Editorial

Would Active Surveillance Cultures Help Control Healthcare-Related Methicillin-Resistant *Staphylococcus aureus* Infections?

Barry M. Farr, MD, MSc; William R. Jarvis, MD

In 1934, Reinhold Niebuhr penned lines that could almost serve as a mantra for healthcare epidemiology: "God give us grace to accept with serenity the things that cannot be changed, courage to change the things which should be changed and wisdom to distinguish the one from the other." In the same year, however, T. S. Eliot wrote lines that also resonate strongly and appear to many to sometimes represent a better description of what is actually happening: "Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?" Conflicts about what can and should be changed and the knowledge and wisdom to recognize these situations seem to be what healthcare epidemiology is all about.

In this issue, the Rhode Island Best Practice Guideline for controlling methicillin-resistant *Staphylococcus aureus* (MRSA)[1] addresses the control of one of the major causes of antibiotic-resistant healthcare-associated infections in U.S. hospitals. National secular trend data since the early 1980s have shown that the prevalence of MRSA keeps increasing every year (Fig. 1). The Centers for Disease Control and Prevention (CDC) has estimated that approximately 13,300 Americans died in 1992 of healthcare-associated infections caused by antibiotic-resistant pathogens. The rates of such infections (and of deaths directly or indirectly caused by these infections) have continued to rise each year. This means that, during the past decade, approximately 130,000 to 150,000 patients have died of these infections in U.S. hospitals. It should be remembered that control of healthcare-associated antibiotic-resistant pathogens was the reason that infection control programs were created in the first place, back in the early 1970s. This had followed two decades of steady increases in penicillin resistance (Fig. 2) and the development of a consensus that finding an effective means of prevention might be preferable to seeking another cure (because infections caused by antibiotic-resistant pathogens seemed to be more deadly than those due to antibiotic-susceptible strains of the same species and because an apparent panacea like penicillin really hadn't worked for all that long). Research during the past 50 years has confirmed repeatedly that antibiotic use and patient-to-patient spread are the two most important risk factors for infections caused by antibiotic-resistant pathogens.

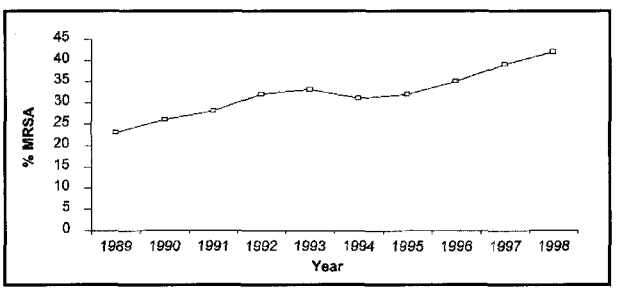

FIGURE 1. Percentage of nosocomial *Staphylococcus aureus* infections reported to be resistant to methicillin (MRSA), by year. From the National Nosocomial Infections Surveillance (NNIS) System data, 1989–1998.

The Rhode Island Guideline is important because it (1) addresses one of the most important problems of our time, (2) is evidence-based, and (3) is the first example of a public health department in the United States (at the state or federal level) publicly stating that identification of the reservoir for spread of antibiotic-resistant pathogens (ie, colonized patients) is necessary for effective control. It also provides an important example of the kind of collaboration

Dr. Farr is from the University of Virginia Health System, Charlottesville, Virginia. Dr. Jarvis is from the Centers for Disease Control and Prevention, Atlanta, Georgia.

Address reprint requests to Barry M. Farr, MD, MSc, P.O. Box 800473, University of Virginia Health Sciences Center, Charlottesville, VA 22908.

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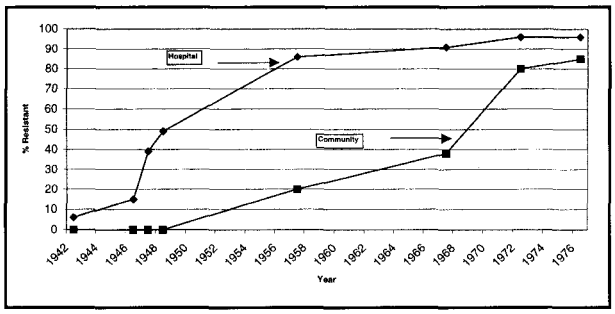

FIGURE 2. Estimated prevalence rates for penicillin resistance among methicillin-susceptible *Staphylococcus aureus* isolates in hospitals and the community. (Modified from Chambers HF. The changing epidemiology of *Staphylococcus aureus*? *Emerg Infect Dis* 2001;7:178-182.)

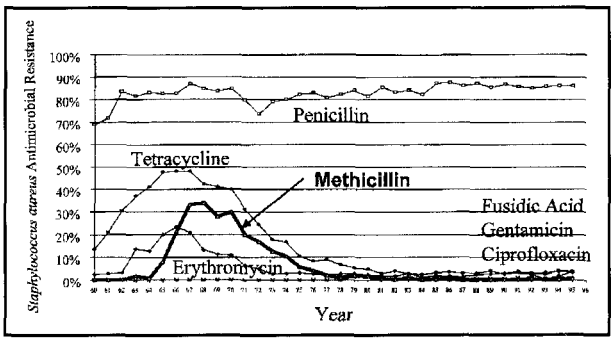

FIGURE 3. Proportion of *Staphylococcus aureus* bloodstream infections with isolates resistant to antibiotics in Danish hospitals from 1960 to 1995. (From Bager F, ed. *DANMAP 98: Consumption of Antimicrobial Agents and Occurrence of Antimicrobial Resistance in Bacteria from Food Animals, Food, and Humans in Denmark.* Copenhagen, Denmark: Danish Zoonosis Centre; 1999. Available at www.svs.dk/dk/z/Danmap%201998.pd.)

that is needed among clinicians, hospital epidemiologists, infection control professionals, and local and state health department officials. Some may quibble with the designation "evidence-based," because the authors didn't cite the evidence supporting each of their recommendations. There are, nevertheless, copious data demonstrating spread of antibiotic-resistant pathogens, such as MRSA, in healthcare settings[2-12] and showing prevention of both colonization and infections.[2,4,5,8,9,12-32] Those who wish to criticize the Rhode Island Guideline for not citing data supporting each of its recommendations should also remember that although CDC guidelines are categorized by the level of scientific data to support the recommendations, the CDC isolation guidelines published since 1983 have not cited data supporting specific isolation precaution recommendations. For the 1983 guideline there were no references[33] and in the most recent guideline, published in 1996,[34] there were only 4 references for the Recommendations section, 3 to other guidelines and 1 to an Occupational Safety and Health Administration publication in the *Federal Register* about respirator requirements. Others may ask whether the Rhode Island Guideline is really that much of an advance, because CDC guidelines as far back as 1983 recommended that patients with "epidemiologically important antibiotic-resistant pathogens," like MRSA, should be cared for using Contact Precautions and dedicated equipment to prevent contamination of clinicians' hands, apparel, and equipment so they wouldn't carry contagion to another patient.[33]

The important difference between the Rhode Island Guideline and the CDC guidelines of the past 19 years is that it recommends and emphasizes using active surveillance cultures to identify the reservoir for spread. For example, a statement on the current CDC website states that, "Standard Precautions should control the spread of MRSA in most instances," again without citing supportive data. This conflicts with a study that found 15.6-fold lower transmission of MRSA when colonized patients were recognized and cared for wearing mask, gown, and gloves than when using Standard Precautions.[4] While publications are rare showing sustained control of MRSA without the use of active surveillance cultures, many studies have shown control using an adequate number of active surveillance cultures to identify the reservoir along with barrier precautions for patients identified as being colonized.[2,4,5,8,9,13-32] The reason why such cultures might be important seems to be that a large majority of the reservoir for spread goes unrecognized and not isolated in hospitals not using them.[12] This proactive approach has worked at the ward, hospital, health district, and even national health system level (including those in Denmark, Holland, and Finland) (Fig. 3). Similar efforts are under way in Belgium and appear to be working.[14,35]

After 50 years of observation and debate, it is likely, however, that some still won't be satisfied that we have perfect/total/enough knowledge/wisdom and will insist that it is not yet time to try this approach. The vast majority of U.S. healthcare facilities have never tried using this approach[36] perhaps because neither the CDC nor any national infection control organization has explicitly stated that this is necessary for control of the problem. Nevertheless, when the CDC intervened to control epidemic vancomycin-resistant *Enterococcus* (VRE) throughout an entire health district using active surveillance cultures and Contact Precautions, the problem was completely controlled or significantly reduced in all 32 healthcare facilities in the district (ie, all 4 hospitals and all 28 nursing homes).[29] A CDC press release suggested that this public health effort had provided "a role model for all health regions." That statement and the Rhode Island Guideline in this issue should be carefully considered by anyone trying to protect patients from this growing threat. Those accustomed to the high and growing rate of MRSA infections in U.S. healthcare facilities should compare Figure 1 and Figure 3 and ask themselves if they are comfortable with our present course, because the difference in outcomes appears to be one of choice, not chance.

It is perhaps instructive to note that Oliver Wendell Holmes' seminal 1843 publication in the *New England Quarterly Journal of Medicine and Surgery* entitled "The Contagiousness of Puerperal Fever" was not a presentation of new data, but rather a review of many different scientific

publications on the same topic.[37] Holmes concluded his review by saying that it was time to end the half-century of debate about whether clinicians were spreading lethal infections from patient to patient. He said that this was obvious to anyone who had cared to look at the published data and that it was time to stop talking and start doing something to prevent the spread. We have now been discussing where lethal infections caused by antibiotic-resistant pathogens are coming from for a half century; as Holmes suggested after a similarly long discussion, the time for effective action is now long overdue.

After a prominent physicist on the faculty of the University of Virginia lost his wife to a surgical MRSA infection with secondary bacteremia,[38] he asked one of us to assure him that the hospital was and would continue doing "everything possible to keep this from happening to someone else's wife." It is probably obvious to the epidemiologists reading this editorial that preventive measures in just one tertiary care hospital can't and won't prevent the spread that is going on in all other surrounding facilities. The Rhode Island approach (ie, of doing this in all hospitals) is therefore much better from an epidemiological perspective and much more likely to have a positive effect.

Everyone knows that Columbus got into a boat, sailed west, and changed both history and our view of the world. Those who have read accounts of that voyage also know that there were heated debates among all involved about knowledge, wisdom, and what could/should be done at the time. Einstein suggested that, "Imagination is more important than knowledge." This was as true for the Apollo lunar landing in July 1969 as it was for Columbus finding San Salvador in October 1492. Without the courage and imagination of John Kennedy and Christopher Columbus and of all involved, those voyages would not have occurred.

The Rhode Island Guideline seems to say that enough (high-browed) debate is enough; let's take the half-century worth of data that we have and try to change the things that we should while we can. It seems to say, using the analogy to Columbus, that one must use a boat and follow the readings of a compass (ie, active surveillance cultures). By contrast, the approach used by personnel at most healthcare facilities has been merely to use a boat (ie, barrier precautions) with no compass readings to know where to go with the boat. There should thus be little surprise that the rate of healthcare-associated infections caused by antibiotic-resistant pathogens keeps getting worse every year as our fleet floats idly about going in no particular direction and with no thought of using a compass or a rudder.

The goal of medicine is to help the patient without doing harm, but the "bottom line" now frequently seems to be about minimizing some component cost. It has been shown that one can sometimes minimize a component cost, however, and paradoxically cause total costs to the hospital to increase. The cost per capita of healthcare-associated *S. aureus* infection in Denmark is likely lower than that in the United States, because MRSA infections, which are kept exceedingly rare in Denmark through active culture surveillance programs, cost significantly more than do methicillin-susceptible *S. aureus* (MSSA) infections.[12] A Danish patient with healthcare-associated *S. aureus* infection can thus be treated with an old-fashioned beta-lactam antibiotic with faster response, higher cure rate, and quicker hospital discharge at lower overall cost to society. This would suggest that just letting MRSA spread freely might not be the most cost-effective approach.

We can't resist saying, "Bravo, Rhode Island!" If all healthcare facilities start implementing programs of active surveillance cultures (increasing and/or decreasing the program **as epidemiologically appropriate** to control the continually expanding epidemic of healthcare-related infections), and infection control experts spend their political capital to convince other healthcare workers to have the "courage to change the things which should be changed," healthcare-associated MRSA infection rates could begin falling for the first time in decades.

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