Letters to the Editor

Universal Maximal Sterile Barrier Precautions May Be Unnecessary

To the Editor:

Raad et al[1] present welcome data showing that maximal sterile precautions at the time of insertion of central venous catheters (CVC) significantly reduces infection.

However, Maki's ringing endorsement[2] of the universal use of maximal sterile precautions at the time of CVC insertion needs to be tempered with reason. Like Dr. Maki, we have inserted and supervised insertion of hundreds of CVCs and agree that touch contamination of the guidewire, the CVC, or both is common but rarely appreciated. Like Dr. Maki, we believe that maximal sterile precautions should be considered mandatory. Over the last 2 years, we slowly have changed practice in our intensive care unit (ICU) from one in which CVCs were inserted with gloves alone with a small sterile drape to one in which all CVCs are inserted with maximal barrier precautions, including a gown, mask, and large drape that leaves no part of the patient or bed sheet exposed. A survey of 160 CVCs done during this transition showed that the overall infection rate was 32 of 160. Of these 160 CVCs, 75 were in septic patients with multiorgan failure on respiratory and circulatory support. In this group, we were unable to show any difference in CVC infection rates in those catheters inserted with maximal sterile precautions (8 of 25) and those inserted with gloves and a small drape alone (19 of 50).

We believe that projecting data from one type of patient group, in this case, cancer patients with long-term CVC placement,[1] may not apply to all patients who require CVCs. The situation in critically ill patients may be significantly different, and our data do not support the concept of dramatic benefit with the use of maximal sterile precautions. Nevertheless, we continue to use maximal sterile precautions with the hope of reinforcing the importance of infection control in the ICU.

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REFERENCES

1. Raad II, Hohn DC, Gilbreath J, et al. Prevention of central venous catheter-related infection by using maximal sterile barrier precautions during insertion. *Infect* Control *Hosp Epidemiol* 1994;15:231-238.
2. Maki DJ. Yes, Virginia, aseptic technique is very important: maximal barrier precautions during insertion reduce the risk of central venouscatheter-relatedbacteremia. *Infect Control Hosp Epidemiol* 1994;15:227-230.

The author replies.

Dr. Kapadia and Dr. Rodrigues raise a valid point. Is it justified to conclude, based on a study showing marked benefit in ambulatory cancer patients, that use of maximal barrier precautions during insertion of a central venous catheter (CVC)—a sterile long-sleeved surgical gown and large sterile sheet drape, a head cover and mask, as well as sterile gloves-also will be of benefit in other patient populations, such as critically ill ICU patients?

First, although it is not stated, I presume that their data, which form the basis for their reservation, refer to ***colonized*** catheters, rather than catheters that produced catheter-related bacteremia. It is always preferable that a study of a measure to prevent CVC-related infection be sufficiently large to have statistical power to identify significant differences in ***catheter-related bloodstream infection.***[1] The database they provide is far too small to be able to draw meaningful conclusions about differences in risk of CVC-related infection between the two groups.

Second, Kapadia and Rodrigues' analysis is further compromised by the fact that the levels of barrier precautions used in their "septic" ICU patients were not determined by random assignment, but rather by individual physicians' choices during a "transition" period when Kapadia and Rodrigues were striving to gain acceptance of maximal barrier precautions. It is very plausible that the two groups differ in important ways that influence susceptibility to CVC-related infection, beyond the level of barrier precautions used, such as physicians who chose to use maximal precautions were less experienced in the insertion of CVCs than those who used lesser precautions and thus, any benefit gained with the use of maximal precautions was negated; or, physicians' decisions to use maximal barrier precautions were determined primarily by how critically ill the patient was perceived to be at the time, particularly how vulnerable they felt the patient was to nosocomial infection.

Kapadia and Rodrigues have fallen into the same intellectual trap as early authors of observational studies of surgical antimicrobial prophylaxis who, comparing rates of postoperative surgical wound infection in patients who happened not to have received prophylaxis with rates in patients whose surgeons chose to give them prophylaxis-usually because they were sicker or were

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considered to be at greater risk of infection-concluded that because patients given prophylaxis had the same rate (or an even higher rate) of wound infection than patients who were not given prophylaxis, that surgical antimicrobial prophylaxis is of no value. Such incomplete analyses delayed appreciation of the efficacy of surgical antimicrobial prophylaxis, which only came with the first prospective, controlled, randomized trials.

To address Kapadia and Rodrigues' concern satisfactorily would require a ***randomized trial*** in which septic ICU patients who need central access are randomized to have a CVC inserted with minimal barrier precautions or with maximal barrier precautions, similar to the study done by Raad et al.[2] But, it would be essential that the study be sufficiently large to have statistical power to detect 25% to 50% differences in rates of CVC-related bloodstream infection with 80% to 90% certainty. Given their reservation, I would encourage the writers to undertake such a trial.

I would assert once more that my editorial conclusion was based on ***multiple*** sources of data[3]: 1) a large prospective study of risk factors for catheter-related infection with Swan-Ganz catheters in ICU patients done in my center[4] which showed, using multivariate analysis, that insertion of these catheters with minimal barrier precautions (sterile gloves and a small sterile drape, without a long-sleeved sterile surgical gown and large sheet drape) was associated with a significantly increased risk of catheter-related infection (odds ratio = 2.2; $P = 0.03$);2) comparative trials of IV therapy teams that found that more stringent asepsis at the time of insertion of a CVC, which usually included barrier precautions beyond the norm, was associated with greatly reduced rates of IV catheter-related bloodstream infection; 3) multiple prospective studies, which have shown that the prophylactic use of barrier precautions in high-risk ICU populations-vis-a-vis protective isolation-reduced the incidence of device-related nosocomial infections of all types[5-9]; and 4) the study by Raad et al,[2] which provides the first data, based on a randomized trial, confirming the benefit of maximal barrier precautions during insertion of a CVC.

Kapadia and Rodrigues are correct in their assertion that the findings of a study in one subset of patients may not necessarily apply to all patients who require a CVC. However, until a study of the efficacy of maximal barrier precautions is done in ICU patients that refutes the extrapolation, for the reasons stated above and in the editorial,[3] I continue to believe it is justified to conclude, "maximal barrier precautions, as Raad and his colleagues have shown, are inexpensive and highly cost effective, and should now be considered the standard of care for insertion of central venous devices of all types" and, I would further add, "in all patient populations."

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REFERENCES

1 Maki DG, Alvarado CJ, Ringer M. A prospective, randomized trial of povidone-iodine, alcohol and chlorhexidine for prevention of infection with central venous and arterial catheters. *Lancet* 1991;338:339-343.
2 Raad II, John DC, Gilbreath J, et al. Prevention of central venous catheter-related infections by using maximal sterile barrier precautions during insertion. *Infect Control Hosp Epidemiol* 1994;15:231-238.
3 Maki DG. Yes, Virginia, aseptic technique is very important: maximal barrier precautions during insertion reduce the risk of central venous catheter-related bacteremia. *Infect Control Hosp Epidemiol* 1994;15:227-230.
4. Mermel LA, McCormick RD, Springman SR, Maki DG. The pathogenesis and epidemiology of catheter-related infection with pulmonary artery Swan-Ganz catheters. A prospective study using molecular subtyping. *Am J Med* 1991;38:197S-205S.
5. Burke JF, Quinby WC, Bondoc CC, Sheehy EM, Moreno HC. The contribution of a bacterially isolated environment to the prevention of infection in seriously burned patients. *Ann Surg* 1977;186:377-387.
6. Demling RH, Perea A, Maly J, Moylan JA, Jarrett F, Balish E. The use of a laminar airflow isolation system for the treatment of major burns. *Am J Surg* 1978;136:375-378.
7. Shirani KZ, McManus AT, Vaughan GM, McManus WE, Pruitt BA Jr, Mason AD Jr. Effects of environment on infection in burn patients. *Arch Surg* 1986;121:31-36.
8. Weinstein RA, Kabins SA. Strategies for prevention and control of multiple drug-resistant nosocomial infection. *Am J Med* 1989;70:449-454.
9. Klein BS, Perloff WH, Maki DG. Reduction of nosocomial infection during pediatric intensive care by protective isolation. N *Engl J Med* 1989;320:1714-1721.

Three-Dimensional Graphs Misleading

To the Editor:

Presenting one- or two-dimensional data in three dimensions is misleading. Unfortunately, many posters and slides at the Society for Healthcare Epidemiology of America 1994 annual meeting in New Orleans did exactly that. In an analysis of bar and pie charts from posters and slides I saw on the second and third days of the meeting, 12 of 38 bar charts (32%; binomial CI_{95}, 18% to 49%) were "enhanced" with depth. The situation with pie charts was worse: of the 10 pie charts, nine were portrayed in three dimensions (90%; CI_{95}, 56% to 100%).

Advertisers use presentation graphics to distort (emphasize) points. One of the most dangerous techniques is the "third dimension" presented on a flat surface. "Three-dimensional" pie charts are an obvious problem. By placing the chart at an angle, the size of slices in the front is enhanced by the visible chart edge (Figure 1). When employed, perspective further shrinks the size of slices rotated to the distant part of the chart. (Most programs, like Excel, omit perspective calculations in these pseudo-3-D graphs.)

Adding depth to a bar chart also obscures the data. The back edge of the bar appears higher than the front edge; it is difficult to find the actual value on the Y-axis. Small differences that are easily seen presented flat become harder to notice when imaginary depth is added. Though adding depth may seem eye-catching, this maneuver confuses the point (Figure 2).

I am not suggesting that we abandon presentation graphics programs. The general availability of graphics

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