

Special Edition:




the **MRSA** issue

The alarming spread of MRSA is compromising patient safety in hospitals all around the world. It's a global health crisis that must not be ignored.

What does MRSA have to do with complexity thinking? And what is the connection between this threat and Plexus Institute? Find out in this very special edition of *emerging*.

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- An overview of MRSA (page 3)
 - Plexus vs. MRSA (page 9)
 - The human toll (page 19)

Dear Friends of Plexus,

From its very first days, a core conviction of Plexus Institute has been that the lessons of complexity science should ultimately spur *action*. Even as this still-nascent body of theory is refined and tested, pressing needs can be addressed with the insights we have learned.

This month, I am pleased to introduce one such initiative. It is an especially urgent one, with direct implications for you, our readers. Indeed, even if you do not serve in the healthcare industry, you will likely find yourself someday as a consumer of its services.

Methicillin Resistant *staphylococcus aureus*. Perhaps you have never heard the term. However, like many emergent phenomenon, it is increasing rapidly, and its implications are physiological and sociological. This special edition of *emerging* details the epidemic... and what Plexus Institute is doing about it. That work has been enabled by a \$294,000 grant from The Robert Wood Johnson Foundation for the express purpose of battling MRSA using complexity-inspired processes. You will find the details of that work in the article that begins on page 9.

I invite you to learn more about this vital work. And, as always, I invite you to continue supporting and sharing our journey with your own passions, resources and stories.

A special thanks to [David Hutchens](#) for development of this special issue of *emerging*, and also to our tireless staff writer Prucia Buscell for writing the three excellent articles you will encounter here.

Sincerely,

Curt Lindberg
President, Plexus Institute

emerging: applications

Plexus Versus the Bacteria

MRSA is a complex phenomenon. It requires a complex human response. Here's how Plexus Institute, backed by a grant from The Robert Wood Johnson Foundation, is bringing together diverse groups to tap complexity insights in search of solutions.

The unending crises and triumphs, strivings and frustrations that flow and surge inside the walls of a hospital are systems nested within systems. Multiple human systems are organized to care, heal, and fight disease. A vast number of microbial systems have ancient and often unanticipated genetic abilities to disrupt and undermine the more modern human systems. All these entwined and related communities have evolved with extraordinary creativity and certain elements of mystery.

Among the casualties of their visible and invisible interactions are two million patients who get infections annually while being treated in American hospitals. Of those, more than 90,000 die—that's some 250 deaths every day. Just to compound an already complex problem, a burgeoning proportion of bacteria causing hospital infections are developing resistance to commonly used antibiotics. One of the fastest growing is Methicillin Resistant *staphylococcus aureus* (MRSA).

MRSA are sturdy bacteria that survive on people's hands, and even on such smooth dry surfaces as sheets, clothing, medical instruments, door handles and furniture. It even lurks under beds. And MRSA is ubiquitous—about 2.5 million Americans carry it harmlessly in their noses. It has been estimated that approximately 30% of them—that means 750,000 people—will develop an infection, and the death rate for people infected with MRSA is four times higher than the death rate for those infected with nonresistant staph bacteria. Biologists explain that bacteria that mortally afflict all its victims would be unable to survive and reproduce itself. So MRSA can be mild. But it can also



turn deadly when it gets inside the body through a break in the skin caused by injury or surgery.

It's a Social Challenge

Medical experts believe most healthcare acquired infections can be prevented. So why aren't they? The answers are simple, but not easy. Every medical professional knows the importance of hand hygiene and environmental cleanliness. A consistent effort to fight dangerous pathogens always yields unexpected details, but even as new necessities are discovered, knowledge alone does not erase old practices. What needs to change is behavior and habit. As Dr. Jerry Zuckerman, medical director of infection control at Albert Einstein Medical Center in Philadelphia puts it: "We have to change the culture from one of acceptance to one of outrage."

"MRSA stalks every patient admitted to a hospital in this country," says Dr. Jon Lloyd, Coordinator for the Southwest Pennsylvania MRSA Prevention Collaborative for the federal Centers for Disease Control and Prevention and the Veterans Administration Pittsburgh Healthcare System. "In order to solve the problem the staff and the patients have to own the solution. Bacteria are



A nurse manager displays color-coded cleaning guide used to train Environmental Staff for disinfecting MRSA rooms.



An aggressive hand hygiene program is a key component of the MRSA Prevention Program. Research shows that hand washing for a minimum of 15 seconds is most effective.

mutating faster than the drug companies can keep up with it, so we can't look to the pharmaceutical industry to come up with the answer to this. Healthcare acquired infections due to MRSA and other resistant bacteria represent a cultural problem, not primarily a technical or knowledge problem." Solving it will require the engagement of the entire hospital community—administrators, doctors, nurses, housekeepers, volunteers and patients—in cultural change. Ownership of the problem and its solution by healthcare workers and patients will be key to pioneering new initiatives to eliminate this infection.

Plexus vs. MRSA

In 2005 The Robert Wood Johnson Foundation (RWJF) awarded Plexus Institute a \$294,000 grant to begin an innovative effort to prevent MRSA infections in health-care facilities. The initiative involves a partnership among Plexus Institute, the CDC, the Positive Deviance (PD) Initiative at Tufts University, the Delmarva Foundation, the Maryland Patient Safety Center, and the Southwest Pennsylvania MRSA Prevention Collaborative. Monique and Jerry Sternin of the PD Initiative (www.positivedeviance.org), who have used positive deviance all over the world to address seemingly intractable problems such as childhood malnutrition, will help participants identify and amplify the strengths within their communities that can lead to better infection control.

In addition, this effort to eliminate MRSA includes a nationwide network of as many as 40 hospitals, six of which are serving as "beta sites" that have agreed to apply three specific prevention guidelines

Dr. Lloyd says each beta site hospital has at least one target unit where staff will apply active surveillance, which means that each patient admitted will have a nasal swab test that will be cultured for MRSA. Colonized patients will be isolated with strict contact precautions that include gowns and gloves for all who enter the room, and separate maintenance and sterilization of all equipment that is used for them, such as blood pressure machines, stethoscopes, bed tables, or wheelchairs, and vigilant hand cleaning before and after each patient contact. In case that sounds easy, remember that the hand hygiene and sterilization protocol has to be applied at all times before and after every single patient contact. Not only that, experts emphasize that medical practitioners who have scrubbed their hands have to avoid touching things in their environment so they don't recontaminate their hands before donning gloves. So one fleeting barely noticeable gesture can undermine the best goals.

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who have exactly the same resources. The emphasis is on finding solutions that already exist within the organization. That way, problems and solutions have the same DNA, and successful practices have a better chance of spreading throughout the organization. The diffusion of success is not unlike the spread of the bacteria that will be thwarted by successful human practices.

In addition, the beta sites have agreed to submit all their MRSA data to the National Healthcare Safety Network (NHSN), and have representatives specifically trained in collecting and reporting data. The NHSN is a web-based program operated by the CDC to which hospitals nationwide can contribute data that will be gathered and measured in a standardized way. MRSA data will include the number of patients tested and cultured on admission, and test results on the same patients when they are transferred within the hospital and discharged. The statistics will identify the number of MRSA carriers and active infections among those tested, and the number of tested patients who acquired MRSA during their stay even if they never developed symptoms. If a patient entered without MRSA and left colonized, the bacteria were acquired in the hospital.

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Exploring Solutions

The grant allows for 40 partner hospitals, and more than 30 have already joined. Partner hospitals are encouraged to apply all the practices the beta site



Kathleen Risa, MRSA Education Coordinator at VA Pittsburgh Regional Healthcare System, addresses staff on the hazards of MRSA.

hospitals use. In the past, Dr. Lloyd says, hospitals working independently did different things to fight infection, and now, for the first time, uniform web-based data will pave the way for greater collaboration.

Dr. Margaret Toth, chief quality officer for the Delmarva Foundation, notes that Maryland hospitals have a history of working together and MRSA is the next big problem they are tackling jointly. "We have been very excited by the positive deviance work," she says. "We see PD as sort of a missing link, an element we never had before in that it helps us capture the spirit and voice of every single person taking care of patients. And the problem of MRSA is so monumental that every person in patient care has to be part of the solution."

Colonized patients who are most vulnerable to becoming infected are those over age 65, those who undergo surgery and other invasive procedures and those with compromised immune systems, Dr. Lloyd says, but without active surveillance no one will know who is or is not colonized. Knowledge can be protective. Colonized patients needing surgery, for example, can be treated with nasal ointments, and can take Chlorhexadine showers at home and receive prophylactic antibiotics before and after their operations.

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Infection Control Nurse uses a "glow worm" to demonstrate the amount of bacteria or germs that can live on the skin surfaces.

Dr. Lloyd says studies have shown that vigilant hand hygiene alone can cut the transmission of infectious bacteria by 30 to 50 percent, and that active surveillance with hand hygiene and contact precautions can drop it to near zero. Data gathered from cooperating hospitals in the current initiative should provide statistical rigor to the effectiveness of the precautions in use. The NHSN, which now collects data from some 300 hospitals on a voluntary basis, will be able to provide beta site hospitals with information on how their infection rates compare regionally, and help them assess their own progress over time.

While active surveillance is not standard practice, the CDC and every professional healthcare organization have stressed hand hygiene for years. So why are infection rates climbing?

“The sociology of noncompliance is hard to understand,” Dr. Lloyd says. “One of the things I have appreciated about positive deviance is that it allows a group of people working together to transform their culture from within. Then the transformation becomes part of the culture. When you mandate something it may last for a while but rarely endures. Every hospital mandates hand hygiene, and physician compliance is about 30 percent and nurses and other providers are about 60 percent. PD provides a framework that enables all staff to create solutions to those barriers that could prevent them from doing active surveillance, hand hygiene and contact precautions,” Dr. Lloyd explains. “The closer the staff is to the solutions, the more effective and durable those solutions are. In addition to working better and being more self-sustaining, solutions that are created by the staff tend to be simpler and less expensive than those that are mandated or come from outside consultants.”



Dr. Jon Lloyd, Coordinator for the SW Pennsylvania MRSA Prevention Collaborative

Work in participating hospitals has resulted in hundreds of people coming up with hundreds of small solutions that have a huge impact... Housekeepers and maintenance employees are contributing suggestions that have been overlooked by others.

There are myriad excuses for lax hand cleaning. Doctors often say they are too rushed. Some simply doubt that hand washing matters as much as the experts say, some have thought excessive washing with sterilizers could dry sensitive skin and cause cracks that provide a pathway for bacteria. Lubricants in sterilizers take care of that worry. In one hospital a myth began to circulate that alcohol-based hand cleansers caused sterility, requiring the chief of obstetrics/gynecology to write a memo dispelling that notion. Dr. Lloyd says this minor episode reflects

the sort of emphatic resistance that can flare up when change is foisted upon people by outside authorities.

Dr. Lloyd says work in participating hospitals has resulted in hundreds of people coming up with hundreds of small solutions that have a huge impact on preventing bacterial transmission. Housekeepers and maintenance employees are contributing suggestions that have been overlooked by others. Physical therapists realized that knowing the MRSA status of patients was helpful—they could have hand hygiene dispensers available and have gowns and gloves for colonized patients who were going to use shared equipment. They could also schedule colonized patients for the end of the day, so that the room and the equipment would be cleaned and sterilized immediately after they used it. Knowing that they have the freedom and opportunity to do these things and that their leaders will remove barriers has enabled therapists to implement these and other countermeasures that have contributed to dramatic reductions in MRSA transmissions and associated infections. Having MRSA status known to staff and patients also meant both could foster precautions while transporting patients to support services such as X-ray, cardiac catheterization and kidney dialysis.

Dr. Toth observes that within weeks of initial training sessions, hospitals begin “action and discovery dialogues” which elicit observations and ideas from people throughout the organization. They consider questions that include: What am I doing to make sure I do not inadvertently spread MRSA? Does anything stand in the way of my doing it? And what ideas does anyone have to make it easier to do these things all the time? “Ideas just bubble up, and we find quiet heroes who are doing terrific things, and then more and more people volunteer,” Dr. Toth says.

In addition to The Robert Wood Johnson Foundation grant initiative, Plexus will be working with the Veterans Administration on a MRSA prevention effort. In the first phase, 18 VA hospitals will apply the three prevention guidelines and standard reporting systems used by VA Pittsburgh Healthcare System and the other RWJF beta site hospitals, and eventually the program will expand to the entire network of 160 VA hospitals.

In 2001, the VA in Pittsburgh started a MRSA prevention initiative in one surgical specialty ward of an acute care hospital. Today, Dr. Lloyd says, the VA prevention initiative is up and running in a 105 bed acute care hospital and a 275 bed long term facility. This all started because the Pittsburgh Regional Healthcare Initiative (PRHI) was asked to introduce the Toyota Production System (TPS), the industrial quality enhancement program designed by the Japanese automaker, as a methodology for redesigning care on a mixed surgical unit at the VA Pittsburgh acute care hospital. As a result of an interagency

Complex phenomena such as rampant multiplying bacteria require a complex human response, with every member of the community engaged.

agreement among the CDC, the VA and the PRHI, the PRHI was brought into train the VA staff on how to use the Toyota system in its infection prevention program. The Toyota system had many benefits, Dr. Lloyd says, especially in identifying inefficiencies, minimizing overtime and staff turnover, and ultimately giving nurses more time to tend to the details of prevention, such as organizing supplies and equipment for handy access. The prevention program spread to a surgical intensive care unit, and resulted in an 85 percent reduction in MRSA transmission in both units.

Solving the Problem from Within

“What the Toyota Production System accomplished was a breakthrough because it proved to the staff that MRSA infections were preventable, and that implementing standard surveillance and contact precautions was an effective way of doing it,” Dr. Lloyd says. The frustrating part, he says, was it was slow to spread. In four years it was operational in only two units in the acute care facility perhaps because it was a program that carried significant demands on time, resources, and experts. In 2004, Dr. Lloyd read an article about the work of Jerry and Monique Sternin from the Positive Deviance Institute at Tufts University, and it struck him that positive deviance might amplify the successes in these two units at the VA and identify other successes and ideas among the staff and patients that could lead to system wide improvements. Where TPS was an outside job on the system, he mused, PD was an inside job. In discussions with Dr. Rajiv Jain, chief of staff, and the rest of the Executive Leadership Team at VA Pittsburgh Healthcare System, a decision was made to incorporate PD as a strategy to expand the MRSA prevention efforts in the acute and long term care facilities of VAPHS

Shortly thereafter, Jerry and Monique Sternin conducted a workshop for 40 leaders and clinicians. This was followed over the next two months by “discovery and action dialogues” involving healthcare workers from all specialties and vocations whose answers to questions were collected. With a PD focus, he says, the roles of leaders change. Instead of issuing orders, leaders set direction

Beta site hospitals have agreed to apply *positive deviance*, a social change process based on the recognition that in every community, there are people who solve problems better than neighbors who have exactly the same resources.

Beta site hospitals participating in the Plexus initiative are:

- Albert Einstein Medical Center, Philadelphia, PA
- Billings Clinic, Billings, MT
- Franklin Square Hospital Center, Baltimore, MD
- The Johns Hopkins Hospital, Baltimore, MD
- University of Louisville Hospital, Louisville, KY
- VA Pittsburgh Healthcare System, Pittsburgh, PA

and create space for people in the system to create solutions to problems. Candace Cunningham, Heidi Walker and Cheryl Creen, the VA's MRSA Coordinators, asked questions and elicited answers from more than 400 staff that uncovered successful practices that were isolated and not widely appreciated and ideas that represented solutions just waiting to happen. They wrote the answers down and asked for volunteers to work on amplifying and implementing the solutions.

Monique Sternin, technical director of the PD Initiative, suggested VA patients would want to understand pathology of MRSA and how it is spread.

"That was a gold mine," Dr. Lloyd says. "Of course they wanted to know, and they wanted to help. If they were isolated, they wanted to know why. Hospital brochures were not addressed to patients, so they wrote their own brochure, in language that made sense to them, with help from the Internet and a volunteer who is a pre-med student. Now, instead of patients being the defective, passive recipients of our expert care, they are part of the solution and they love it." The recreational

therapists are working with patients to clean their hands before and after playing bingo and cards. This is being reinforced by the nursing staff who educate patients about the importance of hand hygiene before leaving their rooms and before meals. The pre-med student volunteer is now working with patients in the VA's long term care facility to develop a culture of hand hygiene using an

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"The disease known as Puerperal Fever is so contagious as to be frequently carried from patient to patient by physicians and nurseswherever they can be shown to carry disease and death instead of health and safety, the common instincts of humanity will silence every attempt to explain away their responsibility."

– Oliver Wendell Holmes, physician and poet,
whose impassioned 1843 essay on
the contagiousness of puerperal fever
called attention to medical practices that spread infection.



Dr. Margaret Toth, chief quality officer for the Delmarva Foundation

educational video and discussions in which patients who are MRSA positive are participants.

In four years, the successes of the Toyota system spread from one unit to two in one hospital. In one year, successes based on PD spread from two units to 14. In Dr. Lloyd's view, complex phenomena such as rampant multiplying bacteria require a complex human response, with every member of the community engaged, observant, and poised to interact collaboratively for the benefit of all. He observes that a year ago if the staff had been asked, "Who is responsible for controlling MRSA and other healthcare acquired infections?" they would have named our infectious disease physician and infection control nurses. Today when we ask them this question they answer, "We are all responsible, including our patients."

Dr. Toth has been encouraged by how fast new infection control ideas can be put into practice, and pleased with the opportunity for "real time" learning when partner hospitals share information—a success in one place can be tried out quickly in another. "I have also been delighted at how quickly hospitals begin working across boundaries," she says. "People in hospitals will think we really ought to be working with a long term care facility. People in a clinic will think hospitals are discussing this, but what happens when the patients come here? Boundaries dissolve, and expansion begins to emerge naturally, as does the notion that this really is community problem." ■