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Case study

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In 1847, a 29-year-old Hungarian doctor, Ignaz Phillip Semmelweis², working as an obstetrician in Vienna's General Hospital, became intrigued by a puzzling statistic: the hospital ward where the physicians delivered babies had three times the maternal mortality rate of the ward where the midwives were in charge. The cause of these maternal deaths was attributed to puerperal fever, or childbed fever, a poorly understood disease that was common in mid 19th century European hospitals. It had devastating mortality rates as high as 35%.

Driven by a desire to solve this puzzle, Dr. Semmelweis noticed that the obstetricians and their trainees spent their mornings dissecting cadavers of patients who had died of puerperal fever, followed by routine patient examinations, probing the uterus, cervix, and womb with bare, unwashed hands. When a new baby needed to be delivered, it was often done with the same unclean hands. While unthinkable today, in the mid 19th century this was fairly common practice. Dr. Semmelweis hypothesized that "cadaveric particles" introduced into the women during such

Spanning silos and spurring conversations: positive deviance for reducing infection levels in hospitals¹

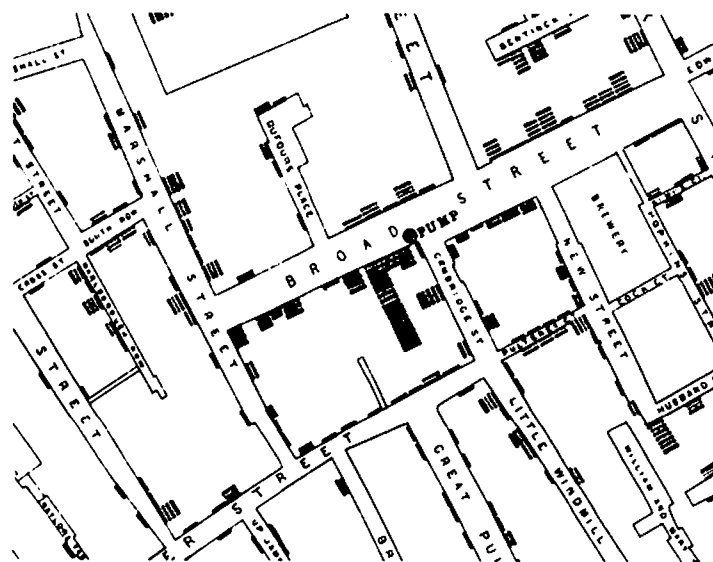
procedures caused puerperal fever and that the hands of physicians spread the infectious agents.

When Semmelweis implemented more rigorous handwashing and scrubbing procedure in the doctor's ward, most notably with chloride of lime solution (a powerful antiseptic), the incidence of puerperal fever dropped precipitously, from 17% of all patients to 1%.

Around the same time as Semmelweis' ground-breaking work on infection control, John Snow, a general practitioner in London, was involved in investigating the spread of cholera in Victorian England.³ When a cholera epidemic broke out in London's Soho District in 1854, Snow plotted the information he gathered on the deceased and sick patients on a map of the Soho area, identifying the source - the public water pump on Broad Street (now Broadwick Street).

Snow used stacked bars to illustrate the numbers of the deceased, showing that cholera cases were centered around Broad Street pump. Source: www.ph.ucla.edu/epi/snow/highressnowmap.html

Snow's data gathering confirmed that 61 of the deceased persons in Soho used to drink the pump water from Broad Street (Snow, 1855). There were only ten deaths in houses situated closer to another street pump. However, in five of these cases, Snow learned that the deceased drank the water from the Broad Street pump. Upon Snow's recommendation, the City Council removed the handle of the Broad Street water pump, ending the outbreak.⁴



1 This case draws upon the authors' previous writings, including, Arvind Singhal and Prucia Buscell (2009). *From Invisible to Visible: Learning to See and Stop MRSA at Billings Clinic*, Billings, Montana. Plexus Institute (Bordentown, NJ) and Billings Clinic (Billings, Montana), (2) Arvind Singhal, Prucia Buscell, and Keith McCandless (2009), *Saving Lives by Changing Relationships: Positive Deviance for MRSA Control and Prevention in a US Hospital*, Positive Deviance Wisdom Series Number 3, Boston: Positive Deviance Institute; and (3) Prucia Buscell (2008). *Pathways to prevention. Prevention Strategist*. Autumn, pp. 41-45.

2 W.J. Sinclair (1909) *Semmelweis, His Life and his Doctrine*. Manchester, U.K.: Manchester University Press. www.foundersofscience.net/semmelweis.htm, and en.wikipedia.org/wiki/ignaz_Semmelweis.

3 This section draws upon UCLA's, School of Public Health's web-site on John Snow www.ph.ucla.edu/epi/snow.html; [en.wikipedia.org/wiki/John_Snow_\(physician\)](http://en.wikipedia.org/wiki/John_Snow_(physician)); and the original writings of John Snow (1855) *On the Mode of Communication of Cholera*. Second Edition. London: John Churchill.

4 While the removal of the pump handle stopped further infections, the epidemic may have already been in rapid decline by then.


Authors

Dr. Arvind Singhal serves on the Science Advisory Board of Plexus Institute and is the Samuel Shirley and Edna Holt Marston Endowed Professor of Communication at University of Texas, El Paso.

Keith McCandless, co-founder of the Seattle-based Social Invention Group is co-developing Liberating Structures, self-organizing methods to help groups of people change how they interact and work together to solve complex problems and develop opportunities.

Prucia Buscell, an experienced journalist who has written extensively about positive deviance and MRSA prevention, is Communications Director of Plexus Institute.

Dr. Curt Lindberg, Chief Learning and Science Officer of Plexus Institute, is playing an important role in bringing complexity science insights and complexity-informed practices to management and healthcare.



Hospital Acquired Infections (HAIs) kill an average of 275 Americans a day in US hospitals, largely because known infection control protocols are not consistently followed in all contacts with patients.

While the science of infection control has been around for over 160 years, why do hospital acquired infections (HAIs) kill, on average, about 275 patients a day in US hospitals? One reason is that doctors, nurses, therapists, ambulance drivers and other health care workers do not consistently follow known infection control protocols, including hand hygiene and contact precautions when caring for those infected. Another is the proliferation of drug-resistant bacteria that has accompanied the burgeoning use of

antibiotics in recent decades. Furthermore, hospitals are prone to become reservoirs of infection because so many strains of bacteria coexist with numerous antibiotics and so many healthcare workers move among so many patients in such close quarters. Controlling infection in every aspect of patient care is a multi-layered and complex challenge.

A leading bacterial source of HAIs is Methicillin-resistant *Staphylococcus aureus* (MRSA), a deadly pathogen resistant to most commonly used antibiotics. MRSA

infections have increased 32-fold in the US in the past three decades. To make matters even worse, MRSA can live up to six weeks on environmental surfaces and it is easily transmitted through contact.

In the midst of this alarming reality, a handful of US hospitals have shown sharp declines in MRSA infections. At the Billings Clinic's 272-bed hospital in Billings, Montana, hospital-acquired MRSA infections have been reduced by a massive 84% in the past 2.5 years.

The Billings Clinic's approach to MRSA prevention focuses on identifying what already works, and then on finding ways to amplify these practices.



Dr. Walt Fairfax (center), a physician who gave up his tie, his white coat, and long shirt sleeves in a bid to reduce the transmission of MRSA .



Hallway scrubbing of ordinary healthcare equipment, unknown a few years ago, is now routine.

These individuals and dozens of others like them at the Billings Clinic are "positive deviants". They are "deviants" because their behaviors are not the norm and "positive" because they model the desirable MRSA prevention behaviors. As more people discover how to practice safety, the norms throughout the institution begin to shift.

Billings Clinic

MRSA Healthcare-associated infections per 1000 patient dates

What is Billings Clinic doing differently?

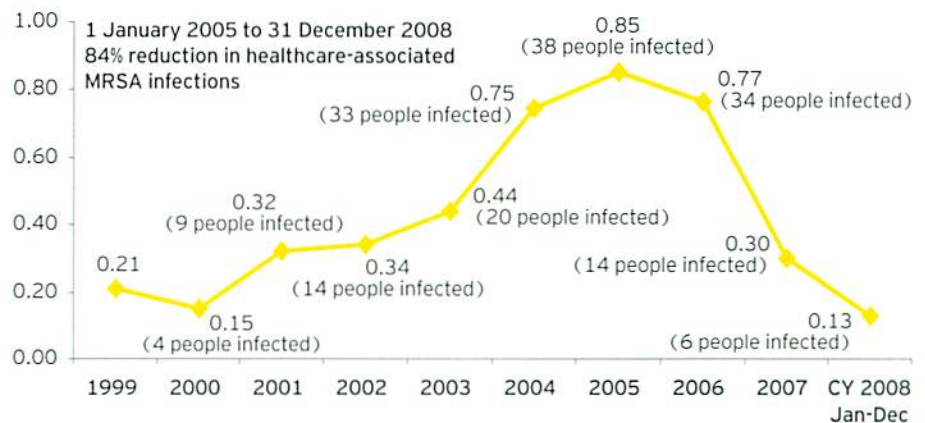
In contrast to the traditional approach of focusing on what does not work, and rewarding or punishing employees to enforce safety, the Billings Clinic's approach to MRSA prevention focuses on what works, believing that, among its vast pool of 3,500 employees – doctors, nursing staff, housekeepers, therapists, technicians, pastors, and social workers – there are individuals who practice certain simple yet uncommon behaviors that prevent MRSA transmission. For instance:

▶ A physician purposely sees his MRSA

patients last during rounds, a simple practice that greatly reduces the risk of transmitting MRSA.

- ▶ An ICU nurse disinfects the patients' side rails several times during her shift to keep MRSA from being picked up and spread.
- ▶ A nurse places a clean sheet between herself and a MRSA patient when holding the patient to avoid direct microbial transfer.
- ▶ A physician decides to stop wearing his tie, white coat and long sleeves – all vectors for the spread of MRSA infections. Many others adopt his practice.

Figure 1. Declining MRSA infections at billings clinic





Jerry Sternin making a presentation on positive deviance

Non-adherence to hand hygiene and gowning and gloving procedures was a behavioral problem, but it was usually treated as a technical one.

Tackling intractable behavioral problems

In the summer of 2004, Billings Clinic CEO, Nick Wolter MD, attended a workshop in Durham, NH, where Jerry Sternin, co-founder of the Positive Deviance Initiative at Tufts University, made an impromptu 15-minute presentation on the topic of changing ingrained behavior patterns. Sternin emphasized that the Positive Deviance (PD) approach was especially suited to address intractable social and behavioral problems.

The failure of staff to follow basic hand hygiene protocols, Wolter knew, was an intractable behavioral problem in US hospitals, including his own. Adherence to hand hygiene protocols for every patient encounter in US hospitals ranged from 29% to 48%. This meant that, more than likely, the interaction between a healthcare worker and a patient carried the risk of infection transfer. Patients expect hospitals to be safe environments, not vectors of deadly pathogens.

Wolter knew from his experience as a physician that if he washed his hands before examining a patient, it would be cumbersome to wash them again just because he answered his pager. When one's hands feel clean, the behavioral tendency is to resume interrupted work, not fully grasping the implications for infection transfer.

Nearly all MRSA infections are preventable. If hand hygiene, gloving, and gowning protocols were meticulously followed by all staff, the rates of MRSA transmission and infections would drop. However, rates were rising in spite of widely held knowledge, positive attitudes and behavioral intention to follow correct infection control procedures. Surprisingly, physicians, especially surgeons, were the worst offenders. Non-adherence to hand hygiene, gowning and gloving procedures was a behavioral problem that needed to be addressed.

Intrigued by the potential of PD approach to combat behavioral problems, and the belief in the complexity science principle that small changes can make a big difference, Dr. Wolter and Nancy Iversen, Billings Clinic's director of patient safety and infection control, championed the Clinic's participation as one of the eight beta site hospitals in a MRSA Prevention Partnership led by the Plexus Institute. The Plexus Institute is a non-profit organization that fosters the health of individuals, organizations and communities by helping people use the principles of complexity science. In 2006, these beta sites agreed to tackle MRSA as a behavioral and social problem using the positive deviance approach which is compatible with complexity science concepts.

Two and a half years later, the levels of MRSA and other infections, dropped steeply hospital-wide.

Acting one's way

"We dance around in a ring and suppose, while the secret sits in the middle and knows." Robert Frost

The Billings Clinic's MRSA prevention activities got off to a slow yet turbulent start, with moments of skepticism, anxiety and uncertainty. There were negotiations, debates, and many conversations. False starts and doubts held hands with small triumphs and joys. Nancy Iversen and her team championed the PD efforts at Billings. She recalled their biggest challenge: "How to create experiences where our people could learn for themselves, discover solutions and have a safe place to practice." PD coach, Keith McCandless, suggested "guerilla theater," which is essentially improvisational theater, commonly referred to as "improv."

"Theater in a hospital?" the skeptics scoffed.

But Iversen and her team persisted. Casting calls were made, actors recruited, and some 50 improv sessions were conducted in 2007, involving over 500 Billings Clinic frontline staff in the battle against MRSA. Another improv session took place in 2008, building on the success of the first one. Improv scenarios explored practical matters such as how to safely don and dispose of protective gear, how to transport patients with MRSA within the hospital and how to deal with infected or colonized rehab patients whose treatment

“It’s easier to act your way into a new way of thinking than it is to think your way into a new way of acting.”

Jerry Sternin

included many activities outside their rooms. The improv sessions were also used to deal with emotional issues, such as informing patients they have a MRSA infection and how to speak openly about correct procedures with those in powerful positions, for instance – physician leaders who do not follow infection prevention protocols.

In one session, several nurses and others talked about their solutions for taking food trays out of rooms for MRSA patients in isolation. One suggested disposable food trays. Another employee observed, “If you want patients to feel unwanted, like pariahs, give them a cardboard tray with cold food.” A simple solution emerged. The nurse wipes the bottom and edges of the tray with anti-bacterial wipe and hands it to someone outside the room.

In another improv session, a nurse playing the role of physician examined a patient’s leg wound that was oozing brown liquid. She paused to shake hands with the patient’s family, back-patted a nurse, touched some objects and resumed the examination. Within seconds, the patient’s body, the bedding, the hands and clothes of the doctor, the nurse and the patient’s family showed brown stains. The brown liquid – chocolate pudding – represented MRSA, making visible the spread of invisible bacteria.



Chocolate pudding: making MRSA visible

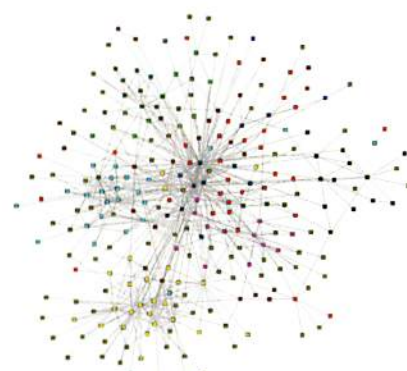
Improv participants – frontline workers from multiple units, emphasized that the improves were a fun and refreshing way of learning. It was not another lecture or briefing. The scenes provided a continuous stream of “aha” moments.

Carlos Arce, Director of Organizational And Leadership Development at Billings Clinic reflected, “Improv and positive deviance go hand in glove – improves are about ‘acting one’s way into a new way of thinking.’ Improvs provide a safe space where the unspoken can be spoken. The stage is a space of experimentation.”

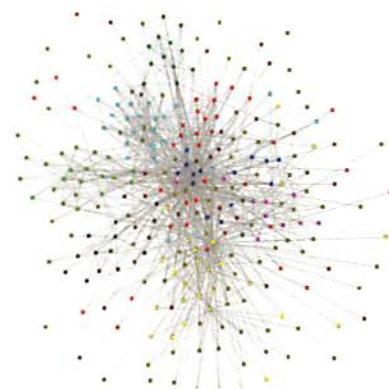
Preventing infections by changing relationships

Nick Wolter, was asked, “What explains the recent drops in MRSA infections at Billings?” His response, “Infections are being prevented at Billings Clinic by changing relationships.”

Giant posters visually displayed the changing nature of relationships among the 300-plus Billings employees engaged in MRSA prevention work. A baseline plot of interactional relationships in 2006 was placed alongside one from 2008.



Baseline social network map before PD was implemented.



Collaboration social network map 18 months after PD was implemented.

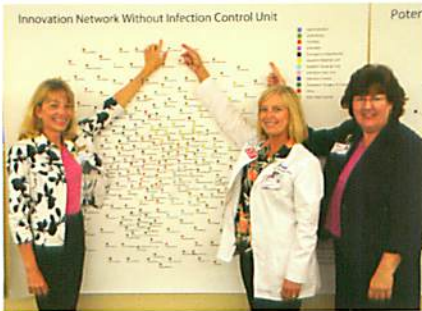
Even to the untrained eye, it was apparent that more people were having more conversations about MRSA prevention within and across units and more cross-unit collaborations were occurring to fight MRSA.

Indeed, lives were being saved at Billings Clinic simply by changing the nature of relationships and relationship patterns.

The PD approach values the wisdom of “unusual suspects” - those whose contributions may otherwise be overlooked.

Spanning silos and spurring conversations

In studying the maps with her team, Nancy Iversen found several “unusual suspects” – people who were highly connected with others and served as a resource, but who were not previously recognized as leaders in infection prevention. One, for instance, was Sarah Leland, a young oncology nurse who emerged as a “go to person.” This knowledge allowed staff to identify people they should “especially support, draw more into the MRSA prevention initiative and tap for influence.”



Network maps allowed Nancy Iversen (left) and her team to identify the “unusual suspects.”

Bathed in data

PD processes at the Billings Clinic were formulated and guided by, a constant stream of data gathering, analysis and action. In autumn 2006, when the MRSA prevention initiative was launched, piloting units made a commitment to active surveillance, which meant every patient was screened for MRSA with a nasal swab on admission, transfer and discharge. Hand hygiene and adherence to other infection control protocols were tracked and recorded and supplies, purchases and usage were documented.

The data was available for all to see and participating units displayed infection rates in colorful graphs – scorecards of their progress. Hand hygiene data was collected through anonymous observation, and the staff in each unit received a graph documenting their performance. In essence, self and peer regulation of hand hygiene procedures, substantiated with feedback data, was encouraged.

The regularly-updated and shared MRSA data has increased staff involvement, noted Nancy Iversen, “When they see the data, they see the difference their actions make.”

When data allows people to see the differences their actions are making, information acts as a self and collective motivator.

Cultural change

Many of Billings Clinic’s staff believe that the introduction of the PD approach has started a slow but palpable cultural transformation within the organization. A senior doctor narrated an experience, “A few months ago, I went into a MRSA room, not having seen the isolation sign. I had not gowned and gloved. After coming out of the room, I realized my mistake. I apologized to the nurse, telling her how I missed the isolation sign.”

“The conversation between the senior doctor and the nurse led to the re-design of the isolation sign. It has now been placed where it can not be missed.”



A doctor’s apology leads to the redesign of the MRSA isolation sign.

A year or two ago, it would have been unlikely for a senior doctor to apologize so readily to a nurse and not enough goodwill would have been present for an ensuing conversation that would help fix the problem.

If this is not a cultural transformation, then what is?