Unnecessary Deaths: The Human and Financial Costs of Hospital Infections

3rd Edition

By Betsy McCaughey, Ph.D.

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Committee to reduce infection deaths
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Essential Facts You *Need* to Know About Hospital Infections

Keep in mind:

- We have the knowledge to prevent hospital infection deaths.
- Yet most hospitals have failed to act.
- The situation is growing more dangerous because, increasingly, hospital infections cannot be cured with commonly-used antibiotics.

Essential facts:

1. Infections contracted in hospitals are the fourth largest killer in America. Every year in this country, two million[1] patients contract infections in hospitals, and well over 100,000 die as a result, [2] more deaths than from AIDS, breast cancer, and auto accidents combined.

2. A few hospitals in the U.S. – too few – are proving that infections are almost entirely preventable. How are they doing it? Through rigorous hand hygiene, meticulous cleaning of equipment and rooms in between patient use, testing incoming patients to identify those carrying dangerous bacteria, and taking precautions to prevent these bacteria from spreading to other patients.

3. Hospital infections add an estimated $30.5 billion to the nation's hospital costs each year. Patients, insurers and taxpayers pay part of that, but hospitals have to absorb much of the cost. As a result, infections erode hospital profits. Preventing infections can turn a financially failing hospital profitable.

4. Until recently, infection was considered an inevitable risk of hospitalization. Now, there is compelling evidence that nearly all hospital infections are preventable when doctors and staff adhere to research-based guidelines. This puts physicians, hospitals, and hospital board members in a new legal situation. The belief that infections are unavoidable shielded hospitals and doctors from liability for decades. But not in future. Hospital infections could be the next asbestos.

5. Better infection prevention in hospitals is essential to prepare the nation for avian flu or bioterrorism. If avian flu were to wing its way to the U.S., the death toll would depend largely on what American hospitals did when the first avian flu patients were admitted. If hospitals have effective infection controls in place, they can prevent bird flu from infecting other patients who did not come in with it. If not, bird flu could sweep through hospitals. Right now, most hospitals are woefully under prepared. Hospitals have failed to stop the spread of ordinary infections spread by touch and would not be able to contain flu viruses, which are communicated by droplets from coughing and sneezing as well as touch. Shoddy infection control is poor preparation for a flu epidemic and poor homeland security as well.

6. Hospital infection is a far deadlier problem than the number of uninsured. The Institute of Medicine estimates that as many as 18,000 people a year die prematurely because they don't have health insurance. That's tragic. But five times as many people die each year from hospital infections, and most of them are insured.[3]

rid™ Committee to reduce infection deaths

Dear Reader,

This book has been written to help you and to enlist your help in correcting a deadly situation that kills well over 100,000 people in this country each year — more deaths than from AIDS, breast cancer, and auto accidents combined.

Where does it kill? In our hospitals. What is it? Hospital infection.

The death toll is staggering. So is the economic cost. Hospital infections add over $30 billion a year to what the nation spends on hospital care, enough to pay for a large part of the Medicare Part D drug program.[4]

These infections are almost all preventable. An increasing number of hospitals in the U.S. are proving it, reducing some of the deadliest types of infections by 90 percent. Their achievements prove that we have the knowledge to solve this problem. What is lacking is leadership.

That is why I founded the Committee to Reduce Infection Deaths (RID): to motivate hospitals to make infection prevention a top priority; to inform patients about the steps they can take to reduce their risk of infection; and to ensure that no matter where you live, you can find out which hospitals in your area have the worst infection problems.

- **RID holds forums** for hospital administrators, public health officials, lawmakers, medical educators, insurers, and patient advocates, showing them *how* infections can be eradicated and *how much money can be saved*. The humanistic reasons to stop hospital infections are obvious. RID forums also make a compelling economic case for infection prevention, showing that for some hospitals, preventing infection can actually make the difference between profitability and loss.

- **RID educates** the public through television, radio, popular publications, and our website. One of our most important educational tools is the "15 Steps You Can Take to Reduce Your Risk of a Hospital Infection," which is included in this study.

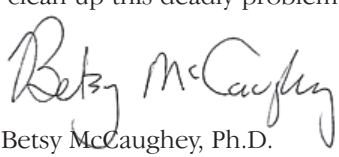
- **RID works with state lawmakers and other policy makers** to develop hospital infection report cards, because if you need to be hospitalized, you should be able to choose a hospital with a low infection rate.

- **RID provides the latest, most accurate research** in a format that doctors, nurses and other caregivers can access electronically at any time, from any where. RID's electronically delivered curriculum bridges the gap between today's research and yesterday's practices.

■ **RID is encouraging medical schools and nursing schools** to educate their students about how bacteria are spread from patient to patient in hospitals and the precautions that should be taken to protect their patients — a subject that is almost entirely neglected in most schools.

RID has a distinguished advisory committee, including: Dr. Carlene Muto, Director of Infection Control and Hospital Epidemiology, University of Pittsburgh-Presbyterian Medical Center; Dr. Richard Shannon, Professor of Medicine, Hospital of the University of Pennsylvania; Dr. Jeffrey Borer, Chairman of the Division of Cardiovascular Pathophysiology at New York-Presbyterian Medical Center; Dr. Steve O'Brien, Vice Chairman of the Sports Medicine Department at Hospital for Special Surgery; Dr. Allen Hyman, Former Chief of Staff and Medical Director of New York-Presbyterian Medical Center; Dr. Bart Pasternack, a cardiovascular surgeon at Norwalk Hospital and Yale-New Haven Hospital in Connecticut; Dr. Alan Jasper, Chairman of the Department of Critical Care Medicine and Former Chief of Staff at St. Vincent's Medical Center in Los Angeles; Jane Barnsteiner RN, PhD, FAAN, Professor of Pediatric Nursing at UPENN School of Nursing; Dr. Sherwin Nuland, author of *A Doctor's Plague*; and Dr. Elizabeth Whelan, founder of the American Council on Science and Health. RID mourns the loss of our advisory board member Nobel Laureate Dr. Joshua Lederberg, who died on February 2nd, 2008. Other members include philanthropists and civic and corporate leaders.

Everyday you hear about health care problems such as providing for the uninsured. The Institute of Medicine estimated that as many as 18,000 people a year may die prematurely because they don't have health insurance.[5] But consider this even more tragic fact: five times that many people die each year from hospital infection, and most of them are insured. Having insurance is no guarantee that you will be safe in the hospital. The only way to ensure that is to clean up this deadly problem.



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"We believe that healthcare facilities in the United States can be as successful in controlling MRSA as health care facilities in Northern Europe and Western Australia…."

– William Jarvis, December 2007 [6]

I

Third World Hygiene in Our First Class Medical System

Every day in hospitals across the United States wondrous medical procedures rescue patients from the brink of death. But there's a catch: in these same hospitals, hygiene and procedures are so inadequate that up to 10% of hospital patients contract infections.[7]

Infections that have been nearly eradicated in some countries are raging through American hospitals. In 2003, the Society for Healthcare Epidemiologists of America warned that although hospitals have infection prevention programs, "there is little evidence of control in most facilities."[8]

The danger is growing because hospital infections, increasingly, cannot be tamed with commonly-used antibiotics. One of the deadliest germs is methicillin-resistant Staphylococcus aureus (or MRSA). Patients who do survive MRSA often spend months in the hospital and endure repeated surgeries to cut out infected tissue. In 1974, 2 percent of Staph infections were MRSA. By 1995, the number had climbed to 22%, in 2003 an alarming 64%, and now even higher.[9] In 2007, a research team led by William Jarvis concluded that MRSA is "has become endemic in virtually all U.S. health care facilities."[10]

Denmark, Holland, and Finland once faced similar rates, but brought them down below 1 percent.[11] How? Through rigorous hand hygiene, meticulous cleaning of equipment and rooms in between patient use, testing incoming patients for MRSA and other drug resistant bacteria, and taking precautions to prevent transmission to other patients. Wheelchairs and other equipment used to transport patients who test positive for MRSA are not used for other patients, and hospital staff have to change their uniforms and footwear after entering the rooms of MRSA patients, before they are permitted in other areas of the hospital.

An increasing number of hospitals in the United States are proving these precautions work here too. The University of Virginia Hospital eradicated MRSA.[12] The Veterans Hospital in Pittsburgh reduced MRSA by 85 percent in a pilot program.[13] The University of Pittsburgh-Presbyterian Medical Center slashed MRSA by 90 percent in the medical intensive care units in a pilot program,[14] and a

Yale-affiliated hospital in New Haven, Connecticut, cut MRSA infections by two thirds in a surgical intensive care unit. Beth Israel Medical Center in New York City reduced MRSA infections 65% from 2003 to 2007.[15] Brigham and Women's Hospital in Boston reduced MRSA bacteremia 77% in intensive care and 67% hospital-wide.[16]

Smaller hospitals around the nation are providing leadership as well. In November, 2007 Pitt County Memorial Hospital in South Carolina announced that screening all incoming patients and all elective surgery patients for MRSA, and then taking precautions to prevent the germ from spreading, achieved a 67% reduction in ventilator-associated pneumonia and a 60% drop in MRSA urinary tract infections in eight months. Pitt County is now hosting forums to show other hospitals in the region how it's done.

Twenty-nine healthcare institutions in Iowa eliminated another drug-resistant germ, *vancomycin-resistant Enterococcus* (or VRE).[17] Unfortunately, most U.S. hospitals have not implemented these precautions.

How Many Hospital Infections? Tallying the Human Cost

Dad's death certificate said "organ failure," my friend recalled. "That's like saying the cause of death was dying. It was the hospital infection that killed him."

Until recently, the Centers for Disease Control and Prevention estimated that one out of every twenty patients (5%) contracts an infection in the hospital. That figure was based on what a small number of hospitals voluntarily report to the CDC's National Nosocomial Infection Survey (NNIS). But two new studies show that the CDC estimate understates the problem by as much as half.

First, a nationwide survey announced in June, 2007 found that 2.4% of inpatients were infected with hospital-acquired MRSA. That's just one bacterium! Surely the overall infection rate would be far higher than 5% if all bacteria were counted. The new survey was far more extensive that previous CDC collection efforts, and included 1,200 hospitals (nearly a quarter of the hospitals in the U.S.). Also, the CDC customarily relies on data from the ICU only, and the new survey found infections are more prevalent in other parts of the hospital than in ICUs.[28]

Second, a report in the October 17, 2007 issue of the Journal of the American Medical Association made headlines by disclosing that more people in the U.S. die from MRSA than from HIV. The MRSA death toll is significantly larger than previous CDC estimates. Why? The new study examined patients' actual laboratory results, rather than basing its findings on what hospitals tell families, put on death certificates, or report to the CDC. In other words, the new report exposed the truth gap between actual cases and those reported.[29]

If the same methodological improvements that result in far higher MRSA figures were used to tally hospital infections from all types of bacteria, instead of this one superbug, total infection rates would be found to be much higher than 5% and the annual death toll would be found to be substantially greater than 100,000.

II

The Major Problem: Poor Hygiene

Astoundingly, physicians and other caregivers break the most fundamental rule of hygiene over half the time by failing to clean their hands before treating patients.[18] Programs to encourage better compliance have been disappointing. Brigham and Women's Hospital in Boston assessed the impact of installing dispensers for alcohol based hand cleaners in every patient's room and conveniently in the hallways, and conducting a year long campaign on hand hygiene. The results? Hand cleaning temporarily improved from 40% to 80%, but quickly dropped back to 60%.[19]

Unfortunately, caregivers often think putting on gloves — without cleaning their hands first — is sufficient. But pulling on gloves with unclean hands simply contaminates the gloves.

Cleaning hands is essential, but it's only the first step. Caregivers also need to learn how to prevent their hands or gloves from becoming re-contaminated before touching the patient. Stand in the emergency room, and watch caregivers clean their hands, put on gloves, and then reach up and pull open the privacy curtain to see the next patient. That curtain is seldom changed, and it is frequently full of bacteria. The result? Caregivers' gloves are soiled again.

As long as surfaces in hospitals are inadequately cleaned, caregivers' hands will become recontaminated seconds after they are washed.

How dirty are hospitals? Boston University researchers examining 49 operating rooms in four New England teaching hospitals found that more than half the objects that should have been disinfected were overlooked by cleaning staff. A follow-up study of patients' rooms in 20 hospitals in Washington, D.C., Connecticut and Massachusetts found that more than half the surfaces that are supposed to be cleaned after a patient is discharged and before the next patient is admitted were overlooked.[20]

Research shows that nearly three quarters of patients' room are contaminated with MRSA and VRE.[21] These bacteria are on cabinets, counter tops, bedrails, bedside tables, and other surfaces. Once patients and caregivers touch these surfaces, their hands become vectors for disease. One study showed that when a nurse walks into a room occupied

by a patient with MRSA and has no patient contact, but touches objects in the room, the nurse's gloves are contaminated 42% of the time when leaving the room.[22]

MRSA and VRE can live for many hours on surfaces and fabrics. Thorough cleaning is highly effective in reducing the spread of drug-resistant bacteria to patients.

In a 2006 study, researchers at Rush University Medical Center in Chicago trained the environmental services staff to soak surfaces with detergent and wait, rather than merely spraying and quickly wiping, and to clean commonly overlooked objects such as telephones, remote controls and faucets. The result was a two-thirds reduction in the spread of VRE to patients.[23] Even the cash-strapped British National Health Service recognizes that intensive cleaning is a bargain compared with the cost of treating infections. By nearly doubling cleaning staff hours on one ward, and with no other interventions, a hospital in Dorchester, England reduced the spread of MRSA by 90%. The financial results were also impressive. Savings from infections avoided were 3.5 times the cost of the added cleaning.

Environmental surfaces are vectors for drug-resistant bacteria, but the most important sources of these bacteria are the patients coming into the hospital. Amazingly, most hospitals in the U.S. don't test incoming patients for MRSA. Seventy to ninety percent of patients carrying MRSA are unknown. They are the silent reservoir in the hospital. Knowing which patients are sources of bacteria is the key to stopping the spread.[24]

Recent research highlights the danger of MRSA and other superbugs lingering on surfaces long after the patient who carried the germ has been discharged. In one nine-bed ICU, more than half the patients who picked up MRSA after entering the ICU acquired a strain of the bacteria not present on other patients in the ICU at the time. In other words, the bacteria had been left behind on floors, bedrails, tables, and other surfaces by patients already discharged. These findings demonstrate 1) the importance of housekeeping and 2) how essential it is to know which patients entering the ICU are carrying the bacteria.

Placing a patient in a room or even a wheelchair previously used by someone who unknowingly carried MRSA put that patient at risk.

When hospitals fail to identify which patients are carrying superbugs, hospital uniforms and equipment become conveyor belts for infection. When doctors and nurses lean over a patient with MRSA bacteria, their white coats and uniforms pick up that bacteria 65% of the time, allowing it to be carried to other patients.[25]

A 2007 University of Maryland study revealed just how contaminated the clothing worn by hospital personnel can be. In the study, sixty-five percent of doctors and other medical personnel treating patients admitted that they change their lab coat less than once a week, even though they know it is contaminated. Fifteen

percent admitted they change it less than once a month.[26]

Hospitals that are conquering infections require their staff to put on fresh gowns or disposable aprons every time they approach the bedside of patients carrying MRSA, not just infected patients, but all patients carrying the bacterium. (The disposable aprons cost a nickel and are ripped off rolls like clear, plastic dry cleaning bags.)

Stethoscopes, blood pressure cuffs, pulse oximeters, wheelchairs, and other equipment are frequently carrying live bacteria. Do doctors clean the stethoscope before listening to a patient's chest? Not usually, though the American Medical Association recommends it.

When a nurse wraps a blood pressure cuff around the patient's bare arm, the cuff frequently carries live bacteria, including MRSA. In a September 2006 study, 77% of blood pressure cuffs rolled from room to room in the hospital were contaminated.

An astounding example of the impact of contaminated equipment occurred in a burn unit at an academic hospital in Galveston Texas. When the VRE outbreak began, hospital personnel cultured every surface in the unit. The results were revealing: 19% of bedrails, 26% of infusion pumps, and virtually all other surfaces were contaminated with VRE. Hospital personnel launched a "very aggressive" twice-daily cleaning of patients' rooms and equipment, including equipment that ordinarily was the responsibility of the nursing staff. Incoming patients were cultured for VRE, and all caregivers wore gowns and gloves when treating positive patients. The "clean and screen" strategy succeeded. VRE was eradicated from the unit by October, 2000.

Then, in November, a physician treating a patient with a large shoulder and neck burn noticed one item had not been cultured — the EKG wire just used. Four days later, his patient's wound tested positive for VRE — and molecular typing confirmed the germ had come from the wire. Amazingly, the VRE on that wire had been left behind by a patient discharged 38 days earlier!

We have the knowledge to prevent infection. What has been

VRE Contaminates Surfaces in an Academic Hospital, Galveston, TX

Site	(%) Positive for VRE
Infusion pumps	26 %
Bed rails	19 %
Shelves	19 %
Overbed tables	18 %
Bedside tables	17 %
Pulse oximeters	14 %
Stethoscopes	13 %
Monitors	13 %
Suction canisters	12 %
Chairs	11 %
Doors	11 %
IV poles	10 %
Oxygen flow meters	8 %
Faucets	6 %
Miscellaneous	14 %
Total	**13.5 %**

BP Cuffs As Vectors of Disease

In 2003, a university hospital in Tours, France, examined 203 BP cuffs used in medical, surgical, ICU, and emergency units.

Type of BP Cuff	Total Number	% Contaminated
On Nurses' Trolleys	35	77%
Individual	41	63%
Wall Model	57	53%
Stored	52	17%
Newly Cleaned (with disinfecting detergent)	18	0%

Extensive contamination of BP cuffs (30% of contaminated cuffs carried MRSA).

Source: C de Gialluly et al., "Blood Pressure Cuff as a Potential Vector of Pathogenic Microorganisms: a prospective study in a teaching hospital," *Infection Control and Hospital Epidemiology* 27.9 (2006): 940-3.

lacking is the will. In 2003, a committee of the Society for Healthcare Epidemiologists of America codified the precautions that have worked well in Denmark, Holland, and Finland and in the hospitals here in the U.S. that have tried them. The essence of these guidelines (see Appendix C) is cleaning and screening. This twofold strategy works. One study shows that MRSA bacteria spread from patient to patient 16 times as fast under standard CDC precautions as under the more rigorous precautions outlined in the 2003 guidelines. What a shame that more hospitals are not implementing these lifesaving precautions. The next chapter will review the compelling evidence for screening.[27]

III

MRSA Screening Is Essential

What kills more than five times as many Americans as AIDS each year? Hospital infections. Yet federal officials at the Centers for Disease Control and Prevention, who are calling for voluntary blood testing of all patients to stem the spread of AIDS, are not recommending a test that is essential to stop the rapid spread of another killer sweeping through our nation's hospitals: MRSA.

On September 19, 2006 the Centers for Disease Control and Prevention recommended universal testing for HIV. One month later, a Centers for Disease Control and Prevention committee issued new guidelines to prevent hospital infections but chose not to recommend that hospitals begin screening all patients for MRSA.[30]

Is the MRSA test more invasive than the HIV test? No, it's less invasive — a simple skin or nasal swab to determine which patients carry the bacteria.

Is the MRSA test more expensive? No. The rapid MRSA test costs about the same as the rapid HIV test, $20 or so.

Is MRSA testing needed? Yes, because MRSA is transmitted easily from patient to patient on clothing, medical equipment, hands, and gloves.

Research shows that you cannot prevent MRSA infections until you identify which patients bring these bacteria into the hospital. Patients who unknowingly carry MRSA shed it in tiny particles on bedrails, wheelchairs, blood pressure cuffs, stethoscopes, and the floor under their beds. They don't realize they have it, because the germ doesn't make you sick (infected) unless it gets inside your body via a catheter, a surgical incision or other open wound, or a ventilator.

Among developed nations, Japan and the U.S. have the worst records of failing to control the rapid rise of drug-resistant hospital infections.[29] Data from the Centers for Disease Control and Prevention indicate that MRSA hospital infections increased 32 fold from 1976 to 2003.[31]

For a decade, the Centers for Disease Control and Prevention have rebuffed calls for screening. In 1996, in the *Journal of the American Medical Association,* a panel of experts warned that hospitals faced an "unprecedented crisis"

due to drug-resistant infections.[32] In 2003, a committee of the Society for Healthcare Epidemiologists of America warned again that screening patients at risk for carrying MRSA was urgently needed.[33]

In 2004, Dr. John Boyce announced that screening had reduced MRSA infections by two thirds in an intensive care unit at a Yale-affiliated Connecticut hospital. Based on this study and others, Boyce and co-researchers concluded that patients will not be protected from MRSA until hospitals start screening.[34]

That is the compelling conclusion of a 9 year study done at the Brigham and Women's Hospital in Boston and published in the fall of 2006 in *Clinical Infectious Diseases*.[35] Researchers found that installing dispensers of alcohol-based hand cleaners in each patient's room and outside each patient's room had no significant impact on MRSA bacteremia rates. Similarly, a subsequent year-long hand hygiene education campaign achieved no statistically significant reduction in MRSA bacteremia. But initiating routine surveillance cultures for all ICU patients and contact precautions for patients testing positive for MRSA resulted in an impressive 75% drop in MRSA bacteremia in intensive care units and a 67% drop hospital wide.

Researchers called the infection reduction at Brigham and Women's "profound." They explained that the reduction could have been even greater had they either used a rapid MRSA test, instead of a culture that took two days, or preemptively isolated patients until their cultures came back from the laboratory. The two day

New British Recommendations

1. Screen all patients admitted to "high risk" units, such as the ICU, cardiothoracic, orthopedic, and burn units.
2. Minimize movement of MRSA-positive patients.
3. Use gowns and disposable aprons when treating MRSA-positive patients.
4. Launder privacy curtains or use disposable curtains.
5. Decontaminate trolleys and wheelchairs after patient use.
6. Before surgery, attempt to decolonize MRSA positive patients.
7. In the recovery area, segregate MRSA positive patients.

Source: Specialist Advisory Committee on Antimicrobial Resistance (established to advise the UK government), "Guidelines for the control and prevention of methicillin-resistant Staphylococcus aureus (MRSA) in healthcare facilities," *Journal of Hospital Infection* 635 (April 2006).

delay permitted some spread of bacteria from patients who unknowingly carried MRSA to other patients who did not come in with it.

Despite these and many other studies, the CDC continue to equivocate, rather than urging all hospitals to screen incoming patients for MRSA and take contact precautions to prevent the bacteria from spreading to other patients. "There are at least fifty studies demonstrating the effectiveness of these precautions," explains Dr. Carlene Muto, and "not one study suggesting it's possible to control MRSA without them."[36]

Fortunately, some hospitals are leading the way, including Evanston Northwestern, the seventeen Veterans Affairs medical centers, New England Baptist Hospital in Boston, Johns Hopkins in Baltimore, North Shore University Hospital on Long Island, and Beth Israel Medical Center in New York City.[37] Even the cash-strapped British National Health Service has launched MRSA testing. Hospitals that don't screen are putting their patients at greater risk of an MRSA infection.

Now that the Centers for Disease Control and Prevention are telling hospitals to test for HIV, they should call for MRSA screening as well. Lax guidelines encourage hospitals to do too little. Every year of delay is costing thousands of lives and billions of dollars.

IV

Success Stories: Infections *Can* Be Eradicated

A. Dr. Carlene Muto Describes Victory Over MSRA at the University of Pittsburgh-Presbyterian Medical Center[38]

"It's a fabulous feeling," says Dr. Carlene Muto, reflecting on the team effort that has resulted in a 90 percent reduction in *methicillin-resistant Staphylococcus aureus* (MRSA) in the medical intensive care unit at the hospital where she is director of infection control. How long did it take? Three years. Ask her how it was done. She explains that it required total commitment from the top leadership at the hospital and caregivers. Many hospital administrators worry that they can't afford to implement these precautions. The truth is, they can't afford not to. Infections erode hospital profits, because rarely are hospitals paid fully for the added weeks or months of care when a patient gets an infection.

When Muto came to UPMC-Presbyterian, the flagship hospital in the University of Pittsburgh system, in the 1990s, drug-resistant *Staphylococcus aureus* was a rapidly growing problem. In 2000, Muto launched a campaign to eradicate the "superbug" in the hospital's medical intensive care unit. Critical to the strategy was active surveillance culturing — meaning that every patient coming into the intensive care unit who might be carrying MRSA was cultured. Muto, one of the co-authors of The Society for Healthcare Epidemiologists of America's guideline, emphasizes that you can't eliminate infection until you know which patients are the sources of the bacteria. Every patient who tested positive was isolated, and doctors and nurses treating them wore gowns and masks, and kept equipment used on these patients away from others. By 2003, MRSA was almost eliminated. The strategy has worked so well that it has now been expanded to all 15 intensive care units in the hospital system.

The key, explains Muto, was to identify every patient carrying the dangerous bacteria. "We had total compliance, 98 percent to 100 percent, with culturing patients," she said, adding that she was astonished.

After all, asking nurses to culture every new patient in the ICU meant adding one more thing to an already long list of tasks they have to do. The staff reaction, says Muto, "has been overwhelmingly positive." "That's essential," she adds. "You can come up with an idea, but no matter how great it is, you have to have the buy in from the staff at the point of care."

Getting caregivers to clean their hands has been a tougher challenge, in part because at the beginning, Muto explains, some "nurses didn't realize that if they went into a room of a patient in isolation and didn't touch the patient or the bed linen but did touch other surfaces such as countertops, their hands *were* contaminated."

Now that the education process is well under way, hand cleaning compliance is about 69 percent, well above the national average but not good enough for Muto and her team. The top leadership at UPMC-Presbyterian is taking an uncompromising position on the failure of staff and doctors to clean their hands. The hospital is getting set to impose stiff penalties, including firing staff members who chronically ignore hand cleaning rules and denying doctors the privilege of practicing at the hospital.

The goal? "Our goal is 100 percent compliance with hand cleaning, 100 percent compliance with gowning, 100 percent compliance with surveillance culturing," says Muto, adding excitedly that she can only imagine what can be achieved when they reach perfection.

■

B. Dr. Barry Farr Recalls Early Victories[39]

Barry Farr remembers the first outbreak of MRSA at the University of Virginia Hospital. It was 1978, and Farr and his wife had recently come to the hospital to train, having just finished medical school. "MRSA was wildly out of control," he recalls, and the hospital was doing "what most American healthcare facilities are still doing today." As a result, the hospital "failed miserably to control the MRSA."

For nearly three years, as the outbreak raged on, the hospital followed a business-as-usual approach: no routine cultures were being taken to identify the patients silently carrying the bacteria. The result, recalls Farr, was that doctors were touching patients who had MRSA, or allowing their white coats to brush up against them, and then passing the bacteria on to other patients without knowing it. At the hospital infection control meetings, the mood was pessimistic and apathetic. Staff members were saying "no one has ever controlled this."

Finally, after three years of failure, the hospital took a radical step, inspired by the success of several European countries that had brought MRSA under control. The hospital began regularly testing patients for

the bacteria and isolating those who tested positive. The results were stunning. Soon after the testing began, in December 1980, MRSA declined rapidly, and by the summer of 1982, the hospital was MRSA free. "It was beautiful," Farr recalls.

Surveillance culturing — identifying every patient carrying the bacteria — was the key to thwarting the outbreak and eradicating MRSA, says Farr. It was to work again a decade later.

The University of Virginia hospital was struck with MRSA a second time in the early 1990s, when a surgeon apparently walked into the neonatal intensive care unit with MRSA on his hands or clothing and transmitted it to one of the babies. Quickly it was spread to babies in the neighboring bassinettes, and then to another neonatal intensive care unit when one of the babies carrying the bacteria was moved there. The hospital immediately put into place the same precautions that had worked a decade earlier, and the outbreak was curtailed. Culturing every baby, and isolating every one who tested positive, was once again the key.

Would this method conquer other deadly bacteria as well? Soon afterward, the hospital faced an outbreak of *vancomycin-resistant Enterococci* (VRE), which spread rapidly to 30 percent of patients on eight separate wards. After several months, the hospital brought the outbreak under control once again by testing patients, isolating the carriers, and making sure that all staff put on gowns and gloves when treating them.

Are the University of Virginia's successes atypical? "No," says Farr. "There are over ninety studies, probably 100 by now," demonstrating that this method works. Yet antibiotic-resistant infections are "clearly out of control in the American health care setting." Why? Farr suggests that faulty cost-cutting is partly to blame.

Hospital administrators complain about the cost of these rigorous precautions, but the data proves these precautions save money. Farr compared the University of Virginia hospital with several other university hospitals of similar size. These other hospitals "are spending between $1 million and $3 million a year extra to treat antibiotic-resistant infections, far more than what UVA has had to spend on gowns, cultures, and gloves. We're taking the ounce of prevention approach. Many other hospitals are taking the pound of cure approach."

Another reason few hospitals are adopting rigorous infection control is that the public has not demanded it. "In Britain there is a public outcry over the failure to control MRSA infections in hospitals, and the British government is reportedly now considering firing hospital directors that fail to take effective measures to control MRSA," says Farr. "In this country there has been comparatively little outcry from the public and no urgent demands from the government that the spread of infections be stopped."

C. Dr. Richard Shannon Aims for Zero Central Line Infections

When Dr. Richard Shannon told the top executives at Allegheny Hospital that he wanted to do something about central line-associated blood stream infections (CLABs), the hospital leadership expected him to suggest reducing them by 10 or 20 percent over several years. To their surprise, Shannon said he wanted to totally eradicate these deadly infections in ninety days. And he did it! Even more amazing, he and his staff kept these infections near zero in the medical intensive care unit and coronary care unit during the entire next year, achieving a 95 percent reduction in CLAB-related deaths.[40]

Why strive for merely minor improvement when lives are at stake? Shannon's pet peeve is benchmarking — the thinking all too common in hospitals today that it's okay to have infections and medical errors so long as they don't exceed the national average. "Who volunteers to have a family member get one of the infections we plan on having this year?" The goal has to be zero infections and perfect care, says Shannon, who is Chairman of the Department of Medicine at Allegheny. [41]

How was that goal reached? By ensuring that all caregivers meticulously follow a regimen for inserting and removing central lines that includes masks, gowns, gloves, and drapes; inserting lines in the neck area rather than in the groin area, which is more difficult to keep clean; rearranging supply closets to ensure that the supplies needed to carry out this regimen are easily accessible, even when staff are rushed; and empowering all staff members to enforce hand cleaning and other rules of hygiene. If a doctor doesn't clean his hands, the nurse working alongside can call a halt to the procedure until the doctor complies.

Shannon oversees some 800 employees and a $150 million budget. Nevertheless, he makes time to speak across the country, with PowerPoint in tow, showing his audiences that preventing infections is possible and profitable. Doing the right thing costs less, he says, using Allegheny's financial records to prove the point. A typical example is the tragic case of a woman who came into the hospital for stomach reduction surgery, a procedure that should have produced a $9,900 gross profit for the hospital. But when she developed a central line-associated bloodstream infection and had to spend 47 days in the hospital, that profit turned into a $16,000 loss. Preventing CLABs saved Allegheny $1.4 million the first year.[42]

The best news of all is that the success at Allegheny is being duplicated by at least a few other institutions. At Johns Hopkins, catheter-related bloodstream infections in the

intensive care unit have been virtually eliminated. How? ICU staff were educated about the seriousness of catheter-related infections; a catheter-insertion cart was created to ensure that necessary equipment was readily at hand; doctors were asked daily whether catheters should be removed; bedside nurses were given a safety checklist to follow during insertion; and nurses were empowered to stop procedures if safety rules were not being followed. Peter Provonost, the intensive care physician at Johns Hopkins who developed the safety checklist, sees the success as proof that infections are not inevitable.[43]

That is Richard Shannon's mantra as well. Shannon is amazed that so little is being done nationwide to curb bloodstream infections and to halt the alarming rise in MRSA. Shannon asks why the procedures that reduced Staph infections by 85 percent in a pilot program at the V.A. Hospital in Pittsburgh are not being duplicated everywhere. "What if you had a patient with TB or SARS? Wouldn't you pull out all the stops, gloving and gowning and washing up all the time? Well, we haven't seen TB in years, and we've never seen SARS, but we have MRSA silently stalking us every day." The magnitude of the problem, he says, is "a call to action for all health-care providers to step up and get serious about all hospital-acquired infections."[44]

V

Protecting Patients from Central Line Infections

One of the deadliest hospital infections is the central-line associated blood stream infection (CLABS). At least 12% of patients who contract these infections die from them, and in some hospitals the mortality rate is above 40%.[45] Astoundingly, new research shows that these infections are preventable. Here is the proof — at individual hospitals, in a large metropolitan area, and even across the entire state of Michigan.

CLAB Prevention Honor Role

■ **Johns Hopkins**
Baltimore, Maryland
In one ICU, Dr. Peter Pronovost and Dr. Sean Berenholz pioneered the interventions that eradicated CLABs. The results: A zero rate of central line infections and an estimated 43 infections and 8 deaths prevented from 1998–2002.[46]

■ **Michigan**
103 ICUs in Michigan (85% of all ICU beds in the state), including academic hospitals and small community hospitals duplicated the Johns Hopkins method. The results? An impressive 66% reduction in CLABs with sustained improvement over 18 months.[47]

■ **CLAB Quality Improvement Collaborative** *New York City*
This regional effort involving 56 ICUs at 38 hospitals was launched in June, 2005. Early results indicate a 58% reduction in CLABs in ten months. At Beth Israel Medical Center, Dr. Brian Koll reports that both the critical care unit and the ICU have been CLAB free for almost two years![48]

How Are They Doing It?

■ Educating caregivers about best practices when inserting lines.

■ Ensuring caregivers use full barrier precautions (masks, gowns, gloves, and full sterile drapes) to insert lines.

■ Inserting lines in the neck-shoulder area (subclavian) rather than in the groin area (femoral), which is more difficult to keep clean.

■ Cleaning skin with chlorhexidine before insertion.

■ Rearranging supply closets and pre-packaging supplies in kits to ensure that the regimen can be followed even when staff are rushed.

■ Asking daily whether the line can be removed.

■ Empowering caregivers to enforce sterile procedures and halt a procedure if they see a lapse.

Can Hospitals Afford To Prevent CLABS? They Can't Afford Not To!

■ The statewide reduction in CLABS in Michigan was achieved with no additional ICU staffing.[49]

■ At Johns Hopkins, researchers estimated that the pilot program averted $1.9 in treatment costs.[50]

■ "At Beth Israel Medical Center, says Dr. Brian Koll, total additional costs to launch the CLABS initiative were $30,000 (to package the insertion supplies into kits); treatment costs avoided were $1,500,000 — not a bad investment!"[51]

A Below-Average Infection Rate Is Not Good Enough!

"We demonstrated that it is possible to nearly eliminate catheter-related blood stream infections; therefore we should not accept National Nosocomial Infection Surveillance mean values as a measure of success, but rather we should shift our focus to zero harm." — Sean Berenholtz, M.D., (*Critical Care Medicine*, 2004)[52] Hopkins.

Treated Catheters Are an Important Supplemental Tool

Sterile procedures are the first line of defense against central line infections. But humans are fallible. New technology can help kill germs that manage to get into a central line. For patients who need a central line for five days or longer and are at high risk for infection, catheters treated with chlorhexidine and silver sulfadiazine or with the antibiotics rifampin and minocycline are recommended by the Agency for Healthcare Research and Quality. These devices complement rigorous attention to sterile procedures. Recent research at Stanford University shows that that although treated catheters cost twice as much as untreated catheters, they are cost-effective whenever they reduces infection risk by at least 30%, as numerous studies indicate they do.

VI

Preventing "C. diff": Cleaning Is Essential

Hygiene is the best defense against today's superbugs, MRSA and VRE. But it is also the best known shield against the next germ threat, Clostridium difficile or "C. diff." C. diff. killed more patients in England in 2006 than MRSA,[53] and the same hyper-virulent strain, dubbed ribotype 027, has invaded some hospitals in the U.S. and Canada. In fact, despite almost no news coverage until 2007, C. diff has been causing trouble for several years.

The Centers for Disease Control and Prevention tracked a nearly two-fold increase in C. diff infections from 1996 to 2003.[54] Two statewide studies in Oregon and Massachusetts found C. diff infections increasing at an even faster pace.[55] In the Montreal area of Canada, C. diff increased fivefold from 1997 to 2004.[56] Worse still, in both Canada and the U.S., the mortality rate from this disease is rising. Therefore, it is more important than ever to prevent it with rigorous hygiene, education of caregivers, and prudent use of antibiotics.

So what do we need to know about this bacterial villain? Outside of hospitals, it is normally found in the gastrointestinal tracts of about 5% of the general population. It doesn't usually cause trouble because other bacteria keep C. diff from getting out of control. In hospitals, the story changes. When a patient is put on antibiotics, the balance of bacteria in his gastro-intestinal system is affected, and C. diff. may take over, causing severe, watery diarrhea and inflammation of the colon.[57]

It's the out of control nature of watery diarrhea that allows C. diff to spread so fast in a hospital. Although a small number of patients come into the hospital with C. diff spores in their bodies, many more ingest the germ through oral-fecal contamination, meaning traces of one patient's feces enter another patient's mouth. How could such a thing happen? The only answer is inadequate cleaning. Patients pick up the C. diff spores off contaminated bedrails, IV poles, tables, and other surfaces, virtually anywhere their hands can reach. Then they touch their lips, or touch their food and swallow C.diff along with their dinner roll. Caregivers unwittingly carry C. diff spores on their hands, uniforms, and equipment from patient to patient.

A 2006 study in the Journal of

Hospital Infection showed that one-third of blood pressure cuffs rolled from room to room carried C. diff spores on the inside of the cuff.[58] It's a short trip from a patient's arm to their fingertips and their mouth. Occasionally patients also get C. diff from inadequately cleaned rectal thermometers and endoscopes.[59]

Environmental cleaning is so important that when it is not done regularly and rigorously, placing a patient in a room previously occupied by a patient with C. diff can be a fatal mistake. At Thomas Jefferson University Medical Center in Philadelphia, where C. diff was raging, three patients occupying the same room consecutively came down with C. diff. One died as a result.[60]

In July and August, of 2005, eight infants in the neonatal intensive care unit at Intermountain Healthcare in Provo, Utah contracted C. diff. All eight infected infants had shared one of three beds in a corner of the NICU. The longer the hospital stay and the closer one is to a patient with C. diff, the greater the risk of contracting it.[61]

Training environmental services staff on how to clean more thoroughly is essential. At Case Western Reserve and the Cleveland VA Medical Center, researchers cultured commonly touched surfaces such as bed rails, telephones, call buttons, toilet seats, and bedside tables in the rooms of patients with C. Diff. After routine cleaning, 78% of the surfaces were still contaminated with C. diff spores. But once researchers disinfected the rooms with bleach, including surfaces commonly overlooked by cleaners, only 1% of surfaces were still contaminated.

Dr. Carlene Muto and her colleagues at the University of Pittsburgh Medical Center –Presbyterian faced a 400% increase in C. diff infections in the year 2000. They responded with a comprehensive strategy that emphasized rigorous cleaning with bleach and rapid identification and isolation of C.diff positive patients to prevent the bacteria from spreading to other patients. (Additional interventions included reliance on soap and water rather than alcohol-based sanitizers to clean caregivers' hands, and controlled use of antibiotics beginning in 2003). This comprehensive strategy worked. By 2006, C. diff rates were down 71%, and severe cases of C. diff associated diarrhea fell by 89%.

At Intermountain Healthcare, after the eight infants contracted C. diff, the affected corner of the NICU was "cleaned from top to bottom," according to researchers there, including rockers and scales. "We launched extensive staff education related to C. difficile and its ability to be found on environmental surfaces," and "the importance of washing hands with soap and water when caring for a patient with C. difficile," they reported. The results? Not one new case of C. diff in the NICU in the next two years.[62]

Educating hospital personnel on how patients are exposed to C. diff spores is essential. A study at one hospital found that resident physicians and other medical personnel were woefully under informed about

C. diff. For example, 39% didn't know that C. diff spores could be transmitted from patient to patient on equipment such as stethoscopes and blood pressure cuffs. Nearly 20% incorrectly thought C. diff was a blood borne pathogen, and almost 9% incorrectly believed it was transmitted through the air. Only about one third of medical professionals knew that cleaning hands with soap and water was essential, because alcohol sanitizers are often ineffective against C. diff. [63] This knowledge gap is dangerous to patients and costly to hospitals.

Based on an assessment of the increased length of stay required to treat C. diff patients in Massachusetts, researchers estimated "conservatively" that in 2005 alone, treating C. diff added $3.2 billion to the cost of treating hospital patients nationwide.[64]

Cleaning the hospital environment, educating personnel about C. diff., and controlling antibiotic use are essential to meet the C. diff challenge. In addition, hospitals need to consider other strategies. One is rigorous hand hygiene for patients. Nonambulatory patients are frequently handed a food tray, but have no way to clean their hands before dining. Their hands are contaminated with C. diff spores, which they ingest as they eat. Whenever and wherever C. diff threatens, patients need to be helped to clean their hands routinely before meals.

Looking Ahead

Though more research needs to be done, preliminary results suggest that adding a lactobacillus acidophilus milk product to the daily diet of patients on antibiotics may be effective at reducing antibiotic-associated diarrhea (AAD), including diarrhea caused by C. diff. A double blind study suggests that certain probiotics are effective, compared with a placebo, in reducing the incidence of antibiotic associated diarrhea by about half in patients on a variety of antibiotic regiments. The study suggests that some specific organisms may help restore the normal balance of bacteria in the gastro-intestinal system to spare patients from life-threatening diarrhea. If more research confirms these initial findings, hospitals may want to consider adding a nutritional supplement routinely to the diets of patients on antibiotics.

VII

Preventing Infections Makes Hospitals More Profitable

Many hospital administrators worry that they can't afford to implement these precautions. The truth is, they can't afford *not* to. Infections erode hospital profits, because hospitals are rarely paid fully for the added weeks or months of care when a patient gets an infection.

For example, Allegheny General Hospital in Pittsburgh would have made a profit treating a 37-year-old video programmer and father of four who was admitted with acute pancreatitis, but the economics changed when the patient developed an MRSA bloodstream infection. He had to stay in the hospital 86 days, and the hospital lost $41,813, according to research by Richard Shannon,

Estimated Hospital Costs of Hospital-Acquired Infection in the United States

2,000,000

Estimated infections per year

X

$15,275[69]

(Average additional hospital costs when a patient contracts an infection)

= $30.5 Billion

Per year spent treating hospital infections

Note: This figure does not include doctors' bills, home nursing bills, home nursing care, lost time at work, and other non-hospital costs.

former chairman of the Department of Medicine at Allegheny.[65]

Similarly, a woman came into the hospital for stomach-reduction surgery, a procedure that should have produced a $5,900 gross profit for the hospital. But when she developed a central line-associated bloodstream infection and had to spend 47 days in the hospital, that profit turned into a $16,000 loss.[66]

At Allegheny General Hospital, the average payment for a patient who developed a central line-associated bloodstream infection (CLAB) was $68,894, but the actual average cost of treating the patient was $91,733, leading to a gross loss of $26,839 per case. The hospital had 54 such cases in the medical intensive care unit and coronary care unit between July 2002 and June 2005. The infections resulted in a total economic loss to the hospital of $1,449,306.[67]

Hospital infections add more than $30 billion annually to the nation's health tab in hospital costs alone.[68] The tab will increase rapidly, as more infections become drug-resistant.[70]

A new study based on all the hospital infections reported in Pennsylvania in 2005 dramatizes this enormous economic burden. The average charge for patients who developed an infection ($173,206) was nearly four times as high as for patients admitted with the same diagnosis and severity of illness who did not contract an infection ($44,367). The 11,688 infections reported added over two billion dollars in hospital charges that year. That's in one state alone![71]

Other studies on the cost of infections found that:

- Post surgical wound infections more than double a patient's hospital costs. When a patient develops an infection after surgery, the cost of care increases **119** percent, on average, at a teaching hospital, and **101** percent at a community hospital.[72]

- Urinary tract infections increase a patient's hospital costs by **47** percent at a teaching hospital and **35** percent at a community hospital.[73]

- The average ventilator-associated pneumonia infection (a type of infection contracted when a patient is on a respirator) adds **$40,000** to a patient's hospital costs.[74]

- *Staphylococcus aureus* infections are especially costly. According to a recent nationwide study, patients with *Staph* infections incur hospital costs that amount to more than triple the average hospital costs of other patients.[75]

Not worried because your hospital's infection rate is well below the national average? Even hospitals with a below-average infection rate lose money on infections. A recent survey of 55 hospitals, where the infection rate averaged only 4.09% — well below the national average — showed that treating these infections wiped out inpatient operating profits.[76]

The fact that hospitals lose money on infections doesn't necessarily prove that spending *more* on

prevention will increase profits. Fortunately, there is compelling evidence that testing patients for drug-resistant bacteria and treating those who test positive with contact precautions yields a high return immediately and requires no capital outlays.

For example, Dr. Carlene Muto at the University of Pittsburgh-Presbyterian, where MRSA infections were slashed 90% in a pilot program, found that implementing these precautions in one medical intensive care unit cost $35,000 in additional labor and materials, but prevented infections that would have cost over $801,000 to treat. That's a 20 to 1 financial return the first year, not to mention lives saved.

Two community hospitals in Charleston, South Carolina, demonstrated that targeted surveillance — testing only patients deemed at high risk, such as patients recently hospitalized, living in a nursing home, or with kidney problems — produces more modest reductions in infection and lower financial returns. This is not surprising, because a significant number of patients carrying MRSA go undetected. The costs of targeted surveillance, including laboratory tests and supplies such as gowns and gloves, cost $113,955 and yielded just over a 10 to 1 return, saving the hospitals $1,548,740 in avoided treatment costs.[77]

A recent review in Lancet concludes:

> "Virtually all published analyses that have compared the costs of screening of patients on admission and using contact precautions with colonised patients with the cost savings made by preventing health-care associated MRSA infections have concluded that the combination of surveillance cultures and barrier precautions results in cost savings for hospitals."
>
> **"THE COSTS OF CARING FOR PATIENTS WHO BECOME INFECTED WITH MRSA ARE MUCH GREATER THAN THE COSTS OF SCREENING PROGRAMMES."[78]**

A Model for Conducting Your Own Study

(From the U. of Pittsburgh-Presbyterian Medical Center)

Components of the Cost of Implementing Active Surveillance Culturing and Barrier Protections in One Medical Intensive Care Unit:

- Laboratory: **$8,275**
- Personnel Time to Collect Samples: **$8,400**
- Supply Costs for Barrier Protections: **$16,337**
- Personnel Cost in Time to Don Protections: **$2,069**
- One Time Cost for Isolation Boxes: **$600**

Results

Presumes 22% Annual Increase of Infections Without Intervention:

$2,015,919
Cost of Expected HA-MRSA w/o Intervention
–
$35,281
Cost of Interventions
=
$1,980,638
SAVINGS

Presumes a Stable Infection Rate Without Intervention:

$801,652
Cost of Expected HA-MRSA w/o Intervention
–
$35,281
Cost of Interventions
=
$766,371
SAVINGS

Source: CA Muto et al., "Cost Avoidance Associated with Control of MRSA (University of Pittsburgh-Presbyterian Medical Center) — Presented at SHEA's 16th Annual Scientific Meeting (March 2006).

Staphlococcus aureus infections (both MSSA and MRSA) cost $14.5 billion to treat in U.S. hospitals in 2003, according to a recent study by Gary Noskin and Robert J. Rubin. An estimated 85% of those infections were hospital acquired.[79]

The federal Medicare program announced that beginning in October, 2008, it will no longer pay the extra cost of treating several types of hospital infections, including device-associated urinary tract infections, central line infections, and certain types of post-cardiac surgical site infections. (The rule excludes all MRSA infections.) The new rule prohibits hospitals from billing patients or third parties for these costs. Federal officials indicated that the rule will probably be expanded to include other types of infections. Already several private insurers, including United Health Group and Cigna Corp. say they are exploring similar policies.[80]

This change in reimbursement should motivate hospitals to pursue the low-cost methods already available to prevent the most common infections, those caused by in-dwelling urinary tract catheters. Amazingly, most hospitals do almost nothing to prevent these infections. A survey of 719 hospitals across the nation showed that fewer than 25% monitored how long urinary tract catheters are left in, though monitoring is low-tech, almost cost free, and effective in reducing infection rates.[81]

VIII

Hospital Infection Is the Next Asbestos

Until recently, infection was considered an inevitable risk of hospitalization. Now, there is compelling evidence that nearly all hospital infections are preventable when doctors and staff adhere to research-based guidelines. This puts physicians, hospitals, and hospital board members in a new legal situation. The belief that infections are unavoidable shielded hospitals and doctors from liability for decades. But not in future. Hospital infections could be the next asbestos.

Most victims who sue will not be able to prove precisely how the bacteria entered their body while they were hospitalized. Soon, it may not matter. Jurors will be told that the defendant physicians and hospital failed to implement guidelines provided by the federal Centers for Disease Control and Prevention (CDC) or such groups as the Society for Healthcare Epidemiology of America (SHEA), the Infectious Diseases Society of America (IDSA), and the Institute for Healthcare Improvement (IHI). Consequently, the argument will go, these defendants should be deemed negligent and held liable for patients' infections.

In 2006, the American College of Surgeons held a mock trial to anticipate the outcome of such a trial. In the mock trial, a hospital and physicians were sued when a patient suffered a catheter-related bloodstream infection and endocarditis that contributed to his death. The trial revealed that the resident physician who inserted the central line failed to wear a cap or gown, use a full sterile drape, or use an antimicrobial-impregnated or antiseptic-coated central line, even though the patient was at high risk for line sepsis and the line was expected to be in place for a prolonged period. Care did not meet CDC level 1A and 1B recommendations. The surgeons' defense attorney argued that the defendants were highly qualified physicians whose actions were within the standard of care in their community. It was also argued that only a small minority of hospitals and physicians follow CDC recommendations.

But mock trial experts warned that "community standard of care" is an inadequate defense if hospitals and physicians fail to implement recently published, nationally available, best practices. Physicians will

have to read published guidelines and request that hospitals have the equipment on hand to implement them. The fact that the defendant hospital in the mock trial did not have appropriate central line kits in the intensive care unit was no excuse, trial experts agreed, because the surgeons had never requested a change of equipment. "Hospitals will not accept blame for stocking inappropriate equipment unless there is a clear paper trail that physician requests for proper supplies were denied."[82]

In the real world, what must be done to avoid liability for infections? Ultimately, the courts will decide. Physicians and hospitals will need to make every effort to comply with published standards of infection prevention. I urge you to examine appendices C & D in the back of this book, as well as information provided by the Committee to Reduce Infection Deaths (www.hospitalinfection.org). For example, a hospital that fails to screen at least high-risk patients for MRSA colonization, despite a rapid rise in MRSA infections at the institution, may be at legal risk.

Even when a hospital complies with best practices, some plaintiffs' attorneys will still argue that a patient's infection is evidence enough that caregivers breached their duty. Every law student learns about the barrel that fell out of a merchant's second story window, injuring a customer below. In this textbook case, the merchant was held liable because the accident was itself evidence of negligence, under the doctrine of res ipsa loquitor. Similarly trial lawyers will claim that an infection "speaks for itself" and shift the burden onto the hospitals and physicians to offer evidence that all best practices to prevent infection were in place.

Three recent events show how rapidly the legal environment is changing: In December 2004, Tenet Healthcare Corporation agreed to pay $31 million to settle 106 individual lawsuits, filed between 1997 and 2002, on behalf of patients who suffered post-surgical infections after cardiac surgery at Palm Beach Gardens Medical Center.

Since then, thirteen lawsuits have been filed against Martin Memorial Hospital in Florida by patients who claim they contracted methicillin-resistant Staphylococcus aureus (MRSA) infections while at the hospital for surgery. One is a wrongful death suit filed by a deceased patient's wife. In statements to the press, hospital officials claim that drug-resistant infections are a problem at all hospitals, and that their infection rate is below the national average.

That argument is also being used by Jewish Hospital in Louisville, Kentucky, which is facing numerous lawsuits. Among those are 69 filed by one lawyer, Joseph White, who has made unclean hospital conditions an attention-getting, graphic, and sympathetic explanation for why his clients contracted infections. The complaints include photos of unclean patient's bathrooms and testimonials of inadequately cleaned operating rooms with traces of dried blood on the

floor. Litigants even staged protests outside the hospital for evening news cameras, to claim that unsanitary conditions caused them to contract bacterial infections. The lesson is that physicians and hospitals will be put on the defensive even when facilities simply look unclean.

An attorney for Jewish Hospital told the press, "This is not going to become the asbestosis of hospital litigation." That may be wishful thinking.

The Committee to Reduce Infection Deaths would like to help hospitals protect their patients from infection and avoid lawsuits. Lawsuits are not the best way to improve patient care. They often result in unfair verdicts, and few truly injured patients ever make it to court (less than 2% according to the Harvard Medical Practice Study). Hospitals that act decisively to implement infection prevention guidelines will have the best insurance against costly damage awards.

IX

Shouldn't Medical Students Be Taught Hygiene?

What else needs to be done? Medical schools should be teaching future doctors the precautions they must take to protect their patients from infection. It's hard to believe, but most medical schools devote virtually no time, not even one full class, to showing students how bacteria are transmitted from patient to patient on clothing, equipment, and gloves, and what specifically they should be doing to prevent it. Dr. Frank Lowey, a professor at the New York-Presbyterian Hospital at the Columbia University Medical Center says, "it's something we should have done quite a while ago." Lowey says it's ironic that "there are curriculum committees devoted to making sure that bioterrorism is covered, and the risk of nosocomial infections far outweighs that."[83]

Some medical schools are stressing the importance of curbing the use of antibiotics.[84] That's good, because overuse of antibiotics wastes money and causes bacteria to morph into new, drug-resistant strains. But limiting the use of antibiotics won't stop hospital infections. Patients who contract MRSA get it from unclean hands or contaminated equipment or clothing, not simply from taking antibiotics. No hospital has ever eradicated infection merely by controlling the use of these drugs.

When medical students put on their white coats and swear the Hippocratic Oath, they should be taught *how* to do no harm. Preventing the spread of bacteria is an essential part of that lesson. They should learn it before they go out on the hospital floors and touch their first patient.

15 Steps You Can Take to Reduce Your Risk of a Hospital Infection

1. Ask that hospital staff clean their hands before treating you, and ask visitors to clean their hands too. This is the single most important way to protect yourself in the hospital. If you're worried about being too aggressive, just remember your life could be at stake. All caregivers should clean their hands before treating you. Alcohol-based hand cleaners are more effective at removing most bacteria than soap and water.[85] Do not hesitate to say the following to your doctor or caregiver: "Excuse me, but there's an alcohol dispenser right there. Would you mind using that before you touch me, so I can see it?" Don't be falsely assured by gloves. Gloves more often protect staff than patients. If caregivers have pulled on gloves without cleaning their hands first, the gloves are already contaminated before they touch you.[86]

2. Before your doctor uses a stethoscope to listen to your chest, ask that the diaphragm (or flat surface of the stethoscope) be wiped with alcohol. Numerous studies show that stethoscopes are often contaminated with *Staphylococcus aureus* and other dangerous bacteria, because caregivers seldom take the time to clean them in between patient use.[87] The American Medical Association recommends that stethoscopes routinely be cleaned for each patient. The same precautions should be taken for many other commonly used pieces of equipment too.

3. If you need a "central line" catheter, ask your doctor about the benefits of one that is antibiotic-impregnated or silver-chlorhexidine coated to reduce infection.[88]

4. If you need surgery, choose a surgeon with a low infection rate. Surgeons know their rate of infection for various procedures. Don't be afraid to ask.

5. Beginning three to five days before surgery, shower daily with 4% chlorhexidine soap. Drug stores that don't stock chlorhexidine soap are generally happy to order it for you. You don't need a prescription. One of the easiest brands to find is Hibiclens. Using this soap

will help remove any dangerous bacteria you may be carrying on your own skin that could enter your surgical incision and cause an infection.[89] Keep the soap away from your eyes and ears.

6. Ask your surgeon to have you tested for *Staphylococcus aureus* at least one week before you come into the hospital. The test is simple, usually just a nasal swab. About one third of people carry Staphylococcus aureus on their skin, and if you are one of them, extra precautions can be taken to protect you from infection, to give you the correct antibiotic during surgery, and to prevent you from transmitting bacteria to other.[90]

7. Stop smoking well in advance of your surgery. Patients who smoke are three times as likely to develop a surgical site infection as non-smokers, and have significantly slower recoveries and longer hospital stays.[91]

8. On the day of your operation, remind your doctor that you may need an antibiotic one hour before the first incision. For many types of surgery, a pre-surgical antibiotic is the standard of care, but it is often overlooked by busy hospital staff.[92]

9. Ask your doctor about keeping you warm during surgery. Operating rooms are often kept cold for the comfort of the staff, but research shows that for many types of surgery, patients who are kept warm resist infection better.[93] There are many ways to keep patients warm, including special blankets, hats and booties, and warmed IV liquids.

10. Do not shave the surgical site. Razors can create small nicks in the skin, through which bacteria can enter. If hair must be removed before surgery, ask that clippers be used instead of a razor.[94]

11. Ask that your surgeon limit the number of personnel in the operating room. Every increase in the number of people adds to your risk of infection.[95]

12. Ask your doctor about monitoring your glucose (sugar) levels continuously during and after surgery, especially if you are having cardiac surgery. The stress of surgery often makes glucose levels spike erratically. New research shows that when blood glucose levels are tightly controlled to stay between 80–110 mg/unit, heart patients resist infection better. Continue monitoring even when you are discharged from the hospital, because you are not fully healed yet.[96]

13. Avoid a urinary tract catheter if possible. It is a common cause of infection. The tube allows urine to flow from your bladder out of your body. Sometimes catheters are used when busy hospital staff don't have time to walk patients to the bathroom. Ask for a diaper or bed pan instead. They're safer.[97]

14. If you must have an IV in your arm, make sure that it is inserted and removed under clean conditions and changed every 3 to 4 days. Intravenous catheters, or IVs, are a common source of infection and are not always necessary. If you need one, insist that it be inserted and removed under clean conditions, which means that your skin is cleaned at the site of insertion, and the person treating you is wearing clean gloves. Alert hospital staff immediately if any redness appears.

15. Wash your hands frequently, avoid touching your hands to your mouth, and do not set food or utensils on furniture or bed sheets. Germs such as "C.Diff" can live for many days on surfaces and can cause infections if they get in your mouth.

Note to expectant mothers: If you are planning to have your baby by Cesarean section, follow the steps listed above as if you were having any other type of surgery. Most mothers-to-be probably aren't worried about hospital infections, but if you're having a cesarean, you are ten times more at risk of infection than if you are giving birth vaginally.[98]

X

The Importance of Hospital Infection Report Cards

Maureen Daly wishes she had known more when she took her 63-year old mother to the hospital. Johanna had slipped and broken her shoulder at a restaurant, and no one expected that she would be in the hospital for more than a day or two. But a *Staph* infection ravaged her body for four months and killed her. "What happened to my mother shouldn't happen to anyone," says Daly. "If only I had had enough information to choose a hospital with a better infection record."

If you need to be hospitalized, wouldn't you want to know which hospital in your area has the lowest infection rate? Good luck getting that information!

The federal Centers for Disease Control and Prevention collect infection data from several hundred hospitals around the nation, but the CDC also promises hospitals to keep infection rates secret.[99] Government, for the most part, is not helping you choose a safe hospital.

The irony is that it's easy to get information for the less important decisions you make in life, such as where to have lunch. Most states will help you find out which restaurants and delicatessens have been cited for health violations. But you can't find out which hospital has the worst infection rate. You can go home to make your own sandwich, but you can't perform surgery on yourself.

The good news is that Colorado, Connecticut, Delaware, Florida, Illinois, Maryland, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Virginia, Vermont, and Washington have passed laws to provide the public with hospital infection report cards. Publicly comparing hospital performance will motivate hospitals to improve.

New York's experience with another type of hospital report card proves this. In 1989, New York became the first state to publish each hospital's risk-adjusted mortality rate for cardiac bypass surgery. The results? Deaths from bypass surgery dropped 40 percent, giving New York the lowest mortality rate in the nation for that procedure.[100] Critics of hospital report cards speculate that deaths went down in New York because hospitals avoided treating the sickest patients, fearing that high-risk

operations would bring down the hospital's grade. However, the evidence proves that's untrue. Deaths declined for a different reason: hospitals forced their worst-performing surgeons — generally, those with low volume — to stop doing the procedure. Patients of the 27 barred surgeons were more than three times as likely to die during surgery. In technical jargon, the 27 surgeons had an average risk-adjusted mortality rate of 11.9 percent, compared with a statewide average of 3.1 percent.[101] Wisconsin also found that report cards motivate poorly performing hospitals to improve, according to a 2001 study of 24 hospitals there.[102]

Is there a reason *not* to have infection report cards? The hospital industry argues that publicly comparing hospital infection rates would be unfair to hospitals that treat AIDS, cancer, and organ transplant patients who are especially vulnerable to infection. Fair enough, but reports can be risk-adjusted to reflect these differences. What is unfair is keeping the public uninformed.

Fortunately, several other states are considering legislation to provide the public with the information they need. These states should use the model bill suggested here (Appendix A), because it improves upon the laws already passed in three ways: First, it specifies the method of risk-adjustment for surgical site infections used by the CDC, rather than leaving the risk-adjustment method to be determined by committee. This should assure hospitals that comparisons will be fair and take into account which hospitals treat especially sick and infection-prone patients.[103]

Secondly, the bill imposes civil penalties on hospitals that fail to report or flagrantly underreport their infections. These penalties are needed. For many years, some hospitals have openly ignored data collection laws with impunity. For example, in one recent year, hospitals in New York reported only 16.5 percent of the post-surgical deaths that the law required them to report.[104] In 2005, the first year of Pennsylvania's hospital infection reporting program, hospitals reported only one tenth as many infections to the new program as they billed. Some Pennsylvania hospitals implausibly claimed they had no infections at all.[105]

Thirdly, the model bill ensures that hospital infection reporting will benefit the public, not enrich trial lawyers. The bill provides that "none of the data collected and reported under this law can be used in litigation against an individual hospital."

Next time you hear an ad on the radio urging you to use a particular hospital because it has the best doctors or the latest equipment, keep in mind what you're *not* being told: how many patients get infections while in that hospital. Hospitals are doing their best to keep that information secret. In contrast, in England hospital infection rates are posted conspicuously on the front door of the hospital. Americans deserve the same information. The legislation proposed here won't help hospitals save face, but it will help you choose a safe hospital. Let hospitals vie for your business by improving their infection rates.

Appendix A

RID's Model Hospital Infection Report Card Bill

The following outline is intended to help state lawmakers as they draft legislation to provide the public with hospital infection rates:

AN ACT to provide the public with information on infection rates at hospitals in the state of _____.

Section 1. Definitions.

(a) The public health law is amended to add a new section (lawmakers here should include the specific title of the public health or health department law to be amended).

(b) "Hospital" shall mean (lawmakers here should consider whether to include only acute care hospitals or also free-standing outpatient surgical centers).

(c) "Hospital-acquired infection" shall mean, as defined by the federal Centers for Disease Control and Prevention (CDC), "any localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) that (a) occurs in a patient in a hospital, (b) and was found not to be present or incubating at the time of admission to the hospital, unless (c) the infection was related to a previous admission to the same hospital."

(d) "Risk adjustment" shall mean a statistical procedure for comparing patient outcomes, taking into account the differences in patient populations, including risk factors such as the number of patients on central line catheters, or the number of patients undergoing specific types of surgery, as a percentage of the overall number of patients treated. For purposes of this bill, risk adjustment shall duplicate the CDC's NNIS System surgical wound infection risk index or use the number of central-catheter days as a risk-adjustment factor for central line infections.

Appendix A

Section 2.

(a) Using established public health surveillance methods, each hospital shall maintain a program of identifying and tracking the following types of hospital-acquired infections for the purpose of reporting such data semi-annually to the state health department (lawmakers insert the appropriate state department here): central line-associated, laboratory confirmed primary bloodstream infections contracted by intensive care unit patients, and surgical site infections.[106]

(b) The state health department (lawmakers insert the appropriate department name here) shall establish an advisory committee that includes recognized experts in the field of hospital-acquired infection, public reporting of hospital data, and health care quality management to establish data collection and analysis methodologies and risk adjustment procedures.

(c) The state health department (lawmakers insert the appropriate department name here) shall establish a state-wide data base of all risk-adjusted, hospital-specific infection rates and make it available to the public on a website and in printed materials that can be used by consumers, purchasers of healthcare and advocacy groups to compare the performance of individual hospitals, and the aggregate performance of hospitals in the state with those in other states and nationwide.

(d) The first year of data submission under this section shall be considered the "pilot phase" of the reporting system. The pilot phase is to ensure the completeness and accuracy of hospital reporting and the fairness and completeness of the state health department's report to the public. During this pilot phase, hospital identifiers shall be encrypted, the state health department (lawmakers insert proper department name here) shall provide each hospital with an encryption key for that hospital only, and no public hospital comparisons will be available. Sixty days after the end of the second year of data submission, the state health department (appropriate department name here) will provide its first report to the public with hospital-specific infection rates included.

(e) To ensure compliance with this law and the accuracy of self-reporting by the hospitals, the department shall establish an audit process. A civil penalty of $_____ shall be imposed on any hospital that fails to report on time, or is shown to substantially underreport infections, for each semi-annual reporting period.

(f) None of the data collected and reported under this law can be used in litigation against an individual hospital.

Appendix B

A Model Hospital Screening Bill

The following outline is intended to help state lawmakers as they draft legislation to mandate MRSA screening in acute care hospitals:

AN ACT to provide universal screening for MRSA in acute care hospitals in the state of _____

(a) Whereas at least one out of every twenty patients contracts an infection in the hospital, and these infections kill more people in the U.S. each year as all the cases of AIDS, all breast cancer cases, and all auto accidents combined.[107]

(b) Whereas the danger is worsening, because increasingly these infections cannot be cured with commonly used antibiotics. They are "drug-resistant."

(c) Whereas in 1974, only 2% of Staphylococcus aureus infections were drug resistant, by 1995 that figure had soared to 22%, by 2003, 64%, and now an even higher percentage are drug resistant or MRSA (methicillin-resistant Staphylococcus aureus).

(d) Whereas hospitals in Holland, Denmark and Finland once faced similarly soaring rates of drug-resistant infections and brought them down below 1% through meticulous hygiene and screening all patients for the bacterium MRSA.[108]

(e) Whereas an increasing number of leading medical centers in the U.S. have proved screening is essential and effective here too, including University of Pittsburgh-Presbyterian, which reduced MRSA infections 90% in an intensive care unit; The Veterans Hospital in Pittsburgh, which reduced MRSA infections 85% in a pilot program, Evanston-Northwestern, Johns Hopkins in Baltimore, St. Raphael's in New Haven, Connecticut, Brigham & Women's in Boston,[109] and numerous other examples.

(f) Whereas research shows that you cannot prevent MRSA infections until you identify which patients bring these bacteria into the hospital.[110] Patients who unknowingly carry MRSA on their skin and in their nasal passages shed it in tiny particles on bedrails, blood pressure cuffs, stethoscopes, furniture and the floor, where the bacteria can live for many days. Patients become infected with MRSA when the bacteria enter their body, usually via a urinary tract catheter, IV catheter, surgical incision or other open wound, or a ventilator.

Appendix B

(g) Whereas MRSA testing is simple, noninvasive, and no more costly than a routine HIV test now recommended for all patients admitted to hospitals.

(h) Whereas research indicates that hospital infections add at least $30.5 billion a year to the nation's health tab in hospital costs alone, including at least $2 billion in New York State.[111]

(i) Whereas research demonstrates that in Pennsylvania, in 2005, the average charge for patients who developed a hospital infection ($173,206) was nearly four times as high as for patients with the same diagnosis and severity of illness who did not contract an infection ($44,367),and that hospital infections added over two billion dollars in hospital charges in that state alone.[112]

(j) Whereas "virtually all published analysis that have compared the cost of screening of patients on admission and using contact precautions with colonized patients with the cost savings made by preventing healthcare associated MRSA infections have concluded that the combination of surveillance cultures and barrier precautions results in cost savings for hospitals," according to the prestigious medical journal Lancet, and whereas such research proves that "the costs of caring for patients who become infected with MRSA are much greater than the costs of screening programs."[113]

(k) By January 1, 2009, all acute care hospitals in _____ shall screen all patients undergoing in-patient orthopedic or cardiac surgery and all patients entering intensive care units, burn units, and other "high risk units" for the bacterium MRSA. Patients in these categories who are scheduled for hospitalization can be tested up to two weeks before admission. In addition to other best practices, hospitals shall require contact (barrier) precautions when treating patients who test positive for MRSA colonization, including wearing gloves and gowns for all direct patient contact, using dedicated or disposable equipment such as wheelchairs, blood pressure cuffs, and EKG wires, and thoroughly cleaning other equipment after contact with MRSA positive patients. Wherever possible, hospitals will isolate or cohort patients colonized or infected with MRSA, control and monitor their movement within the hospital, and take whatever steps are needed to stop the transmission of MRSA bacteria to patients who did not come into the hospital with it.

(l) Patients being discharged from intensive care and other high risk units shall be tested again for MRSA, and those testing positive will be informed of their status, and it will be noted in their medical records.

(m) An acute care hospital that is in violation of the provisions of this Act shall be subject to such penalties as the Department of Health may determine, and in addition, shall be ineligible for Medicaid reimbursement until the violation is corrected.

(n) This law shall expire on January 1, 2012.

Appendix C

Society for Healthcare Epidemiologists of America Guideline for Preventing Nosocomial Transmission of Multidrug-Resistant Strains of *Staphylococcus Aureus* and *Entrococcus*

■

Strength of Recommendations

Category Type	Category Subtype	Recommendation
I	A	Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiologic studies.
	B	Strongly recommended for implementation and supported by some experimental, clinical, or epidemiologic studies and a strong theoretical rationale.
	C	Required for implementation, as mandated by federal regulation, state regulation, or both or standard.
II		Suggested for implementation and supported by suggestive clinical or epidemiologic studies or a theoretical rationale.
No recommendation		Unresolved issue. Practices for which insufficient evidence or no consensus regarding efficacy exists.

Recommendations

I. Active Surveillance Cultures to Identify the Reservoir for Spread

1. Implement a program of active surveillance cultures and contact precautions to control the spread of epidemiologically significant antibiotic-resistant pathogens known to be spreading in the healthcare system via direct and indirect contact.(IA)29,30,43,45-47,49,57,96,99,102,106,119,138-147,149,171-173,176

2. Surveillance cultures are indicated at the time of hospital admission for patients at high risk for carriage of MRSA, VRE, or both. (IB)71,76,177,320,321

3. Periodic (eg, weekly) surveillance cultures are indicated for patients remaining in the hospital at high risk for carriage of MRSA, VRE, or both because of ward location, antibiotic therapy, underlying disease, duration of stay, or all four. (IA)30,57,102, 137,141,147-149,174,181

Appendix C

4. In facilities found to have a high prevalence on initial sampling, a facility-wide culture survey is indicated to identify all colonized patients and allow implementation of contact precautions. (IB)102,145,322

5. Because transmission occurs throughout the healthcare system, these measures should be implemented in all types of healthcare facilities throughout the system. (IB)119,161,176,182,323

6. The frequency of active surveillance cultures should be based on the prevalence of the pathogen and risk factors for colonization. For example, more frequent cultures are needed in a facility where 50% of all S. aureus isolates are MRSA than in one where less than 1% of all S. aureus isolates are MRSA. (IB)29,30,43,45-47,49,57,96,99,102,106,119,138-147,149,171-173,176

7. The goal of this program should be to identify every colonized patient, so that all colonized patients are cared for in contact (or cohort) isolation to minimize spread to other patients. (IB)29,30,43,45-47,49,57,96,99,102,106,119,138-147,149,171-173,176

8. Surveillance cultures for VRE should use stool samples or swab samples from the rectum or perirectal area. Polymerase chain reaction, culture with broth enhancement, and quantitative stool culture have each been more sensitive than directly plated rectal or perirectal swab cultures, but the latter have been associated with control of infections and can be recommended as effective and cost-effective until less costly methods of using the other procedures become available. (IB)99,102,106,137,149,181

9. VRE patients can be routinely cohorted with other VRE patients. (II)102,106,145

10. Surveillance cultures for MRSA should always include samples from the anterior vestibule of the nose. (IB)78,315,324

11. If present, areas of skin breakdown should also be sampled for MRSA. (IB)315,324

12. Throat cultures have been shown to detect S. aureus and MRSA with sensitivity equal to or greater than that of nasal cultures in multiple patient populations. If used, the throat swab can be plated onto the same agar as the nasal swab. This would enhance sensitivity without adding the cost of an extra culture. (IB)67,74

13. Perirectal–perineal cultures have been shown to detect MRSA with high sensitivity in certain patient populations, but the perirectal–perineal area should not be selected as the only site for culture. (IB)315,324,325

14. Patients colonized or infected with MRSA isolates can be cohorted with other MRSA patients. (II)30,43,45

15. Patients with MRSA isolates that are eradicable because of known susceptibility to multiple drugs useful for eradication (eg, mupirocin, rifampin, minocycline, trimethoprim-sulfamethoxazole, or all four) should not be cohorted with those with isolates resistant to these drugs, if eradication will be used as an adjunctive measure. (II)272

16. In certain settings, such as nursing homes and psychiatric wards, identification of colonized patients is important, but contact precautions may require modification allowing for social contact while limiting physical contact. (II)119,182,323

II. Hand Hygiene

1. HCWs should be encouraged to decontaminate (clean) their hands with an antiseptic-containing preparation before and after all patient contacts. (IA)121,326-330

2. Soap and water hand washing is required when hands are visibly dirty or visibly contaminated with blood, body fluids, or body substances. (IA)331

3. When hands are not visibly contaminated with blood, body fluids, or body substances, use of an alcohol hand rub containing an emollient should be encouraged. (IB)215,332-338

4. Lotion compatible with (ie, that does not inactivate) the antiseptic being used should be provided for use by HCWs. (II)339-343

5. Monitoring of hand hygiene compliance and feedback to HCWs should be done to motivate greater compliance. (IB)215,344

III. Barrier Precautions for Patients Known or Suspected to Be Colonized or Infected With Epidemiologically Important Antibiotic-Resistant Pathogens Such as MRSA or VRE

1. Gloves should always be worn to enter the room of a patient on contact precautions for colonization or infection with antibiotic-resistant pathogens such as MRSA, VRE, VISA, or VRSA. (IA)122,132,212,225-230

2. Gowns always should be worn as part of contact precautions for all patient and environmental contact with patients known to be colonized by antibiotic-resistant pathogens such as MRSA, VRE, VISA, or VRSA, except when there is no direct contact with patient or environmental surfaces. (IA)29,30,43,4547,49,57,59,96, 99,102,106,119,122,132,135,136,138-147,149,171-173,176,345

3. Universal gown and glove use or universal gloving alone also can be considered for adjunctive control on high-risk wards among patients with surveillance cultures pending. (IB)37,44,105,316-318,346

4. Masks should be worn as part of isolation precautions when entering the room of a patient colonized or infected with MRSA, VISA, or VRSA to decrease nasal acquisition by HCWs. (II)30,123,124,129,231,232

IV. Antibiotic Stewardship

1. Avoid inappropriate or excessive antibiotic prophylaxis and therapy. (IB)194,251,347

2. Ensure correct dosage and duration of antibiotic therapy. (IB)348-350

3. Restrict the use of vancomycin (if possible and appropriate for care of the individual patient being treated) to decrease the selective pressure favoring vancomycin resistance. (IB)115,269

4. To prevent the establishment of VRE intestinal colonization, decrease the use of agents with little or no activity against enterococci, such as third-generation and fourth-generation cephalosporins, in patients not known to be VRE colonized (if possible and appropriate for care of the individual patient being treated). (IB)115,267,268,351,352

5. To prevent persistent high-density VRE colonization, decrease the use of antianaerobic agents in patients with known VRE intestinal colonization (if possible and appropriate for care of the individual patient being treated). (II)102,113,159,270

6. To help prevent persistent carriage of MRSA, reduce the use of antibiotics and particularly fluoroquinolones to the minimum necessary in institutions where MRSA is endemic. (IB)251-258

7. Avoid therapy for colonization except when suppression or eradication of colonization is being attempted using an evidence-based approach for infection prevention, for psychological benefit of the patient, or for cost benefit (ie, by reducing the need for long-term isolation). (IB)5,272,285,286

V. Decolonization or Suppression of Colonized Patients

1. Consider MRSA decolonization therapy for both patients and HCWs as an adjunctive measure for controlling spread of MRSA in selected populations when appropriate. (IB)30,176,271,272,275-277

2. Any program of decolonization therapy should incorporate routine susceptibility testing, as selection of inactive agents is less likely to achieve eradication. (II)272,353

3. Widespread use, prolonged use, or both of decolonization therapy should be avoided, because this has been associated with the evolution and spread of antibiotic- resistant strains, undermining the effectiveness of the control effort.

(IB)285,286

VI. Other

1. Educational programs should be conducted to ensure that HCWs understand why antibiotic-resistant pathogens are epidemiologically important, why prevention of spread is critically necessary for control, and which measures for preventing spread have proven effective. (IB)215,220

2. Ensure that the hospital method of disinfecting hospital surfaces for antibiotic-resistant organisms (especially VRE) has been shown to be adequate based on the results of studies of such methods in the healthcare setting or perform cultures in the room of discharged patients to confirm the adequacy of terminal cleaning. This requires review of the disinfectant agent, method and meticulousness of cleaning, dilutions, and contact time. (IB)102,161,169,294

3. Use the hospital computer system to record longterm isolation indicators for patients colonized with MRSA, VRE, VISA, or VRSA so that on return the computer will provide an alert regarding the need for isolation. (IB)297

4. Dedicate the use of noncritical patient-care equipment to a single patient (or cohort of patients infected or colonized with the pathogen requiring precautions) to avoid sharing between patients. If use of common equipment or items is unavoidable, then adequately clean and disinfect them before use for another patient. (IB)99,150-155,296

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Appendix D

The Institute for Healthcare Improvement's

5,000,000 Lives Campaign

In December, 2006, The Institute for Healthcare Improvement enlisted thousands of hospitals across the country in its 5,000,000 Lives Campaign. The goal is to prevent 5,000,000 incidents of harm to patients by December, 2008. Four of the twelve elements of that campaign call on hospitals to implement procedures proven effective in reducing infection. In support of this laudable effort, included here are excerpts from the IHI campaign. For more complete information, consult the Institute's Web site at: http://www.ihi.org/IHI/Programs/Campaign/Campaign.htm

I. The Four Key Components of Preventing Ventilator-Associated Pneumonia:

1. Elevation of the head of the bed to between 30 and 45 degrees
2. Daily "sedation vacation" and daily assessment of the readiness to extubate
3. Peptic ulcer disease prophylaxis
4. Deep venous thrombosis prophylaxis (unless contraindicated)

II. The Four Key Components for Preventing Surgical Site Infections:

1. Appropriate use of antibiotics, including administering antibiotics within one hour before surgical incision, selecting an antibiotic consistent with national guidelines, and discontinuing prophylactic antibiotics within 24 hours after surgery
2. No shaving. Appropriate hair removal, if necessary, with clippers or a depilatory, but not with a razor
3. Monitor and maintain patient's glucose levels after surgery, particularly for cardiovascular surgery patients.
4. Keep patients' body temperatures at normal levels during and after surgery, especially colorectal surgery, with warmed IV fluids, warming blankets, hats and booties, and other means.

Appendix D

III. The Five Key Components o f Preventing Catheter-Related Bloodstream Infections:

1. Appropriate hand hygiene, including cleaning hands before and after palpating catheter insertion sites, before and after inserting, replacing, accessing, repairing or dressing an intravascular catheter, whenever hands are soiled or contaminated, before and after removing gloves, etc.

2. Maximal barrier protection — meaning wearing a cap, mask, sterile gown, and gloves — when placing or assisting in the placement of a central line, and ensuring that the patient is covered head to toe in a sterile drape with one small opening for the site of insertion

3. Chlorhexidine skin antisepsis before insertion

4. Optimal catheter site selection, with the subclavian vein as the preferred site instead of the jugular or femoral sites for non-tunneled catheters in adult patients

5. Daily review of central line necessity to prevent unnecessary, prolonged use

IV. Reduce Methicillin-Resistant *Staphylococcus aureus* (MRSA) Infections

1. Hand hygiene

2. Decontamination of the environment and equipment

3. Active surveillance cultures (ASCs)

4. Contact precautions for infected and colonized patients

5. Compliance with Central Venous Catheter and Ventilator Bundle

About the Author

Dr. McCaughey is a health policy expert and former Lt. Governor of New York State. In 2004, she founded the Committee to Reduce Infection Deaths (www.hospitalinfection.org), a nationwide educational campaign to stop hospital-acquired infections. She serves as the CEO and Chairman of the organization. RID has made hospital infections a major public issue, provided compelling evidence that preventing infection improves hospital profitability as well as saving lives, and won legislation in over 20 states for public reporting of infection rates. RID has become synonymous with patient safety and clean hospital care.

Dr. McCaughey's research on how to prevent infection deaths has been featured on Good Morning America, the CBS Morning Show, ABC's 20/20, and many other national programs. She has appeared on Fox News Network's Hannity & Colmes, The O'Reilly Factor, CNN's Talk Back Live, and numerous radio programs.

Dr. McCaughey is the author of over one hundred scholarly and popular articles on health policy, infection, medical innovation, the economics of aging, and Medicare. Her writings have appeared in The New York Times, The Wall Street Journal, New Republic, Policy Review, Forbes Magazine, New York Law Journal, Los Angeles Times, U.S. News & World Report, and many other national publications. Her 1994 analysis of the Clinton health plan in the New Republic won a National Magazine Award for the best article in the nation on public policy. Her article on the dangers of "Dumbing Down Medical Care" won the National Media Award from the American Society of Anesthesiologists. She has been profiled in The New Yorker, The New York Times Magazine, New York Magazine, The Washington Post, and other publications.

From 1994 to 1998, she served as Lt. Governor of New York State. She focused on health issues, and her bills became models for legislation in many states and in Congress.

She has taught at Vassar College and Columbia University, and produced prize-winning studies while at two think tanks, the Manhattan Institute and later the Hudson Institute.

Prior to entering the health policy field, Dr. McCaughey earned a Ph.D. in constitutional history. She is the author of two books on that subject, From Loyalist to Founding Father (Columbia University Press), winner of the Bancroft Dissertation Award, and Government by Choice (Basic Books). She also chaired a national commission on reforming the Electoral College in 1992, wrote its report, Electing the President, and testified before Congress on the subject. In 1989, she served as Guest Curator for the Bicentennial Exhibit and related events at the New York Historical Society.

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[84] The CDC and the American Association of Medical Colleges are working on a Web-based curriculum that focuses largely on this issue.

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[86] Studies show that, nearly three quarters of patients' rooms are contaminated with MRSA and 69% with VRE. In one study, 42% of gloves worn by hospital personnel who had no direct patient contact but who touched contaminated surfaces became contaminated. JM Boyce et al., "Environmental contamination due to *methicillin-resistant Staphylococcus aureus*: possible infection control implications," *Infection Control and Hospital Epidemiology* 18.9 (1997): 622-627. A Concensus Statement by a multidisciplinary group of experts asked by the American Medical Association to provide guidelines for infection control cautions that: "In some cases caregivers actually go from patient to patient without changing their gloves, apparently confusing self-protection" with patient protection. DA Goldmann et al., "Strategies to Prevent and Control the Emergence and Spread of Antimicrobial- Resistant Microorganism in Hospitals," *JAMA* 275.3 (1996): 234-240.

[87] Routine disinfection of stethoscopes between patients is recommended by the American Medical Association. CD Salgado, BM Farr, "MRSA and VRE: Preventing Patient-to-Patient Spread," *Infections in Medicine* 20 (2003):194-200; MA Marinella et al., "The stethoscope: a potential source of nosocomial infection?" *Archives of Internal Medicine*,157.7 (1997): 786-90; KC Zachary et al., "Contamination of gowns, gloves, and stethoscopes with vancomycin-resistant Enterococci," *Infection Control and Hospital Epidemiology* 22.9 (2001): 560-564; GA Noskin et al., "Recovery of vancomycin-resistant Enterococci on fingertips and environmental surfaces," *Infection Control and Hospital Epidemiology* 17.12 (1996): 770-772.

[88] The Agency for Healthcare Research and Quality recommends use of antibiotic catheters as one of its eleven patient safety practices. *Making Healthcare Safer: A Critical Analysis of Patient Safety Practices*. AHRQ Publication 01-E058, 2001. Also see: RO Darouiche et al., "A comparison of two antimicrobial-impregnated central venous catheters," *New England Journal of Medicine* 340.1 (1999): 1-8; I Raad et al., "Central venous catheters coated with Minocycline and Rifampin for the prevention of catheter-related colonization and blood-stream infections," *Annals of Internal Medicine* 127.4 (1997): 267-274.

[89] The following four studies support this suggestion : (1) MO Vernon et al., "Chlorhexidine gluconate to cleanse patients in a medical intensive care unit," *Archives of Internal Medicine* 166 (2006): 306-312. (2) LJ Hayek et al., "Preoperative whole body disinfection — a controlled clinical study," *Journal of Hospital Infection* 11, Suppl. B (1988): 15-19 This study showed that two chlorhexidine showers reduced total infection rate by 30% and Staph aureus infections by 50%. (3) DJ Byrne et al., "Rationalizing whole body disinfection," *Journal of Hospital Infection* 15.2 (1990): 183-187. This study shows that a single shower does not maximize skin disinfection. The authors conclude that three showers should be recommended. (4) DS Paulson, "Efficacy Evaluation of a 4% Chlorhexidine Gluconate as a Full-Body Shower Wash," published by the Association for Practitioners in Infection Control (1993). This study found that showering for five days with chlorhexidine yielded maximum results for reducing bacteria on the skin, and keeping it low for 24 hours or more. "A 1 or 2 day presurgical application period is simply too short to establish the necessary levels of residual antimicrobial properties to be of value in reducing post-surgical infection rates."

[90] S Worcester, "Hospital system takes on MRSA," *Internal Medicine News* 38.19 (2005): 1-2.

[91] A Kurz et al., "Perioperative Normothermia to Reduce the Incidence of Surgical-Wound Infection and Shorten Hospitalization," *New England Journal of Medicine* 334.19 (1996): 1209-1215.

[92] The Institute for Healthcare Improvement guidelines for improving infection prevention state that: "Administration of prophylactic antibiotics beginning 0 to 1 hour prior to surgical incision decreases the risk of surgical infection. http://www.ini.org/IHI/Topics/PatientSafety/SurgicalSiteInfections/ImprovementStories (accessed 10-14-02). See also: JP Burke,

"Maximizing appropriate antibiotic prophylaxis for surgical patients: an update from LDS Hospital, Salt Lake City," *Clinical Infectious Diseases* 33, Suppl. 2 (2001): S78-83.

[93] *Ibid*., the Institute for Healthcare Improvement Guidelines for improving infection state that "surgical patients with core temperatures greater than 36 degrees C./ 98.6 degrees F are less likely to get an infection."

[94] *Ibid*., the Institute for Healthcare Improvement states that "clipping instead of shaving results in decreased infection rates," and recommends that patients be told "not to shave the surgical site for 72 hours prior to surgery."

[95] M A Ritter, "Operating Room Environment" *Clinical Orthopaedics and Related Research* 369 (1999): 103-109.

[96] Pittsburgh Regional Healthcare Initiative, "PHRI Executive Summary," (June, 2005).

[97] Urinary tract infections are the most common hospital-acquired infections. Limiting the use and duration of urinary tract catheters reduces risk of infection. See: J Puri et al., "Catheter Associated Urinary Tract Infections in Neurology and Neurosurgical Units," *Journal of Infection* 44.3 (2002): 171-175; F Stephan et al., "Reduction of Urinary tract infection and antibiotic use after surgery: a controlled, prospective, before-after intervention study," *Clinical Infectious Diseases* 24 (2006): 1544-1551.

[98] CA Killian et al., "Risk Factors for Surgical-Site Infections Following Cesarean Section," *Infection Control and Hospital Epidemiology* 22.10 (2001): 613-7.

[99] The CDC's National Nosocomial Infections Surveillance System, including the guarantees of confidentiality to hospitals, is described at www.cdc.gov/ncidod/hip/SURVEILL/NNIS.HTM

[100] Mark Chassin, "Achieving and Sustaining Improved Quality: Lessons from New York State and Cardiac Surgery," Health Affairs 21.4 (July/August 2002): 40-51.

[101] *Ibid.*

[102] JH Hibbard et al., "Does Publicizing Hospital Performance Stimulate Quality Improvement Efforts," *Health Affairs* 22.2 (March/ April 2003): 84-94.

[103] For more information on the NNIS's methodology, consult: TC Horan & R. Gaynes, "Surveillance of nosocomial infections," *Hospital Epidemiology and Infection Control*, ed. CG. Mayhall (Philiadelphia: Lippincott, Williams & Wilkins, 2004) 1659-1702.

[104] J Steinhauer, "Hospitals in City Faulted for Failing to Report Many Errors," *New York Times* (February 13, 2001) B1. See also: M Chassin, EC Becher, "The Wrong Patient," *Annals of Internal Medicine* 136.11 (2002): 826-833.

[105] "Data Show Scourge of Hospital Infections," *Washington Post*, (July 13, 2005); "Hospitals Battling Infections," *Washington Post*, (July 14, 2005).

[106] These are the types of infections that the Centers for Disease Control and Prevention recommend in a public reporting system. However, lawmakers could consider adding ventilator-related pneumonia, but these are more difficult to detect accurately, or urinary tract infections, which are common but less costly and deadly than other infections.

[107] O'Neill AJ, Cove JH, Chopra I. Mutation frequencies for resistance to fusidic acid and rifampin in Staphylococcus aureus. J Antimicrob Chemother 2001;47:647-650. *Unnecessary Deaths*, p.1.

[108] CA Muto, JA Jernigan, et al., "SHEA Guideline for Preventing Nosocomial Transmission of Multidrug-Resistant Strains of Staphylococcus aureus and Enterococcus," *Infection Control and Hospital Epidemiology* 24.5 (2003): 362-86.

[109] Centers for Disease Control and Prevention. National Nosocomial Infection Surveillance (NNIS) System report: data summary from January 1992–June 2001. *Am J Infect Control* 2001;29:404-421.

[110] Boyce JM, Potter-Bynoe G, Chenevert C, King T. Environmental contamination due to methicillin resistant *Staphylococcus aureus*: possible infection control implications. *Infect Control Hosp Epidemiol* 1997;18:622-627.

[111] Dr. Richard Shannon, PowerPoint presentations, December 7, 2004 and March 11, 2005.

[112] Galdbart JO, Morvan A, El Solh N. Phenotypic and molecular typing of nosocomial methicillin-resistant *Staphylococcus aureus* strains susceptible to gentamicin isolated from France from 1995-1997. *J Clin Microbiol* 2000; 8:185-190.

[113] Bager F. DANMAP 98: Consumption of Antimicrobial Agents and Occurrence of Antimicrobials in Bacteria From Food Animals, Food and Humans in Denmark. Copenhagen: Statens Serum Institut, Danish Veterinary and Food Administration, Danish Medicines Agency, Danish Veterinary Laboratory; 1998.