial bacteremia was defined by a bloodstream isolate obtained ≥48 hours after hospital admission, while community-acquired bacteremia was defined by a bloodstream isolate obtained within 48 hours of hospital admission. However, blood isolates obtained within 48 hours of readmission were classified as nosocomial if the infection was determined by the infection control practitioner to be incubating at the time of a recent (<30 days) hospital discharge.

Blood isolates of *S. aureus* were considered to be contaminants if only one blood culture set yielded the organisms, if the clinicians judged the organisms to be contaminants, and if antibiotic therapy directed against the organisms was not administered.

Intravascular device–related *S. aureus* bacteremia was defined as bacteremia unrelated to infection at an extravascular
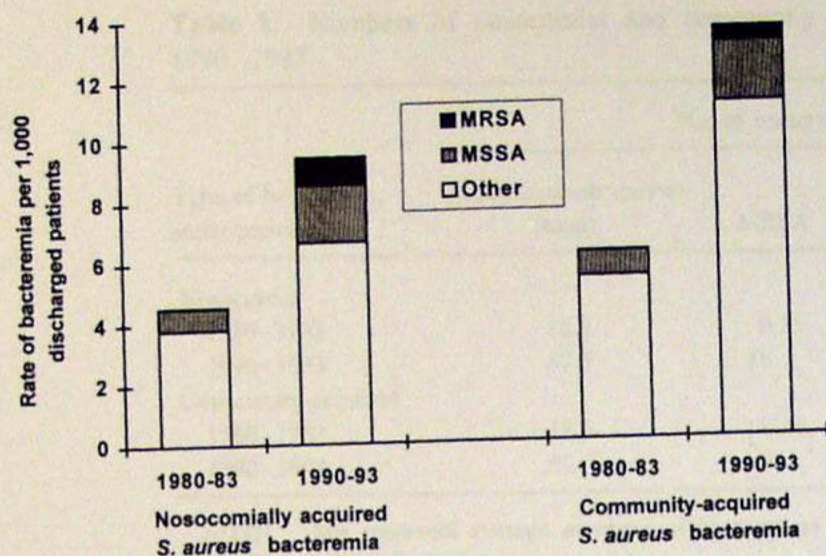
Figure 1. Rates of nosocomial and community-acquired bacteremias due to methicillin-resistant *Staphylococcus aureus* (MRSA), methicillin-susceptible *S. aureus* (MSSA), and other bacteria (excluding mycobacteria) during two study periods.

site with semiquantitative culture of a catheter tip yielding ≥ 15 colonies or with infection at a local catheter site that was due to the same organism. When the catheter was not removed or the tip was not cultured, the infection was considered to be device-related if the infection control practitioner, the hospital epidemiologist, or the involved clinicians determined a device to be the likely source.

During the 1980–1983 study period, the hospital microbiology laboratory used the BACTEC 460 radiometric system (Becton Dickinson, Sparks, MD); for each set of blood cultures, a 7.5- to 10-mL blood sample was inoculated into aerobic, anaerobic, and hypertonic media. During the 1990–1993 study period, the BACTEC 660 nonradiometric system (Becton Dickinson) was used; a blood sample of 20 mL was inoculated into aerobic and anaerobic vials.

During both study periods, the hospital's policy called for replacement of peripheral intravenous catheters after 72 hours. There was no similar standard governing the duration of the placement of central venous catheters. From 1980–1983, there was limited use of central venous catheters outside of the intensive care units, and implanted ports and tunneled cuffed catheters were either not commercially available or not used.

The Mantel-Haenszel χ^2 test was used to determine statistical significance.

Results

The rate of bacteremia doubled during the second 4-year period, with the rate of nosocomial bacteremia increasing from 4.59 to 9.44 cases per 1,000 discharges and the rate of community-acquired bacteremia increasing from 6.2 to 13.46 per 1,000 discharges (figure 1). The rates of nosocomial and community-acquired *S. aureus* bacteremias also increased from 0.75 to 2.80 cases per 1,000 discharges and from 0.84 to 2.43 cases per 1,000 discharges, respectively.

Table 1 shows the numbers of *S. aureus* and other bacteremias for the study periods. The proportion of nosocomial bacteremia caused by *S. aureus* increased from 16.3% to 29.6% ($P < .001$), and the proportion of community-acquired bacteremia caused by *S. aureus* increased from 13.5% to 18.1% ($P < .05$). The annual average number of blood cultures performed also doubled from 7,758 to 15,725, while the annual number of hospital discharges decreased slightly from 22,117 to 20,540 over the same periods. Two *S. aureus* isolates (1.4%) recovered from blood cultures were considered contaminants during the first period compared with 14 (3.1%) during the second period.

Sources of Bacteremia and Underlying Diseases

The sources for all *S. aureus* bacteremias during the study periods are shown in table 2. The number of intravascular device–associated nosocomial *S. aureus* bacteremias increased eightfold from 16 (25% of total) during 1980–1983 to 128 (56% of total) during 1990–1993. This increase in the number of device-associated bacteremias accounts for 70% of the increase in the number of nosocomial *S. aureus* bloodstream infections. Fifty-two percent of the device-associated bacteremias from the 1990–1993 period were confirmed by cultures of catheter tips or specimens from device sites that yielded *S. aureus*.

No single source accounted for the increase in the number of community-acquired *S. aureus* bacteremias (table 2). Intravascular devices, not documented as a source of community-acquired bacteremia in the 1980–1983 period, were associated with 43 community-acquired bacteremias (22%) in the 1990–1993 period. These infections resulted primarily from long-term indwelling catheters (see next section). Skin and soft-tissue infections caused 44 community-acquired bacteremias (22%) in the 1990–1993 period. Of these 44 infections, 16 (nine due to MRSA) were from infected decubitus ulcers in nursing home patients, and 11 were from lower extremity infections in patients with diabetes or vascular insufficiency. Bacteremias related to hemodialysis shunts and fistulas were common in both study periods.

Two patients with community-acquired bacteremia in the 1980–1983 period and four patients in the 1990–1993 period were intravenous drug users. Comparing 1990–1993 with 1980–1983, nursing home residence (16% vs. 4%, respectively), AIDS (10% vs. 0, respectively), and sickle cell anemia (8% vs. 0, respectively) were significantly ($P < .05$) more common, whereas diabetes (27% vs. 22%, respectively), renal failure (28% vs. 35%, respectively), and cancer (9% vs. 16%, respectively) were not. The mean age of patients with community-acquired bacteremia was 55 years in the 1980–1983 period and 57.6 years in the 1990–1993 period. Although nursing home residence was more common in the 1990–1993 period, a greater percentage of patients were 65 years of age or older in the earlier period (45% vs. 39%, respectively). Sixty-five percent of patients with community-acquired *S. aureus* bacter-

Table 1. Numbers of nosocomial and community-acquired bacteremias during 1980–1983 and 1990–1993.

Type of bacteremia, study period	No. of bacteremias due to indicated pathogen				
	Staphylococcus aureus (total)	MRSA	Other gram-positive organisms	Gram-negative organisms	Total
Nosocomial					
1980–1983	16.5	0.25	25.5	65	101.5
1990–1993	57.5	18	84	67	194
Community-acquired					
1980–1983	18.5	0.25	33	88	137
1990–1993	50	9	93	142.5	276.5

NOTE. Data represent average numbers of bacteremias per year during the 4-year study period. MRSA = methicillin-resistant *S. aureus*.

emia during the second study period were hospitalized within 1 year before the bacteremia, and 52% were hospitalized within 90 days of the bacteremia.

Types of Intravascular Devices

The types of intravascular devices associated with *S. aureus* bloodstream infections are listed in table 3. From 1990 to 1993, central venous catheters and peripheral intravascular catheters were associated with 31% and 18%, respectively, of the nosocomial device-related infections. These bacteremias occurred in patients with a wide variety of underlying medical and surgical

Table 2. Sources of *Staphylococcus aureus* bacteremia during the two study periods.

Source	No. of bacteremias due to MRSA/ total no. due to *S. aureus*	
	1980–1983	1990–1993
Nosocomial		
Intravascular devices	1/16	30/128*
Unknown[†]	0/23	12/54
Surgical wound infection	0/10	15/19
Skin/decubitus ulcers	0/3	6/9
Respiratory tract	0/5	6/11
Other	0/8	4/9
Total	1/65	73/230
Community-acquired		
Intravascular devices	0/0	8/43*
Unknown[†]	0/27	7/52
Dialysis shunt or fistula	1/18	5/28
Skin/decubitus ulcers	0/7	13/44[‡]
Bone/joint	0/4	0/11
Intravenous drug use	0/2	0/4
Respiratory tract	0/10*	0/4
Other	0/6	4/14
Total	1/74	37/200

* Significant difference, $P < .01$.
[†] Includes cases where multiple possible sources were identified.
[‡] Significant difference, $P < .05$.

problems. Implanted ports were the source of 25% of the nosocomial bacteremias; 18 (56%) of the port-related infections occurred in patients with sickle cell disease, and 12 (38%) occurred in oncology patients. The 18 bacteremias in patients with sickle cell disease occurred in 12 patients. Six patients each had two bacteremias associated with implanted ports; the same device was implicated as the source in three of these six patients.

Sources of community-acquired device-related bacteremias during 1990–1993 included implanted ports (49%), hemodialysis catheters (33%), tunneled cuffed catheters (9%), and peripheral intravenous catheters (5%). The 43 bacteremias occurred in 39 patients. Underlying diseases in these patients included chronic renal failure (36%), AIDS (23%), sickle cell anemia (21%), and cancer (8%).

MRSA Bacteremia

Only one nosocomial MRSA bacteremia occurred in the 1980–1983 period. During the 1990–1993 period, MRSA caused 73 nosocomial *S. aureus* bacteremias (32%). Sources of these bacteremias are listed in table 2.

Thirty-seven community-acquired MRSA bacteremias occurred from 1990 to 1993, whereas only one occurred a decade earlier. These 37 bacteremias occurred in 35 patients, all of whom had ongoing contact with health care settings. The patient had been hospitalized at our institution within the previous year in 24 (65%) of the cases; in 19 cases (51%), the patient had been hospitalized within the previous 90 days. Fourteen (40%) of the patients with community-acquired MRSA bacteremia resided in nursing homes. Forty-five percent (14 of 31) of *S. aureus* bacteremias occurring in nursing home residents were caused by MRSA.

Underlying diseases in patients with community-acquired MRSA bacteremia included diabetes (29%), chronic renal failure (23%), cancer (14%), AIDS (9%), and sickle cell anemia (3%). Nursing home residence, but not any of these underlying diseases, was associated with a significantly higher risk of

Table 3. Types of intravascular devices associated with *Staphylococcus aureus* bacteremia during two study periods.

Type of infection, study period	No. of *S. aureus* infections associated with indicated catheter					
	Peripheral intravenous	Central venous*	Tunneled[†‡]	Ports[‡§]	Hemodialysis	Other[‖]
Nosocomial						
1980–1983	5	7	0	0	0	4
1990–1993	23	40	8	32	3	22
Community-acquired						
1980–1983	0	0	0	0	0	0
1990–1993	2	1	4	21	14	1

* Includes single-, double-, and triple-lumen catheters.
† Tunneled cuffed catheters, primarily Hickman catheters.
‡ Not in use during 1980–1983.
§ Implanted ports.
‖ Includes arterial catheters, Swan-Ganz catheters, umbilical catheters, and femoral vein catheters.

MRSA infection ($P < .001$). The mean age of patients with community-acquired MRSA bacteremia was 67.7 years; 58% were 65 years of age or older.

Discussion

This study shows a significant increase in the number of community-acquired as well as nosocomial *S. aureus* bacteremias at our institution from 1980–1983 to 1990–1993. The increase in the number of nosocomial *S. aureus* bacteremias is consistent with data generated by NNIS and other investigators [1, 2, 4, 5]. However, there are little comparable data on trends in community-acquired *S. aureus* bacteremia. Intravascular devices are the major source of nosocomial *S. aureus* bacteremia and are emerging as important sources of community-acquired bacteremia. Similarly, MRSA has emerged as a cause of bacteremia in patients outside the hospital setting.

Intravascular devices, implicated in no community-acquired bacteremias during the first study period, were associated with 22% of community-acquired *S. aureus* bacteremias from 1990 to 1993. We believe that this increase likely reflects the shifting of acute medical care to the outpatient setting and the increasing use of long-term devices in patients with chronic disorders, such as AIDS, cancer, and sickle cell disease. Although outpatient infusion therapy has been associated with a low rate of infectious complications [6], given current economic pressures, this low rate is likely to apply to an increasing population. In addition, the low reported rate of infections may not apply to all populations. Thus, a further increase in the total number of cases of community-acquired device-related infections may occur.

MRSA was responsible for 32% of nosocomial *S. aureus* bacteremias during the 1990–1993 period, a proportion consistent with NNIS data for hospitals of comparable size [7]. MRSA also caused 18.5% of community-acquired *S. aureus* bacteremias from 1990 to 1993. Most of these infections oc-

curred in patients who had been hospitalized recently or were nursing home residents, and all patients with community-acquired MRSA bacteremia had regular contact with health care settings.

Our definition of nosocomial infection was adapted from definitions of the CDC that were designed for the NNIS hospitals [8]; all other infections were termed *community-acquired*. For patients with chronic medical illnesses who may require periodic hospitalizations, home health care, and, possibly, outpatient parenteral therapy, the term *community-acquired* is misleading. These patients are at greater risk for serious infections, including those caused by antibiotic-resistant microorganisms such as MRSA, than are those without prior contact with health care facilities. For example, approximately two of three patients admitted to our hospital with community-acquired bacteremia due to *S. aureus* (methicillin-susceptible *S. aureus* or MRSA) had been hospitalized within the previous year.

The term *nosohusial* has been suggested to describe infections occurring in patients who receive care at home [6]. Whether this new term finds widespread acceptance, the distinction between patients requiring frequent contact with health care settings and those whose infections are truly community-acquired is valid. The increase in the number of patients receiving care at home emphasizes the need to develop methods for studying infections occurring in this setting. Although useful information can be obtained from hospital-based surveillance, an accurate determination of infection rates occurring in non-hospital settings should utilize the population at risk as the denominator. In addition, the use of multiple commercial clinical laboratories for performing culture and sensitivity testing further complicates attempts to determine infection rates in the nonhospital setting. Thus, further home care–based studies are warranted.

These data show a significant increase in the number of intravascular device–associated bacteremias since 1980. Because of the design of this study, we were unable to measure

device utilization or establish infection rates associated with various types of devices. However, the increased use of intravascular devices, particularly central venous catheters, has been implicated in the increased rates of septicemia from 1979 to 1987 that were recorded by the National Hospital Discharge Survey [9]. Fifty-six percent of nosocomial bacteremias in the second study period were device-related, a figure consistent with those of other published series [10]. Fifty-two percent of the nosocomial device-associated infections during the second study period were confirmed by cultures of catheter tips or specimens from device sites that yielded *S. aureus*. A more rigorous definition of device-associated infection, such as requiring cultures of catheter tips or specimens from device sites, could have led to a significant underestimation of the impact of devices. We believe that it is more likely that some of the bacteremias termed as *unknown* were device-related and that our calculation of device-associated infections is conservative.

A surprising finding in our study was the high number of nosocomial and community-acquired port-related bacteremias. Implanted ports have been associated with a low incidence of infection (range, 0.01–0.04 bloodstream infections per 100 device-days [11, 12]). Our data reflect, in part, a large population of patients with diseases such as sickle cell anemia and AIDS and a high utilization of implanted ports in these patients. In addition, suboptimal care of the devices and patient use of ports for injection of illicit drugs were suspected in a few instances. Although we were unable to determine rates of port-related bacteremia, our experience raises concern that the reported incidence of port-related infections may not apply to all settings. Notwithstanding the inferences about rates of port-related infection, these data demonstrate how the use of implanted ports can change the epidemiology of bloodstream infections.

The overall increase in the rates of bacteremia may be confounded by changes in blood culturing methodology and an increase in the number of blood cultures performed. During the 1990–1993 study period, the standard blood specimen for a set of blood cultures was 20 mL, twice that obtained in the 1980–1983 period. A recent controlled trial demonstrated that increasing the volume of blood inoculated into a culture vial from 2.7 mL to 8.7 mL increased the yield of gram-positive pathogens by 19% [13]. The number of blood cultures performed per year doubled from the first to the second study period. This pattern of increased utilization of blood cultures during the 1980s has been reported by other researchers and has been attributed to the presence of a sicker patient population [14].

The annual number of bacteremias also doubled in the second study period, resulting in a stable rate of blood culture positivity. This finding suggests that the methodological changes were not the major cause of the increased rates of bacteremia during 1990–1993. It is also unlikely that these factors accounted for the disproportionate increases in the numbers of *S. aureus* and device-related bacteremias.

In summary, these data show parallel increases in rates of nosocomial and community-acquired *S. aureus* bacteremias since 1980. Device-related infection, the leading source of nosocomial *S. aureus* bacteremia, is emerging as an important source of community-acquired bacteremia in our hospital. Similarly, MRSA bacteremia, once confined to the nosocomial setting, is an increasing problem in the nonhospital setting. The shifting of care, including parenteral therapy, to the outpatient setting likely accounts for some of these observations.

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Editorial Response: Increasing Rates of *Staphylococcus aureus* Bacteremia—A Medical Device Is a Merit in Disguise and Methicillin Resistance Is Merely a Vice

In their observational study of bacteremia, Steinberg and colleagues [1] carefully documented that the rates of *Staphylococcus aureus* bacteremia increased from 1980–1983 to 1990–1993. The trend in increasing rates of *S. aureus* bacteremia was shared by both community-acquired and nosocomial bloodstream infections and was attributed by the authors, at least in part, to the increasing use of vascular access devices for outpatients and inpatients alike. These findings confirm the recent report of an increase in the number of intravascular device–related *S. aureus* bacteremias seen in consultation by the infectious disease service at a tertiary care hospital [2].

In the United States alone, >175 million intravascular devices are sold each year. Most of these intravascular devices are peripheral venous catheters that, fortunately, are associated with a low rate of bloodstream infection (average rate, 0.2%) [3]. Although the number of central vascular catheters (including short-term central venous catheters, tunneled long-term central venous catheters, peripherally inserted central venous catheters, subcutaneous central venous ports, hemodialysis catheters, and Swan-Ganz catheters) constitutes only a minority of the intravascular devices, such catheters can be associated with as much as 20-fold higher rates of catheter-related bloodstream infection [3].

For instance, the average rate of central venous catheter–related septicemia is at least 4%, and by estimating that about 3 million central venous catheters are inserted annually in the United States, such catheters may account for at least 120,000 bloodstream infections each year [4]. These figures help explain why most nosocomial bloodstream infections are related to the use of intravascular devices. Because of the increasing use of intravascular devices for aiding in the treatment of a relatively more immunocompromised and seriously ill population of patients, it is possible that medical devices may contribute even more to the development of bloodstream infections in the future.

Although the report by Steinberg and colleagues [1] focuses on *S. aureus* bacteremia, further inspection of the findings suggests that the increasing contribution of intravascular devices to the development of bloodstream infection is not limited to *S. aureus* alone. As table 1 in their article shows, there was a concurrent increase in the proportion of nosocomial bacteremias due to "other gram-positive organisms" (a good portion of which were presumably coagulase-negative staphylococci; a smaller number may have been enterococci or *Corynebacterium* species) that was equal to that caused by *S. aureus*. Taking into consideration that coagulase-negative staphylococci and *S. aureus* are, in general, responsible for most cases of vascular catheter–related bacteremia, such findings further support the conclusion by the authors that the increase in the number of nosocomial *S. aureus* bacteremias can be mostly accounted for by an increase in the number of device-related bacteremias over the same period.

Although intravascular devices have not been traditionally considered as a major source of community-acquired bacteremia, the increasingly prevalent practice—often imposed by the economically pressured changes in the delivery of health care—of discharging patients from the hospital with long-term vascular access will probably have a substantial impact. This probability is supported by the finding that more than one-fifth of community-acquired *S. aureus* bacteremias in 1990–1993 were related to intravascular devices, compared with no cases in 1980–1983 [1]. The increasing contribution of intravascular devices to community-acquired bloodstream infections was also associated with a rise, albeit smaller than that observed with nosocomial bloodstream infections, in the proportion of bacteremias caused by either *S. aureus* or coagulase-negative staphylococci (almost three-quarters of nosocomial bacteremias vs. one-half of community-acquired bacteremias between 1990 and 1993 were caused by *S. aureus* or "other gram-positive organisms").

The increasing contribution of methicillin-resistant *S. aureus* (MRSA) is better anticipated and more recognized with nosocomial bloodstream infections than with community-acquired infections. The observation [1] that almost one-fifth of community-acquired *S. aureus* bacteremias identified early in this decade were caused by MRSA is disturbing, particularly with regard to the potential impact on strategies for antibiotic therapy. This potential impact is especially true in an era where the increasing resistance to vancomycin among gram-positive organisms is clearly related to the widespread use of this antibiotic.

Unless prompted by historical information (such as a recent episode of clinical infection due to MRSA) or epidemiologic data (such as residence in a nursing home), the inclusion in the initial antimicrobial regimen of antibiotics with activity against MRSA for empirical treatment of community-acquired infections has generally been considered as unnecessary. Although

the report of increasing rates of community-acquired MRSA bloodstream infections should not, in our opinion, dramatically alter this particular antibiotic-prescribing practice, it is alarming enough to require follow-up studies in the future. Since most patients with community-acquired *S. aureus* bacteremia who were described by Steinberg and colleagues [1] had recently been hospitalized or were nursing home residents, it may eventually be necessary to include vancomycin in the initial antibiotic regimen for treatment of life-threatening infection in a recently hospitalized patient or a nursing home resident.

The increasing use of vascular access devices for treatment of outpatients has also contributed to the rise in the number of MRSA bacteremias (one-half of the described patients with clearly identified sources of community-acquired MRSA bacteremia had a vascular access device in place). This finding is anticipated since these patients are likely to have been colonized with MRSA around the time of placement of the vascular access device, typically in a hospital setting, and/or had chronic medical illnesses that required more frequent contact with health care settings after the placement of the device. To our knowledge, the adherence of MRSA to vascular catheters has not been compared with that of methicillin-sensitive organisms; however, there is no reason to suspect differences in the adherence abilities of these equally virulent organisms.

Although intravascular devices have become indispensable tools in modern medical care, the morbidity and mortality resulting from device-related infections and the high cost of managing such complications may offset the benefits derived from these devices. Intravascular device–related bloodstream infections not only have highly deleterious medical complications (the case-fatality rate associated with catheter-related bloodstream infections in patients in intensive care units [ICUs] is about 35%) [5], they also can prolong hospitalization and incur excess cost. In general, one episode of bloodstream infection was reported in 1988 to extend hospitalization by at least 7 days and add about $6,000 to the cost of hospitalization [6].

The economic burden resulting from catheter-related bloodstream infections in ICU patients is even larger. A recent report estimated that the extra hospital and surgical ICU lengths of stay of patients who survived nosocomial bloodstream infections were 24 and 8 days, respectively, with an extra cost of treating one episode of catheter-related bloodstream infection of $40,000 per patient [5]. On the basis of these figures, the annual economic burden resulting from the infectious complications of intravascular devices amounts to billions in the United States alone.

As the report by Steinberg and colleagues [1] clearly shows, the risk of intravascular device–related infection is not limited to only hospitalized patients. Fortunately, the likelihood of bloodstream infection—the most common serious complication of intravascular devices—can be reduced by instituting a variety of measures, including the use of antiinfective devices. Only if we can eliminate the risk of infection will intravascular devices be truly beneficial without a medical or economic vice.

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