



SURVIVOR Carol Bradley, of Nashville, Tenn. (with her new dog, Teyla), developed infections after surgery for stomach cancer in August 2008.

Deadly infections

Hospitals can lower the risk, but many fail to act

IF THERE'S ONE THING that all sides agree on in the health-care-reform debate, it's the need to dramatically reduce the number of infections that patients acquire in the hospital. But infection data newly released to the public show that although some hospitals in this country are doing an excellent job of protecting patients, others are not.

Our study focuses on one of the most dreaded types of the approximately 1.7 million infections that occur each year in U.S. hospitals. They are bloodstream infections introduced through the large intravenous catheters that deliver medication, nutrition, and fluids to patients in

intensive care. These so-called central-line infections account for 15 percent of all hospital infections but are responsible for at least 30 percent of the 99,000 annual hospital-infection-related deaths, according to the best estimates available.

Even for those who survive, a central-line infection means weeks or months of debilitating treatments and side effects.

"I certainly did not expect to go through the torture that happened to me," said Carol Bradley, 61, a registered nurse from Nashville, Tenn., who developed several types of infections, including a bloodstream infection, after surgery for stomach cancer in August 2008. As a result, she

spent about three weeks in intensive care hooked up to feeding and breathing tubes and central-line catheters, and more than a year on antibiotics.

For decades, doctors considered central-line infections an unavoidable risk of intensive care. But in the past few years, determined reformers have shown that hospitals can cut their infection rate to zero or close to it by following a low-tech program that includes a simple checklist. In short, central-line infections are almost completely preventable.

Citizen activists across the country, including those working with Consumers Union, the nonprofit publisher of CON-

SUMER REPORTS, have helped to enact laws in 27 states forcing hospitals to publicly disclose their infection rates as a first step, it's hoped, toward improving them if they are less than optimum. Sixteen of the states have made that information publicly available.

For our analysis, we collected and compared central-line infection data for intensive-care units at 926 hospitals in 43 states. (Among the nation's roughly 5,000 acute-care hospitals, about 3,300 provide intensive care, but in many, there were too few patients to yield statistically meaningful data, and many are still not reporting

Even the sickest patients can be spared infection.

publicly.) Our information comes from the state reports and from the Leapfrog Group, a nonprofit organization based in Washington, D.C., that for the past 10 years has worked with large employers nationwide to collect and disseminate quality information on individual hospitals. The Leapfrog information, which the hospitals submit voluntarily, includes rates of central-line infections in ICUs.

We found enormous variations within the same cities and even within the same health-care systems. For example, among Kaiser Permanente hospitals in the Los Angeles area, Harbor City Medical Center reported no infections in the 1,769 days its ICU patients were on central lines in 2008. But Woodland Hills Medical Center reported 13 infections in 1,937 central-line days in its medical-surgical ICU—more than four times the average rate for such ICUs nationwide.

Our analysis adjusts for the fact that Leapfrog and the states have data from varying mixtures of ICUs, requiring comparisons to different average infection rates. For instance, the average infection rate is two per 1,000 central-line days for a coronary ICU, so a rate of four infections would be 100 percent more infections than average.

Poorly performing hospitals included some major teaching institutions. For instance, New York University Langone Medical Center in New York City reported 39 infections in 10,119 central-line days in 2008, roughly twice the national average for its mix of ICUs. The University of Virginia Medical Center in Charlottesville

didn't do much better, reporting 77 infections in 18,572 days for the 15 months ending in September 2009, also about two times the national average.

More encouragingly, nationwide, we counted 105 hospitals whose most recent public reports tallied zero central-line infections. They ranged from modest rural institutions to urban giants such as the University of Pittsburgh Medical Center Presbyterian hospital, which reported no infections among patients who were on central lines a total of 13,596 days in 2008.

Why are central lines so vulnerable to dangerous infections? And how have some hospitals managed to cut their rate to zero or near-zero?

Central lines: Boon and peril

Most adults have probably had a standard intravenous line at some point in their lives. Central lines are nothing like those.

"When people are as sick as they are in intensive care, you need a way to get things into them in large volumes, and very fast, such as nutrition, fluids or a

blood transfusion," explained John Santa, M.D., M.P.H., director of the Consumer Reports Health Ratings Center. "If you put medication into a central line, it gets into the system much faster than if you put it into a regular IV."

The lines are long, flexible catheters that thread through a large vein that leads to the heart. Unlike regular IVs, which usually stay in for only a few days, central lines can stay put for weeks or even months. It's not unusual for a patient to have something put into a central line many times a day.

The problem is that every time a doctor, nurse, or medical technician touches that line or the skin surrounding it, or the catheter's dressing is dislodged, there's a risk of introducing bacterial contamination unless the strictest sterile conditions are observed. If that happens, the central line's biggest virtue—the ability to spread its cargo throughout the body quickly—becomes its biggest vice. Bacteria, including the antibiotic-resistant "superbugs" present in most hospitals, can quickly

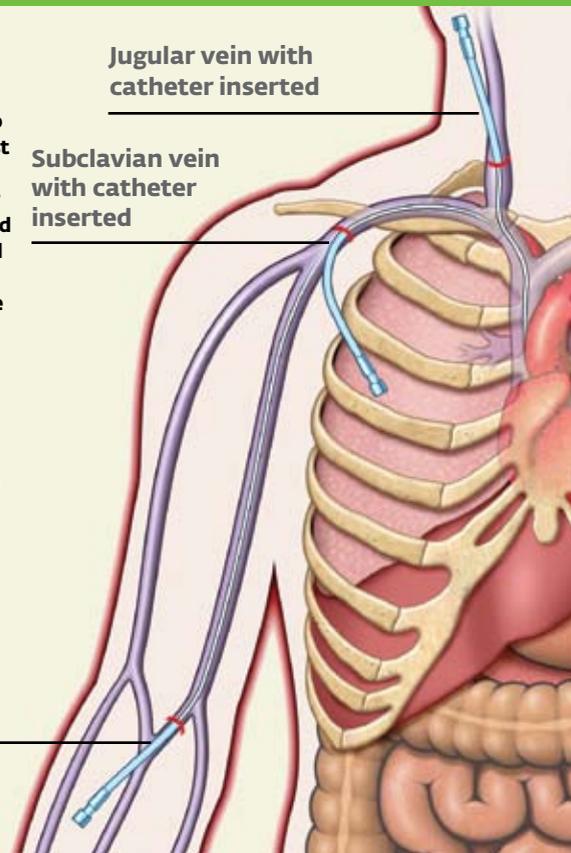
What's a central line?

Central lines are long, flexible catheters threaded through a large vein that leads to a large blood vessel just outside the heart. They're used to deliver medications, fluids, and nutrition to critically ill patients. Research shows that putting the catheter in the subclavian vein is best for infection control, but depending on the patient's particular condition and needs, doctors may choose to insert the catheter through the jugular vein in the neck or through a vein in the arm. We've shown all three locations here.

Arm vein with catheter inserted

Jugular vein with catheter inserted

Subclavian vein with catheter inserted



multiply, causing sepsis, an infection of the entire bloodstream.

“Sepsis produces high fevers, rigors—violent shaking chills—and the high fever could induce delirium,” says Peter Pronovost, M.D., Ph.D., critical-care specialist at the Johns Hopkins School of Medicine in Baltimore. “Imagine the worst you ever felt from the flu, multiplied by 10.”

And it is deadly: Sepsis kills up to 50 percent of its victims.

Pearl Gelman, 91, was admitted to a Florida hospital in May 2007 with bronchitis symptoms, according to her daughter, Susan Denenberg of Merrick, N.Y. “She couldn’t get antibiotics through her arms because the veins were very bad,” Denenberg said. “That’s why they had to do it through the neck.” Later, she said, the hospital called for permission to replace the central line. “She was getting weaker and weaker, and then they told us she had the MRSA,” Denenberg said, referring to the superbug methicillin-resistant staphylococcus aureus. “And it was just downhill. She couldn’t fight back. She died at the hospital.”

The checklist revolution

The way hospitals think about central-line infections has changed in recent years, said James J. Gordon, M.D., chief of infectious diseases at Huron Valley-Sinai Hospital in Commerce, Mich. “If best practices are utilized, the vast majority of line infections can be avoided,” he said. Medicare agrees: It no longer pays the extra costs associated with those infections.

The breakthrough came after years of research on effective steps in infection control, when Pronovost implemented this body of evidence in the unlikely form of a simple five-step checklist. The checklist translated the most effective known approaches into a common-sense series of hygienic precautions to follow (we’ve reprinted it on the facing page) when inserting, using, or removing a central line. The



VICTIM'S DAUGHTER Susan Denenberg, of Merrick, N.Y., holds a picture of herself with her mother, Pearl Gelman, who died after contracting an infection that she said may have been introduced via a central-line catheter.

steps require equipment no more complex than hand soap, an antiseptic solution, and sterile drapes and garb. Other key components: giving nurses the authority to make doctors follow all the steps, and measuring and reporting infection rates.

Pronovost tested his checklist in 67 hospitals in Michigan, and the results, published in the Dec. 28, 2006, issue of the *New England Journal of Medicine*, were dramatic: a 66 percent reduction in central-line-associated bloodstream infections. It is estimated that the program saved more than 1,500 lives and \$200 million in the first 18 months alone. In July 2009, Health and Human Services Secretary Kathleen Sebelius called on hospitals across America to use the checklist to reduce central-line infections in ICUs by 75 percent over the next three years.

Hamilton Medical Center, a 282-bed hospital in Dalton, Ga., uses the checklist and in August 2009 reported a zero

central-line infection rate in its medical and surgical ICUs to the Leapfrog Group. “The checklist is not just a checklist,” said Teresa Fox, infection prevention coordinator at the medical center. “The checklist gives accountability that you’re making sure everyone is doing all the steps and doing them the same, so you get consistency.”

What this kind of experience suggests, said Richard P. Shannon, M.D., professor of medicine at the University of Pennsylvania School of Medicine, is that “all central-line infections have a root cause that can be understood and prevented.” Even the sickest patients, he said, can be spared such infection.

Though the checklist seems simple, it does demand time and attention in the high-pressure environment of an ICU.

Huron Valley-Sinai Hospital, which took part in Pronovost’s study, has had no ICU central-line bloodstream infections during the past two years of using

▶ DID YOU KNOW?

\$42,000

Average added cost when an ICU patient gets a central-line infection.

the checklist, said hospital infectious-disease chief Gordon. "If this practice wasn't continually discussed and recognized as a high priority, the protocols might lapse," Gordon said. "We'd start seeing infections. It's human nature."

Freeing the data

"As a country, we have a health-care system that's been largely unaccountable to the public it serves," says Leah Binder, CEO of the Leapfrog Group. "The federal government has been very timid about requiring public reporting of key indicators of performance in hospitals, including infection rates."

For example, the federal Centers for Disease Control and Prevention has been collecting and analyzing infection data from hospitals since the early 1970s. But the 1,500 or so reporting hospitals participate—some voluntarily and some because their state governments make them—under an assurance of strict confidentiality.

Another federal agency, the Agency for Healthcare Research and Quality, collects data from hospitals in 42 states and uses the information to track trends in quality, costs, and utilization. But it reports its findings only in the aggregate, without

naming any names. And in the private sector, hundreds of hospitals affiliated with academic medical centers share information, including patient-safety data, as part of a consortium.

In short, "most hospitals already have this information, but if they never put it together for the public in a meaningful way, it might as well not be there," said Lisa McGiffert, who heads Consumers Union's Safe Patient Project, which aims to stop preventable medical errors, including hospital infections.

But the culture of secrecy is starting to crumble, as evidenced by the fact that in 27 states, hospitals either already report infection rates or will eventually have to under new laws. Five years ago, only four states did.

That's excellent progress, but some states are lagging in getting their reporting systems up and running at all, and others are too slow in getting hospitals' reports out to the public, McGiffert said.

The national health-reform legislation under debate as this issue went to press contains provisions to require hospitals to report infections publicly. Consumers Union played a leading role in getting those provisions included.

And Daniel Pollock, M.D., surveillance branch chief in the CDC's division of health care quality promotion, told us that his agency is talking seriously with the federal Centers for Medicare & Medicaid Services (CMS) about having hospitals publicly report their infection data on Hospital Compare, a consumer-oriented government Web site that reports how well hospitals provide recommended care to their patients.

Does reporting help?

Peter Pronovost at Johns Hopkins believes that public accountability powerfully motivates hospitals to get their infection rates under control. He notes that in many states without public-reporting laws, "only 20 percent of the hospitals are signing up" for Sebelius' initiative, whereas more hospitals have signed up in states where they face the prospect of public disclosure of infection rates.

In Pennsylvania, the first state to publicly report hospital infections, the number of infections dropped by almost 8 percent between 2006 and 2007, the first and second years of reporting.

And in the first two years in New York state, where hospitals started public

A life-saving checklist to take to the hospital

A program that includes this checklist has been proved to prevent hospital-acquired infections from central-line catheters. But not all hospitals have adopted it. If a family member or friend has to be hospitalized in intensive care, take this list with you and ask whether the intensive-care unit uses it, says checklist developer Peter Pronovost, M.D., Ph.D., critical-care specialist and patient-safety researcher at the Johns Hopkins School of Medicine.

Caregivers should:

1 Wash their hands using soap and water or alcohol gel. Do so before and after examining the patient, inserting the catheter, and replacing, accessing, repairing, and dressing the catheter.

Why it helps: It prevents bacteria from the caregiver's hands from entering the catheter directly or getting into the vein through the opening in the skin.

2 Disinfect the patient's skin. Use a 2 percent chlorhexidine-based preparation or other appropriate

antiseptic before inserting the catheter and during dressing changes. **Why it helps:** It prevents bacteria from the patient's own skin from getting on the catheter and into the bloodstream.

3 Use full-barrier precautions. Maintain aseptic technique by wearing a mask, cap, sterile gown, and sterile gloves when inserting the catheter. The patient should be covered with a large sterile sheet. **Why it helps:** It prevents bacterial contamination from all sources when the catheter is being put in.

4 Avoid placing the catheter in the groin, if possible. A subclavian site is preferred because it's less likely to become infected than sites in the groin or elsewhere. **Why it helps:** The groin area is inherently difficult to keep clean.

5 Remove unnecessary catheters. Evaluate daily whether any catheters or tubes that are no longer essential can be removed. **Why it helps:** The risk of infection increases the longer the catheter is in place.



Peter Pronovost, M.D., Ph.D.

Coming clean on hospital infections

Here are the top and bottom performers in 10 states where hospitals are publicly reporting the numbers of central-line-related bloodstream infections in their intensive-care units. The number next to each state's name indicates how many hospitals we analyzed for that state. The infection rate shows how well each hospital performed compared with

the national average for its mix of ICUs (cardiac, surgical, etc.). We included only hospitals that had more than 1,000 central-line days (total days that all patients spent on central lines during the reporting period). And no, that's not a misprint: The worst-performing hospitals in Rhode Island and Vermont have lower-than-average infection rates—but not zero.

 LOWEST INFECTION RATE  HIGHEST INFECTION RATE

Hospital	ICU central-line days	Infection rate
COLORADO 28 hospitals		
Centura Health-Littleton Adventist Hospital Littleton	2,946	No infections
Exempla Good Samaritan Medical Center Lafayette	2,470	No infections
Mercy Regional Medical Center Durango	1,153	No infections
Boulder Community Hospital Boulder	1,841	129% more infections than average
DELAWARE 6 hospitals		
Alfred I. DuPont Institute Wilmington	5,651	65% fewer infections than average
Christiana Care Health System Newark	9,332	34% more infections than average
MAINE 6 hospitals		
St. Mary's Regional Medical Center Lewiston	1,327	No infections
York Hospital York	1,008	No infections
Maine Medical Center Portland	8,576	149% more infections than average
MISSOURI 40 hospitals		
Phelps County Regional Medical Center Rolla	1,193	No infections
SSM St. Joseph Health Center St. Charles	1,767	No infections
St. John's Mercy Hospital Washington	6,744	No infections
SSM St. Mary's Health Center Richmond Heights	3,351	172% more infections than average
NEW YORK 112 hospitals		
Cayuga Medical Center Ithaca	1,184	No infections
Community General Hospital Syracuse	1,215	No infections
Glen Cove Hospital Glen Cove	1,731	No infections
Kingston Hospital Kingston	1,754	No infections
Northern Westchester Hospital Mount Kisco	1,179	No infections
Rome Memorial Hospital Rome	1,368	No infections
Saratoga Hospital Saratoga	1,609	No infections
Southside Hospital Bay Shore	2,565	No infections
Vassar Brothers Medical Center Poughkeepsie	4,275	No infections
North General Hospital New York City	1,462	394% more infections than average

Hospital	ICU central-line days	Infection rate
RHODE ISLAND 2 hospitals		
Rhode Island Hospital Providence	3,006	85% fewer infections than average
Miriam Hospital Providence	1,429	56% fewer infections than average
SOUTH CAROLINA 31 hospitals		
Loris Healthcare System Loris	1,016	No infections
Oconee Memorial Hospital Seneca	1,217	No infections
St. Francis Hospital Downtown Greenville	3,465	No infections
Hilton Head Hospital Hilton Head Island	1,005	200% more infections than average
TENNESSEE 47 hospitals		
Cumberland Medical Center Crossville	1,006	No infections
Gateway Medical Center Clarksville	1,174	No infections
Indian Path Medical Center Kingsport	1,387	No infections
Morristown-Hamblen Hospital Morristown	1,236	No infections
Skyridge Medical Center Cleveland	1,638	No infections
Regional Medical Center at Memphis Memphis	3,927	238% more infections than average
VERMONT 2 hospitals		
Rutland Regional Medical Center Rutland	1,088	No infections
Fletcher Allen Health Care Burlington	6,822	36% fewer infections than average
VIRGINIA 44 hospitals		
Augusta Health Care Fishersville	1,133	No infections
Danville Regional Medical Center Danville	1,074	No infections
Inova Alexandria Hospital Alexandria	6,483	No infections
Inova Loudoun Hospital Leesburg	1,758	No infections
Sentara Bayside Hospital Virginia Beach	2,052	No infections
Prince William Hospital Manassas	1,184	160% more infections than average

We obtained national averages from the federal Centers for Disease Control and Prevention. The reports for each state are the most recent available; most are from 2008. We excluded from analysis infections in neonatal, burn, and trauma units, where reported. A detailed description of our methodology, "Behind the Data," is available at www.ConsumerReportsHealth.org/hospitalinfections. Sources: Public state infection reports and the Leapfrog Group.

reporting in 2007, officials are starting to see measured decreases in surgical-site infection rates in a majority of hospitals, according to Rachel Stricof, director of the state Department of Health's bureau of health-care-associated infections. "I do believe it is because of reporting," she said.

What you can do

Until all hospitals are doing as well as the top performers do now, patients and their families can't assume that all necessary steps are being taken to guard against infection. Here's how to protect yourself:

- Look online to find out whether your hospital makes its infection rate public. See the box below.

If you have a choice of hospitals, this information can help you find one that practices good infection-control measures. If you don't have a choice, you can see where your hospital stands. If it's not good, prepare yourself to be aggressive in monitoring infection-control practices.

Patients, friends, and family members should insist that caregivers:

- Wash their hands with soap or an alcohol-based solution before touching a patient. They should also don sterile gloves before touching any catheters and check to see that dressings are in place.
- Follow the Pronovost checklist in cases where a central line is needed. (See "A Life-saving Checklist," on page 19.)
- Remove devices that enter the body, including central lines and urinary catheters, as soon as no longer needed.

Online resources

At www.ConsumerReportsHealth.org/hospitalinfections, check to see whether your state publishes hospital infection reports. Links to free state reporting sites are available there. (Some state reports are not user-friendly, something we'd like to see changed as soon as possible.) Additional information on state infection reporting and infection prevention is available at Consumers Union's Safe Patient Project, at www.SafePatientProject.org/topics.html.

Subscribers to our health Web site, at www.ConsumerReportsHealth.org, can compare more than 3,600 hospitals on a range of characteristics, including bloodstream-infection data where available.

Central-line-associated bloodstream-infection rates and other data derived from hospitals' voluntary submissions to the Leapfrog Hospital Survey are also available at www.leapfroggroup.org.

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