Pressure’s on to halt nosocomial infections

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May 2014—Modern health care is more advanced than ever, but institutions continue to battle one problem that refuses to go away: hospital-acquired infections. They should be preventable, yet a recent CDC report estimates that one in 25 U.S. patients acquired at least one infection during a hospital stay in 2011. The most pervasive nosocomial pathogens, by far, are *Clostridium difficile* and *Staphylococcus aureus* (Magill SS, et al. *N Engl J Med.* 2014;370: 1198–1208).

“Hospital-acquired infections are infections that are not supposed to happen,” says Larry Massie, MD, chief of Pathology and Laboratory Medicine for the New Mexico VA Health Care System and a professor of pathology at the University of New Mexico. “This is even more relevant now that the Centers for Medicare and Medicaid Services don’t reimburse for certain hospital-acquired infections. That’s putting a lot of pressure on hospitals to control this problem because they’re not recovering the expenses they incur.”

In a recent Q-Probes study, “Microbiology Testing for Hospital Infection Control,” Dr. Massie and colleagues report the isolation and detection rates of toxigenic *C. difficile* and methicillin-resistant S. aureus at 41 institutions in the United States and four facilities abroad. The results shed light on surveillance practices and detection techniques that can help health care facilities edge closer to the goal of eradicating nosocomial infections.

“We wanted to see how these two important nosocomial infections were being detected in the laboratories and how the laboratory evidence was being put to use. In this case, the clinical microbiology laboratory is the pivot on which the detection and the management of these infections turn,” notes Frederick A. Meier, MD, an author of the Q-Probes study and senior staff pathologist at Henry Ford Hospital in Detroit and director of regional pathology services, Henry Ford Health System.

To collect data for the study, the authors asked participating institutions to track at least 30 MRSA isolates, or all MRSA isolates identified during a 60-day period, whichever came first. The participants then sorted through the isolates to find true nosocomial infections, defined as those acquired at least two days after hospital admission. Surveillance specimens—those routinely collected from patients prior to or within 48 hours of admission and found to be positive—were distinguished from clinical specimens, collected from patients more than 48 hours after admission in response to signs of infection.

The study’s participants calculated the turnaround times from specimen collection to result reporting, and noted the detection methods. In the second part of the study, a similar process was repeated for isolates of toxigenic *C. difficile*. The information was used to calculate the surveillance detection rates, the clinical detection rates, and the overall detection rates for each organism.

Several unexpected findings emerged, the authors note. Most notably, the detection rates calculated in the Q-Probes study differ from those in the recent CDC report, which found that *C. difficile* accounted for 12.1 percent of all health-care–associated infections while S. aureus, including MRSA, accounted for 10.7 percent.

Dr. Meier

“At least in our little population, we found a higher median infection rate with MRSA than with *C. difficile*, with rates of 15 percent and eight percent, respectively,” Dr. Meier says. “These overall detection rates are valuable for people who are wondering about the institutional investment that needs to be made in testing and molecular tools.”

Fewer than half of the hospitals in the study used molecular tools to amplify the MRSA mecA gene, while most hospitals used bacterial culture to detect the pathogen. Predictably, the use of nucleic acid amplification allowed for much faster median turnaround times. Turnaround times were further reduced in laboratories with 24/7 testing capabilities.

Dr. Massie

“These findings are particularly important when you consider the time it takes for hospitals to put patients into contact isolation. The 90th percentile for turnaround times was on the order of almost three days, which means the patients weren’t in isolation for a significant period of time,” Dr. Massie notes.

Institutions that rely on culture methods to detect MRSA are not only at the mercy of bacterial growth rates, but can also find it difficult to keep up with a large volume of samples. Molecular tools can help hospital laboratories overcome these hurdles, but the biggest drawback is cost.

“Molecular methods can be expensive,” Dr. Massie acknowledges, but “institutions should consider, based upon their prevalence of MRSA, whether the cost of non-culture methods would be offset by fewer hospital-acquired infections.”

Detection of *C. difficile* is a different story: Nearly two-thirds of the participating labs already use molecular tools to detect the organism’s toxigenic phenotype. Far fewer labs use ELISA, a method found to be much less sensitive than nucleic acid amplification. “Hospitals or laboratories that are using those methods should consider whether they’re still being effective,” Dr. Massie says.

A number of labs now use a screening algorithm that begins with a test for a *C. difficile* antigen and confirms the result using a molecular probe. “As *C. difficile* has become more frequent, there has been a migration to nucleic acid amplification as a more automated, sensitive confirmatory test,” Dr. Meier says. “There’s a shift away from attempting to detect toxins by just an antigen test, or more rarely by a cell culture technique that detects the toxigenic effect on cells.”

The bottom line, the authors report, is that labs using nucleic acid amplification to detect nosocomial pathogens around the clock will sort patients significantly faster than other labs.

The Q-Probes study produced other interesting results. While the average surveillance detection rate for MRSA was about 11.4 percent, consistent with other published studies, the authors were surprised to find a dramatic variation in MRSA prevalence among the participating hospitals.

“One thing I found particularly intriguing was the incredible range—from roughly five percent to 55 percent—between laboratories, in terms of their isolation of MRSA from surveillance tests,” Dr. Massie says. “Usually studies will report just the average surveillance rate. So when we looked at individual institutions, that broad range really surprised me.”

The authors found that MRSA is more often detected during surveillance than by clinical testing, with a mere 2.4 percent clinical detection rate. By contrast, *C. difficile* had similar rates of surveillance and clinical detection of 5.7 percent and 4.9 percent, respectively.

Though the reasons for these disparities are not entirely clear, the authors speculate that hospitals with higher MRSA prevalence likely admit more patients from nursing homes or long-term care facilities. Regardless of the underlying reason, the finding is significant because hospitals can face entirely different challenges depending on the prevalence of MRSA.

"It's important to know how many patients will be presenting with these infections so you can plan what you're going to do. If you have a lot of these patients, isolation can become impractical depending on how large and complex your organization is," says Dr. Meier. "That said, the direct laboratory cost of MRSA screening for patients from chronic care facilities seems to be valuable. You pick up MRSA more efficiently if you screen all of those patients."

Equally important is remembering, the authors warn, that just because one area of the hospital has a low prevalence of MRSA doesn't mean other areas are necessarily safe. "It might be useful to look at specific units, such as ICUs, where there's a higher risk of hospital-acquired infections due to more central lines and other invasive procedures," Dr. Massie says, "especially if hospitals don't want the expense of doing all of the surveillance."

The Q-Probes findings have a number of potential implications for clinical practice, the authors note.

"There still is controversy in the literature as to the best approach for handling hospital-acquired infections due to MRSA. Some early studies suggested there was no benefit to doing surveillance cultures and putting patients with MRSA into contact isolation," Dr. Massie says. "But in a lot of those studies, there were breakdowns in the hospitals' contact precautions, meaning they weren't fully implemented. If you're only adhering to contact isolation part of the time, you're not really achieving your end goals."

In 2007, a Veterans Health Administration directive implemented a "MRSA bundle," which mandated universal nasal surveillance screening for MRSA on all patients admitted to ICU or non-ICU settings, and required VA hospitals to use contact precautions, including hand hygiene, when interacting with patients found to be colonized or infected with MRSA.

"At my institution, we had to adopt universal screening but we chose to go with a molecular method, rather than trying to culture the organism because that simply takes too long. And then, of course, we put people into contact isolation if they are found to be positive," Dr. Massie says. Though the VHA directive does not require decolonization of patients with MRSA, Dr. Massie's hospital opts to decolonize patients or initiate an eradication protocol consisting of intranasal Mupirocin, as well as chlorhexidine baths and mouthwash.
A few years after the mandate was in place, the VA reported a systemwide decrease in MRSA transmission and infections (Jain R, et al. N Engl J Med. 2011;364:1419–1430).

A more recent report in the New England Journal of Medicine supports the practice of universal decolonization, finding that it may be more effective than either targeted decolonization or screening and isolation at reducing rates of MRSA clinical isolates (Huang SS, et al. N Engl J Med. 2013:368:2255–2265).
But Dr. Massie isn't so sure. "Decolonizing everybody puts a lot of pressure on the organisms to develop resistance," he says. "These organisms have a tremendous capacity to adapt. It wouldn't surprise me if we start to see more resistance with the overuse of these decolonization protocols."

On a more encouraging note, Dr. Massie says, about 22 percent of the participating laboratories offered a fecal transplant program for patients with recurrent *C. difficile* infections. "That almost a quarter of the labs in our study have those programs in place really highlights the difficulty that health care is facing with regard to this particular disease," Dr. Massie says. "Once patients relapse, they're more likely to relapse again. At some point, there just isn't much therapy available, and that's when these fecal transplants can be very effective."

The Q-Probes study also identified a few opportunities to conserve cost and effort. “Roughly a quarter of labs had no limits on the number of samples that could be submitted,” Dr. Massie says. “Other labs were performing *C. difficile* testing on formed stool, which typically is not as valuable because one to three percent of individuals normally carry *C. difficile*. If they’re not having diarrhea, it really isn’t a problem.”

Like the recent CDC report, the Q-Probes study looked of different types of hospitals to better understand surveillance and detection of the two most common nosocomial pathogens. “About a third of the participating hospitals were really small, a third were medium-sized, and a third were really big,” Dr. Meier says. “We’ve represented urban, suburban, and rural settings. So it’s a small study but a fairly representative one.”
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