



## Health Care–Associated Infections: Is There an End in Sight?

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LISA SPRAGUE, *Principal Policy Analyst*

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*OVERVIEW — Health care-associated infections (HAIs) have emerged as a significant concern in policy as well as clinical circles. An HAI is an infection acquired during treatment for another condition. Some of the HAI-causing bacteria have become drug-resistant; methicillin-resistant Staphylococcus aureus, or MRSA, is a familiar example. Tied to perhaps 100,000 deaths and \$20 billion in health care costs each year, HAIs have given rise to state laws, legislative proposals at the federal level, public-private initiatives, and work at the hospital system and individual hospital level. However, much remains to be done. This issue brief reviews the prevalence of HAIs and the strategies for and barriers to reducing their incidence. It examines the roles of public- and private-sector entities in reporting, monitoring, and eliminating HAIs. Policy responses such as research funding, training specifications, and payment adjustments are considered.*

**National Health Policy Forum**

2131 K Street, NW  
Suite 500  
Washington, DC 20037

**T** 202/872-1390  
**F** 202/862-9837  
**E** [nhpf@gwu.edu](mailto:nhpf@gwu.edu)  
[www.nhpf.org](http://www.nhpf.org)

Judith Miller Jones  
*Director*

Sally Coberly, PhD  
*Deputy Director*

Monique Martineau  
*Publications Director*

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Accounts in the popular press tend to have similar beginnings: Jane or John goes into the hospital for a routine procedure, gets an infection, and has to stay for a week instead of overnight. Or loses a limb. Or, in the grimmer versions, dies. “Superbug” is the term often applied to the infecting agent, such as a *Staphylococcus* bacterium (for example methicillin-resistant *Staphylococcus aureus*, or MRSA), that has proved resistant to standard antibiotics and threatening to the patient’s life.

In policy as well as clinical circles, health care-associated infections, HAIs (sometimes called hospital-acquired infections) have emerged as a significant concern. The Centers for Disease Control and Prevention (CDC) estimated that 1.7 million HAIs occurred in U.S. hospitals in 2002 and were associated with approximately 99,000 deaths.<sup>1</sup> A Department of Health and Human Services (HHS) news release suggests that HAIs add as much as \$20 billion to the nation’s health care tab each year.<sup>2</sup>

Many efforts are under way to address the HAI problem. Twenty-six states have passed HAI-related laws, mostly having to do with public reporting of infections. Local and national hospital groups, infection control professionals, and epidemiologists have undertaken infection-prevention initiatives, with some impressive success stories. Several pieces of HAI-related legislation have also been introduced at the federal level. The Centers for Medicare & Medicaid Services (CMS) in October 2008 suspended payment for additional costs for treatment of certain “reasonably preventable” HAIs (see further discussion, [page 8](#)). In January 2009, HHS announced an Action Plan to Prevent Healthcare-Associated Infections, whereby CDC, CMS, the Agency for Health Care Research and Quality (AHRQ), and other federal agencies will coordinate efforts to reduce HAIs.

It is clear that preventing infections is no small task. A 2007 survey by the Leapfrog Group (an employer-backed group focused on hospital quality) found that 87 percent of U.S. hospitals have failed to implement recommended guidelines to prevent avoidable infections.<sup>3</sup> A survey by the Association for Professionals in Infection Control & Epidemiology (APIC) revealed that more than half of respondents

judged their hospitals were not doing as much as they could to prevent the spread of MRSA.<sup>4</sup> Infection preventionists report that they have struggled all along to garner sufficient hospital resources and top management attention to support prevention efforts.

This issue brief reviews the prevalence of HAIs, the strategies for controlling them, and the barriers—technical, practical, and human—to their elimination. It reviews the roles of public- and private-sector entities in monitoring, reporting, and reducing the incidence of infection, and considers further policy development in these areas.

## WHAT IS AN HAI?

In simplest terms, an HAI is an infection acquired during treatment—most often but not necessarily in a hospital—for another condition. HAIs may be caused by bacteria, fungi or viruses. The infections often occur in connection with a device, such as catheter or a ventilator. Additionally, pathogens may be spread by touch or ingestion, or via a contaminated needle or other item of medical equipment. Some patients who carry bacteria into a hospital may be “colonized,” that is, carrying pathogens without being actually infected, yet still able to spread the germ that could become an infection in other people or themselves. For example, MRSA can live asymptotically in the nose or throat of a healthy person. People already weakened by other diseases or the treatments thereof, along with the very young and very old, are most vulnerable to harm.

As recently categorized by a group of health care organizations closely concerned with the topic, the most significant HAIs are those associated with devices and procedures (central line–associated bloodstream infection, ventilator-associated pneumonia, catheter-associated urinary tract infection, surgical site infection) and those attributable to specific organisms, such as MRSA and *Clostridium difficile* (or *C. diff.*).<sup>5</sup>

Not all infections are contracted in a health care setting, certainly. While a surgical site infection is unlikely to occur in the course of daily life, and *C. diff.* is generally transferred among nursing home and hospital patients, cases of MRSA among people with no links to recent health care delivery have increased in recent years. Community-associated MRSA (CA-MRSA for short, a different strain of the MRSA bacterium<sup>6</sup> from health care–associated, HA-MRSA) is known to

spread in crowded settings, where there is close skin-to-skin contact, during activities that result in abraded or compromised skin surfaces, and when potentially contaminated personal items such as towels and sporting equipment are shared. In short, prisons, gyms, locker rooms, and day care are fine breeding grounds. For the most part, CA-MRSA manifests as uncomplicated skin and soft tissue infection that can usually be treated with commonly available antimicrobial agents.

Eighty-five percent of the serious (that is, invasive) MRSA cases identified by CDC in the period July 2004 to December 2005 were associated with health care. Moreover, among the more than 18,000 people who died as a result of MRSA in that period, 92 percent had HA-MRSA infections.<sup>7</sup>

Treatment of bacterial infections usually requires a prescription antibiotic. While created to destroy harmful bacteria, antibiotics lose their effectiveness over time as resistance develops in the bacterial population. Antibiotic resistance is a microscopic illustration of the dictum, “What doesn’t kill you makes you stronger,” as well as of basic natural selection. A bacterium with a genetic mutation that allows it to survive the antibiotic that wipes out most of its kin is the one that will be able to reproduce, passing on its immunity until this becomes the norm in succeeding generations. The more that antibiotics are prescribed, the more opportunities for resistance to develop. This is the basis for concern about over-prescribing, particularly in cases (such as the virus-caused common cold) where an antibiotic can effect no cure, except perhaps by means of the placebo effect on patients who want *something* done for them.

## PREVENTION AND ERADICATION

Keeping HAIs at bay begins with basic hygiene: washing hands, cleaning surfaces that a colonized or infected person may have touched or coughed on, and refraining from inappropriate re-use of supplies and equipment, such as syringes and needles. Hospitals have also begun focusing on reducing the bacteria adhering to a person’s skin, especially before surgery, by means of washing the patient with a fast-acting antiseptic such as chlorhexidine.

Hand-washing, which seems such a simple precaution, is actually an ongoing problem for hospitals and other care facilities. Patient rooms

may not have sinks. A busy clinician may semi-consciously think, “I just washed my hands,” failing to register subsequent touches of potentially contaminated surfaces. CDC stresses that hand hygiene should be adhered to in conjunction with environmental hygiene and other appropriate infection control practices.

Isolation and barriers are the next line of defense. CDC guidelines suggest that in the allocation of available single-patient rooms, priority be given to patients with conditions that “facilitate transmission of infectious material to other patients” (such as draining wounds or incontinence) and to those at heightened risk of acquisition and adverse outcomes related to an HAI.<sup>8</sup> Gloves, gowns, and masks offer protection to health care personnel and visitors and may interrupt transmission of organisms to other patients.

On-admission screening of patients for MRSA or other bacteria that cause HAIs is one strategy that hospitals may use along with other elements of infection prevention. Whether widespread implementation is called for is not certain. CDC notes that screening is only useful if the necessary next steps can be provided, including isolation at least until screening results are available and possibly for the duration of infection or colonization, and decolonization for some bacteria. Veterans Affairs Health Administration hospitals and some other hospital systems now screen all admitted patients for MRSA. Legislation has been proposed in several states, and enacted in Illinois, Pennsylvania, New Jersey, and California, to require all-admission screening for MRSA. New present-on-admission (POA) reporting requirements instituted by CMS (discussed below) certainly nudge all hospitals in this direction, although, some contend, not necessarily to the advantage of the patient.

Research published in *The Journal of the American Medical Association* in 2008 found that universal screening did not reduce nosocomial (hospital-acquired) MRSA infections in a surgical department.<sup>9</sup> A pair of physicians commenting on that research point out that much of the data supporting all-admission screening came from single hospitals using multiple interventions during MRSA outbreaks, without concurrent control groups as a means of demonstrating that screening was the key variable. (For example, researchers evaluating a program at Evanston Northwestern Healthcare hospitals found

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that universal screening *combined with other precautions* was associated with a reduction in the incidence of MRSA infections in the hospital and 30 days after discharge.<sup>10</sup>) The physician commenters also note that isolating more patients on the basis of screening potentially subjects a larger group to the risk of reduced attention from health care workers and increased rates of depression and anxiety.<sup>11</sup>

Electronic surveillance may hold promise as a way of dealing with HAIs. Systems such as MedMined and TheraDoc analyze data from admissions and discharges as well as patterns of antibiotic ordering to reveal infection clusters and to address the antibiotic overuse that encourages the development of resistance. Proponents cite the ability to sort data by facility, unit, organism, or lab test. Vendors suggest that the initial \$100,000 to \$300,000 investment may be recouped speedily through the reduction of unreimbursed costs related to infection.<sup>12</sup> A survey of 790 hospital clinicians by the Premier healthcare alliance found that 22 percent of respondents used such a system, and 47 percent were considering a purchase.<sup>13</sup>

Some have adopted a less technological approach to infection control: the checklist. Peter Pronovost, MD, and colleagues designed an intervention based on recommendations in CDC guidelines to educate clinicians in the use of five evidence-based best practices for reducing the risk of catheter-related bloodstream infections and to track their subsequent adherence to these practices. The five procedures are hand-washing, using full-barrier precautions during the insertion of central venous catheters, cleaning the skin with chlorhexidine, avoiding the femoral site if possible, and removing unnecessary catheters. Implemented in 103 intensive care units in Michigan hospitals in 2004, the intervention resulted in a median infection rate of 0.0 per 1,000 catheter days (from 2.7) within three months.<sup>14</sup> A compendium of strategies to prevent HAIs in acute care hospitals issued by the five health care organizations referenced above (see endnote 5) similarly takes an education-and-basic-steps approach.

## REPORTING HAIS

Two agencies within HHS maintain data on HAIs. CDC's National Healthcare Safety Network (NHSN) has over 2,100 health care facilities enrolled in 48 states, many of which voluntarily report data on HAIs associated with medical devices, medical procedures, or related to antimicrobial resistance. Efforts are under way at CDC to

streamline HAI data collection by enabling health care facilities to use data already available in electronic form at their facilities as the basis for reporting to NHSN. AHRQ's Healthcare Cost and Utilization Project (HCUP) collects discharge data (including discharges following HAIs) reported by hospitals in 39 voluntarily participating states. As the Government Accountability Office pointed out in a recent report, limitations in the scope and data collection methods mean that currently these databases do not generate a national estimate of all HAIs associated with medical devices.<sup>15</sup>

Thanks in part to the efforts of the Consumers Union's Stop Hospital Infections initiative, 26 states require some form of public reporting of HAIs by health care facilities. Pennsylvania was a pioneer; its Health Care Cost Containment Council (PHC4) began reporting infection rates by hospital in 2005. Legislation enacted in 2007 made Pennsylvania also the first state to implement reporting by nursing homes. Many states specify that hospitals shall report via the NHSN, which means that reporting is financed with federal dollars (characterized by some as an unfunded mandate in reverse).

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## EDUCATING, MONITORING, ENFORCING: THE PLAYERS

In addition to maintaining the databases described above, several agencies within HHS have responsibilities with respect to infection control. CDC is central to education, research, and guideline development. It partners with other agencies and groups such as the Institute for Healthcare Improvement, Medicare's Quality Improvement Organization contractors, and hospital associations to promote consumer and clinician awareness and to spur adoption of guidelines. Five academic partners funded by CDC have been designated Prevention Epicenters; their current focus is "to find novel strategies for detection and prevention of post-surgical adverse events, bloodstream infections, *Clostridium difficile* infections, infections caused by antimicrobial-resistant organisms, and inappropriate antimicrobial use."<sup>16</sup> However, CDC's role is informational and persuasive; it has no enforcement authority over health care providers. AHRQ, like CDC, is involved in research, guideline development, and education related to HAIs.

CMS, as the payer for Medicare services, potentially has significant leverage over hospitals and other providers. A recent illustration is the inclusion of certain infections in a list of conditions for the treatment of which pay will be limited. New reporting requirements have also been imposed. The Deficit Reduction Act of 2005 directed the Secretary of Health and Human Services to identify at least two conditions that:

- Are high cost or high volume or both
- Could reasonably have been prevented through the application of evidence-based guidelines
- Result in the assignment of a case to a Medicare Severity Diagnosis-Related Group (MS-DRG) that has a higher payment when present as a secondary diagnosis

Inpatient Prospective Payment System (IPPS) hospitals were notified that as of October 1, 2008, they would not receive the higher MS-DRG payment for cases when one of the selected conditions is acquired during hospitalization. In August 2008, CMS, in collaboration with CDC, published the IPPS fiscal year 2009 final rule, which detailed 11 condition categories selected for implementation. Among these are catheter-associated bloodstream infections, catheter-associated urinary tract infections, and surgical site infections following coronary artery bypass graft, certain orthopedic procedures, or bariatric surgery. Considered but not included were MRSA and *C. diff*. Since CMS may revise the list from time to time, these infections may well be added at a later date. For now, hospitals are required to submit POA documentation for inpatient discharges with respect to the selected conditions. CMS has encouraged state Medicaid programs to mirror its policies on payment for hospital-acquired conditions; New York and Pennsylvania have already done so. Several large insurers have followed suit as well.

The Joint Commission, which accredits hospitals and has the authority to deem that accredited hospitals satisfy Medicare's Conditions of Participation, has incorporated additional infection control expectations in both its accreditation standards and its 2009 national patient safety goals. Standards relate to surveillance, prevention, control, and documentation. The Joint Commission joined with three major infection control associations and the American Hospital Association to issue the above-referenced "Compendium of Strategies to



Prevent Healthcare-Associated Infections in Acute Care Hospitals” (see endnote 5).

National and state hospital associations have been active in education campaigns and other infection control initiatives, as have the associations of infection preventionists and health care epidemiologists.

### ON THE PROVIDER SIDE: REPORTING

At the individual hospital level, the flurry of measurement and reporting requirements from federal agencies, states, and associations can be confusing. Some administrators, faced with scarce resources and competing demands, understandably wish for convergence on two points: this is what you do to make it stop, and here is what you are required to report.

CMS’s POA reporting is seen as onerous by some hospitals; others see it as a change whose time has come. The process requires a physician to make a determination in each patient’s case as to whether certain secondary diagnoses are present on admission, entailing more time and often more tests than previously, and to write this down in a form that can be recognized by a coder. (Proponents of surveillance systems say this determination can be made fairly easily through review of routine lab tests.) Moreover, CMS says, “Issues related to inconsistent, missing, conflicting, or unclear documentation must be resolved by the provider,” adding to the burden.<sup>17</sup> Whether potential withholding of payment is conducive to physicians and hospitals working in tandem to satisfy the Medicare agency is perhaps open to discussion.

The impact of the new CMS policy is also an open question. The effect on infection rates cannot yet be discerned. CMS has estimated that the savings realized from denying higher payment for treatment of hospital-acquired conditions will be \$21 million per year,<sup>18</sup> which prompted one hospital official to comment that its value had been oversold to policymakers and the public. Some analysts have suggested that the chief effect of POA reporting is likely to be channeling hospital resources into proving that infections came from somewhere else (the gym, perhaps).

Physicians have been less than enthusiastic about the inclusion of infections on CMS’s no-pay list. Some have suggested that the list should be limited to conditions for which adherence to evidence-based

guidelines has been shown to eliminate occurrences. A bone of contention is CMS's characterization of included infections as "reasonably preventable." The American Medical Association (AMA) points out that risk of infection varies with a patient's underlying condition; the organization would like the rules to account for patient risk factors and other issues largely beyond doctors' control. The AMA has requested that CMS factor the cost increases related to complying with this program into the physician pay formula. Physicians have also voiced the fear that what has started as a hospital-based proposition will move to the office practice next, as has already been the case with other quality-reporting initiatives.<sup>19</sup>

Infection preventionists have been cautiously supportive of "tying payment to conditions that have a high prevention rate and associated actionable evidence-based prevention guidelines." However, APIC believes that payment policy should recognize and encourage institutions that are making progress in reducing infections.<sup>20</sup>

### REDUCING HAIs

Some hospitals and physician leaders have achieved dramatic reductions in infection rates and mortalities. When PHC4 began reporting hospital infection statistics, and many hospitals cried foul, Hamot Medical Center in Erie responded by investing in surveillance technology and developing new procedures that lowered its infection rates. Another Pennsylvania institution often cited as an inspiring example is Allegheny General Hospital (AGH) in Pittsburgh. Under the leadership of Richard Shannon, MD, the AGH medical intensive care and coronary care units between 2003 and 2006 achieved a greater than 90 percent reduction in central line–associated bloodstream infections (CLABSIs) and reduced CLABSI deaths to zero. Other physicians have continued the work, ensuring that physicians and nurses are trained in a standardized way of inserting and maintaining central lines, and have all but eliminated CLABSIs.<sup>21</sup> Significant improvements have also been documented in places other than Pennsylvania, at the level of hospitals, hospital departments, or in some cases as a consortium of institutions. For example, the Greater New York Hospital Association and the United Hospital Fund have attracted 38 hospitals to a CLABSI collaborative; in its two years of operation, CLABSI rates in participating hospitals have declined by more than 70 percent.<sup>22</sup>

## REACHING ZERO WHEN?

A conference sponsored by Cardinal Health (maker of MedMined) in November 2008 was titled *Chasing Zero*. Speaker after speaker agreed that zero infections was the only appropriate goal. What will it take to get there?

Some have chosen a legislative strategy, particularly with respect to MRSA. In addition to activity at the state level, bills in the U.S. House of Representatives and the Senate would facilitate the exchange of best practices, promote public education, mandate reporting, and make further adjustments to Medicare payment.<sup>23</sup> Infection preventionists tend to favor federal support of research and evidence development and to fear the enshrinement of current medical knowledge in statute. A January 2009 editorial in the journal *Infection Control & Hospital Epidemiology* acknowledged that we have yet to attain “a clear understanding of which risk factors operate in which settings and which interventions are more, or even most, likely to be successful.”<sup>24</sup>

As with any crusade, leadership is key to conquering infection. Under Chief Medical Officer Jonathan Perlin, MD, PhD, hospital giant HCA (Hospital Corporation of America) initiated an aggressive anti-MRSA campaign and adopted its own list of “serious preventable adverse events” for which it will not bill. Acknowledging in the course of a 2007 presentation that provider control is an issue, Dr. Perlin said, “We can choose to argue about the 1-3% that’s outside of our control or focus on the 97-99% that is within our control.”<sup>25</sup> In fact, leaders in the field agree that changing the cultural view of the problem is at the heart of solving it. For many years, infections were seen as part of the territory: they happened. Reaching zero requires accepting that they do not have to happen.

The patient-safety consciousness-raising that followed the Institute of Medicine’s 1999 report *To Err is Human* taught practitioners and observers to look to system fallibility rather than blaming individual clinicians. The Institute for Healthcare Improvement’s Donald Goldman, MD, closes the circle by suggesting that *after* a system’s design is perfected and regularly monitored—for hand hygiene, say—individuals *should* be held accountable for failing to follow rules.<sup>26</sup>

At this stage, “perfected” is well beyond the reach of most hospitals, and the incidence and severity of infections continues to escalate. An APIC study released in November 2008 found that 13 of 1,000 patients were colonized with *C. diff.*, considerably higher than previous

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*We have yet to attain “a clear understanding of which risk factors operate in which settings and which interventions are more, or even most, likely to be successful.”*

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incidence estimates.<sup>27</sup> Similar estimates were found in a recent CDC study. In addition to tracking MRSA and *C. diff.*, CDC is tracking other harmful bacteria, such as strains of *Acinetobacter*, which are not yet common but are already drug-resistant.

The challenges are evident. So is the need to master them. If it can be done in Hamot Medical Center or Allegheny General Hospital, is there really an excuse to allow the bacteria to win anywhere else? As British entrepreneur Richard Branson has observed, if the airline industry had the “adverse event” track record of the hospital industry, “we would have been grounded years ago.”<sup>28</sup> Consumer groups have called for greater employment of government oversight and mandates.<sup>29</sup>

Some experts say that a critical change already has occurred. In the 1970s, CDC’s Study on the Efficacy of Nosocomial Infection Control (SENIC) project found that hospitals could reduce their infection rates by approximately 32 percent if their infection surveillance and control programs followed agency guidelines.<sup>30</sup> The goal today is a reduction to zero, but getting there will be a challenge. Policy options for addressing research, education, training, payment, and transparency as means to the goal are still being sorted out.

## ENDNOTES

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