Healthcare*Papers*

New Models for the New Healthcare

Front-Line Ownership: Generating a Cure Mindset for Patient Safety

Brenda Zimmerman, Paige Reason, Liz Rykert, Leah Gitterman, Jennifer Christian and Michael Gardam

Commentary from Cathy Balding, Paula Beard, Allan Best, Suzanne Gordon, Philip C. Hébert, Susan Law, Ronald R. Lindstrom, Anne Matlow, Virginia Roth, Jessie Saul, Jonny Taitz, Svetlana Taneva, Laurel Taylor and Cameron Willis

www.healthcarepapers.com

Front-Line Ownership: Generating a Cure Mindset for Patient Safety

INVITED ESSAY

Brenda Zimmerman, PhD
Schulich School of Business, York University

Paige Reason, MPH
Infection Prevention and Control Unit, University Health Network
Formerly of Public Health Ontario

Liz Rykert, BSW
Meta Strategies, Toronto, Ontario
Formerly of Public Health Ontario

Leah Gitterman, MHSC
Infection Prevention and Control Unit, University Health Network

Jennifer Christian, MA
Formerly of Public Health Ontario

Michael Gardam, MD
Infection Prevention and Control Unit, University Health
Formerly of Public Health Ontario
Faculty of Medicine, University of Toronto

∽

ABSTRACT

Great advances have been made in standardization and human factors engineering that have reduced variability and increased reliability in healthcare. As important as these advances are, the authors believe there is another important but largely ignored layer to the safety story in healthcare that has prevented us from progressing. In the field of infection prevention and control (IPAC), despite great attempts over several decades to improve compliance with hand hygiene, surveillance, environmental cleaning, isolation protocols and other control measures, very significant challenges remain. We believe this failure is in part due to the power gradients, often dysfunctional relationships and lack of safety mindfulness that exist in hospitals and healthcare more generally. Furthermore, safety culture requires different approaches and considerable ongoing attentiveness. If this is the case, and the authors contend in this paper that it is, then the role of the front line is much more important than many of our healthcare safety and IPAC approaches suggest.

AT A MEETING in May 2012 of the Canada Chapter of the International System Safety Society, members of the aviation, military, nuclear power, marine, rail and road transportation industries mingled with people from healthcare. The safety concerns across the industries were similar, but all at the meeting commented that healthcare was a real laggard in terms of truly creating resilient safety cultures that engage everyone in safety work. Healthcare safety topics discussed that day ranged from employee safety to patient falls to medication errors, but they primarily focused on infection prevention and control (IPAC).

Great advances have been made in standardization and human factors engineering that have reduced variability and increased reliability in healthcare. For example, much work has been done to improve medication preparation and delivery, such as instituting double-checks with a second staff member for dangerous medications and checking patient identification before initiating therapy. As important as these advances are, we believe there is another important but largely ignored layer to the safety story in healthcare that has prevented us from progressing. In the field of IPAC, despite great attempts over several decades to improve compliance with hand hygiene, surveillance, environmental cleaning, isolation protocols and other control measures, very significant challenges remain: healthcare-associated infections (HAIs) are the fourth-leading cause of death in Canada, and many of these infections are preventable (Canadian Nosocomial Infections Surveillance Program 2007).

We believe this failure is in part due to the power gradients, often dysfunctional relationships and lack of safety mindfulness that exist in hospitals and healthcare more generally. Furthermore, we suggest that healthcare safety still lags because of a lack of awareness that safety is perishable, and because we fail to

A GUIDE TO ACRONYMS

EBM	Evidence-based medicine	**MRSA**	Methicillin-resistant Staphylococcus aureus
ED	Emergency department		
FLO	Front-line ownership	**PBE**	Practise-based evidence
HAI	Healthcare-associated infection	**PD**	Positive deviance
IPAC	Infection prevention and control	**SARS**	Severe acute respiratory syndrome
LS	Liberating structures	**VRE**	Vancomycin-resistant enterococci

understand the type of approach and degree of effort needed to forward the safety agenda. In other words, safety culture requires different approaches and considerable ongoing attentiveness. If this is the case, and we contend in this paper that it is, then the role of the front line is much more important than many of our healthcare safety and IPAC approaches (which are based largely upon hoping staff will follow lists of instructions) suggest. We believe that *if people cannot take care of a problem, they won't see a problem*. To increase attentiveness – or the ability to see a problem – we need to ensure those workers who are closest to the patients are vigilant at all times; that is, safety must always be front of mind. Owning the problems expands and deepens one's awareness of their context and increases one's capacity to see problems and solve them.

Over the past several years, we have studied and experimented with different approaches in an attempt to foster resilient safety cultures in healthcare. Part of this work has included a study in which we actively engaged front-line staff in five Canadian hospitals to develop their own solutions for preventing HAIs. Rather than asking the hospitals to adopt a particular IPAC intervention, as would be the case in a traditional IPAC study, the intervention was engagement of front-line staff. Out of this study grew an approach termed *front-line ownership* (FLO), which we detail in this paper. Quotations from interviews of front-line staff in our study are presented throughout the paper.

The FLO approach is a departure from the prevalent healthcare culture where leaders lead, sell or promote ideas to front-line workers so that they will buy-in and follow the lead or implement the plans. Buy-in and ownership are opposite concepts. Ownership involves those doing the work developing the ideas, making the decisions and designing and acting on the plans, whereas buy-in involves agreeing to follow practices that have

been externally imposed. In fact, we argue that buy-in is a sign of trouble because it is likely to decrease the attentiveness or mindfulness of workers, who are encouraged to just follow orders. Top-down policies originating from leaders who likely do not understand the realities of front-line work ignore the challenges of changing human behaviours and habits and are unlikely to create sustained improvement (Flanagan et al. 2011). We propose that the FLO approach holds great promise to change the way safety and IPAC are addressed in hospitals and other healthcare institutions.

Outline of the Clinical Problem

As previously mentioned, HAIs are a serious concern: in fact, roughly one in 10 hospitalized patients develop infections, many of which are entirely preventable (Canadian Nosocomial Infection Surveillance Program 2007). Methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE) and *Clostridium difficile* are three bacteria known to spread in hospitals. Despite decades of IPAC guidance, healthcare-associated MRSA, VRE and *C. difficile* remain a significant problem (Canadian Nosocomial Infection Surveillance Program 2005, 2006; Health Protection Agency 2011; Siegel et al. 2007). Rather than a lack of effective control strategies, experience suggests that a large part of the problem results from deeply rooted behavioural issues. Healthcare workers generally know the actions, such as hand hygiene, that prevent these infections, but they are not consistently following them (Gardam et al. 2010). We came to use the FLO approach because we had been struck by the repeated lack of success using traditional education-based methods, and we felt FLO would be appropriate for highly complex systems as it could address many of the behavioural and culture challenges that are resistant to change (Glouberman and Zimmerman 2002). By creating an environment for staff to interact

and communicate in new ways, we aimed to reduce HAI rates and improve the safety for patients and staff.

Two Logics of Safety: Anticipation/ Prevention and Containment/ Resilience

Weick and Sutcliffe (2007) describe two underlying logics in safety: (1) anticipation and prevention and (2) containment and resilience. The second logic – containment and resilience – is built on the premise of the unpredictability of complex contexts and, hence, the need to be able to respond effectively to unanticipated events. The first logic – anticipation and prevention – is a laudable goal. We do not want our work to in any way diminish the efforts in this arena. And we think our study shows that giving both of these logics legitimacy in organizations increases the chance of success with IPAC and safety more generally. However, our starting assumption is that surprise is ubiquitous in healthcare. For example, on any given day in a busy emergency department (ED), the next patient coming through the door could be the first case of a future outbreak, such as what happened in Toronto in 2003 with severe acute respiratory syndrome (SARS).

The first logic, anticipation and prevention, has gained such legitimacy in healthcare, both in the literature and in practice, that it overshadows the equally powerful second logic. Indeed, most current IPAC guidelines are based firmly on this logic, even though those involved in the field readily acknowledge that a lack of compliance with "best practices" limits their usefulness. We believe it is naive to assume that in a complex human endeavour such as healthcare, surprise will be eliminated. "Human fallibility is like gravity, weather, and terrain, just another foreseeable hazard" (Reason 1997: 25, as cited in Weick and Sutcliffe 2007: 68). To continue with the

above example, it is thus reasonable to anticipate that the existing ED preventative surveillance system may miss the patient's contagious symptoms and not isolate the patient, thus starting a chain of infection that will allow the pathogen to spread to staff and other patients.

The second logic, of containment and resilience, accepts that surprises and hence errors are inevitable *and* requires the culture to be ever vigilant at mitigating the impact of errors. It is important to note that human or biological resilience is very different from engineering resilience. Human resilience relates to a flexible, highly interconnected system that is able to confront, contain and adapt to surprises, whereas engineering resilience relates to a structure being able to bend yet snap back to the status quo: "The only realistic goal for safe and reliable performance in complex organizations is resilience – to develop a maximum capability to catch, correct and learn from surprises as they arise – to develop a kind of intrinsic resistance to operational hazards" (Carthey et al. 2001, adapted by Sutcliffe 2012, May).

"Things that never happened before, happen all the time" (Sutcliffe 2012, May). The challenge of managing complex systems, such as healthcare, is that no one is capable of imagining, deducing or experiencing all of the ways it can generate unexpected results (Weick and Sutcliffe 2007: 44). If the unexpected is everywhere, the next skill set and attitude change in the evolution of safety culture involve the capacity to perform reliably no matter what surprises occur. And this, in our minds, refers to all levels of the organization but, most importantly, the front line as this is where surprise typically manifests. "In the reactive world of the unexpected, the ability to make sense out of an emerging pattern is just as important as anticipation and planning. And the ability to cope with the unexpected requires a different mind-set

than to anticipate its occurrence. The mindset for anticipation is one that favours precise identification of possible difficulties so that specific remedies can be designed" (Weick and Sutcliffe 2007: 69). Resilience is about containment or mitigation rather than anticipation. "The fundamental characteristic of a resilient organization is that it does not lose control of what it does but is able to continue and rebound" (Hollnagel et al. 2006: 348). We believe that FLO increases the attentiveness of staff to problems as they occur and, hence, has the capacity to increase a system's resilience or containment of safety errors.

We want to promote the skill set, mind set, perspectives, structures, practices, relationship networks and capacities needed to reduce and contain safety problems through increased resilience. This is not to suggest ignoring foresight and anticipation, but it does propose being mindful of their limitations (Weick and Sutcliffe 2007: 80). Anticipation is to prevention what resilience is to cure – the ability to respond when presented with errors. We believe the next evolution of safety culture in healthcare will involve recognition that a cure mindset for safety is critical. To be effective, this cure mindset must permeate the organization and shift leadership for creating solutions for errors to those who are at the front line.

Underpinnings of the FLO Approach
In the genesis of the FLO approach, we drew from positive deviance (PD) as our theoretical frame and complexity science's study of complex adaptive systems and resilience. We used organization development approaches consistent with these theories such as social network mapping and a series of intervention techniques called liberating structures (LS) (McCandless and Lipanowicz 2012). to increase the level of IPAC engagement at the front line.

We believe this combination of theories

and practical tools turns the focus of change efforts from *what* needs to change or the technical dimensions of change to *how* change happens or the social dimensions of change. Too often we ignore the *how* of change. We assume in healthcare that if people know what to do, then behaviours will change: indeed the current IPAC model relies very heavily upon education as its primary weapon to improve compliance with practices. Yet time and time again, we find that knowing what to do is not enough to change fundamental ingrained behaviours.

PD is not about selling an idea to spread the best practices. Rather, it is about participatory peer learning, experiential or action-based learning. In essence, it is about social proof. "The basic premise is this: (1) solutions to seemingly intractable problems already exist; (2) they have been discovered by members of the community itself; and (3) these innovators (individual positive deviants) have succeeded even though they share the same constraints and barriers as others" (Pascale et al. 2010: 4). The key to PD is that the local system or community must make the discovery itself. It determines how change can be disseminated peer to peer through the practice of new behaviours – not through explanation or edict (Pascale et al. 2010). The discipline in PD is resisting the urge to tell people what to do once one has discovered what has worked. Hence, PD is antithetical to the dominant change model in healthcare today.

We originally chose PD as our approach to bringing about culture change and improved safety because it had been successfully used to sustain reductions in healthcare-associated MRSA infections (Robert Wood Johnson Foundation 2009). This sustained quality or "stickiness" (Heath and Heath 2007) is a critical factor often missing from IPAC initiatives where change tends to be transient. As our work evolved, however, we found that PD needed to be augmented

with lessons from complexity science and we needed additional engagement tools termed LS to reach front-line staff. These additions were necessary because we learned that the existing culture frequently had prevented front-line ideas from being implemented: there was sometimes a dearth of behaviours derived from the front line even though staff had good ideas about how they might improve if given the chance. These methods enabled our approach to be adapted to a wide variety of settings and to be accepted by the participants. We named this approach FLO because it provides perspectives and tools for front-line staff to work in new ways that help them break current patterns of engaging that are leading to the status quo. And, in the end, we realized that these concepts and approaches needed to live in a dynamic tension with the dominant evidence-based medicine (EBM) model.

Complex adaptive systems such as healthcare cultures are highly adaptable and resilient. They manifest emergent self-organizing outcomes that are created by the relationships or connections between the agents or parts of the system. We found that the FLO approach directly affected and changed how staff interacted with one another, which was critical to our eventual success as the relationships in a complex adaptive system determine its outcomes. These relationships include personal interactions and power differentials, resource flows and behaviour patterns or habits that repeat. We find the explanatory power of complex adaptive systems helpful to understanding how change happens, or doesn't happen, in healthcare systems.

> "Before, managers would tell staff what to do without taking into account their voices, knowledge, experience and skills."
> – *Healthcare staff*

LS are a series of facilitation tools that use simple rules to encourage inclusion, listening and engagement. The tools are easy and quick-to-learn microstructures that enhance relational coordination (see liberatingstructures.com). Examples of LS include TRIZ, a reverse engineering approach to design a system with the worst possible outcomes, which in turn highlights the design flaws in a current system. They also include improvisation, where participants act out a common scenario played out in hospitals to bring to light the patterns of behaviour that are holding the system in its current configuration. Some LS are designed to deepen the listening and peer advice in groups (Wise Crowds) or to increase the generative potential in a team (STAR). All LS are designed to be largely self-facilitated, be entertaining and require a minimal amount of time and a very short learning curve.

Context and Social Proof

> *It won't matter how intelligent and persuasive the arguments for change may be if we cannot convert them into practical approaches.*
>
> "The Clinician's Dilemma,"
> *21st Century Medicine*

Context matters, and importing solutions from "outside" runs the risk of missing key nuances in the local context that could change the intended outcomes of the prescribed solutions. One of the lessons from complexity science is the extreme context specificity of solutions. In effect, part of the social proof of IPAC practices involves a deep understanding of the local context. We contend that much of the dominant change approaches in healthcare involve attempting, often unsuccessfully, to import best practices (based on scientific proof or evidence) from one context to another.

This ignores the social aspects of changing human habits (Flanagan et al. 2011).

> "When a solution was presented to [staff], there was a tendency to find fault or a reason why it wouldn't work."
> –*Manager, Security Department*

> "Usually it's somebody telling you what to do, so they're somebody else's changes. And this way it involved the staff, getting them involved and taking ownership of the changes."
> –*Infection control practitioner*

Social proof involves knowing through doing or behaviour. Actions are used to create ideas. As Jerry Sternin, the father of the PD movement, used to say, "It is easier to act your way into a new way of thinking than to think your way into a new way of acting." This is the underlying logic of PD, whereas the predominant anticipation approach is about thinking first and acting later; that is, if one understands the reasons why change is necessary, then change will follow. The containment or resilient safety logic flips this traditional order on its head: "Resilience encourages people to act while thinking or to act in order to think more clearly" (Weick and Sutcliffe 2007: 71). The activities involved in FLO, particularly the LS tools, are designed to increase local learning through actions and reflecting on actions taken.

We and others postulate that social proof is also critical to the practice of medicine, although its importance is frequently ignored. EBM has dominated the literature in the past decade and is based on scientific proof. As valuable as this paradigm has been in medicine, it needs to be balanced with practice-based evidence (PBE), which has received relatively little attention in the medical literature (Duggal and Menkes 2011). It derives its power from experiential evidence (both from the clinician and the patient). PBE addresses the evidence gap that is inevitable in EBM, which is based on large groups of patients rather than specific individuals. Helpful as it is to know what generally works for most patients, clinicians still need to understand the specific nuances of a patient's illness and social context in order to prescribe solutions that will be effective for that patient.

> "*It is easier to act your way into a new way of thinking than to think your way into a new way of acting.*"

EBM and PBE are focused on the clinical interactions between a clinician and patient. We believe similar analogies exist more broadly in understanding organizational change in healthcare settings. In IPAC, scientific proof is derived from knowing the behaviours that will result in preventing or reducing the spread of infections. Scientific proof is essential in healthcare; but without social proof, time after time we have seen great ideas that do not reach their full potential in practice. We have known for decades what healthcare workers need to do to prevent the spread of infection; however, any IPAC practitioner in the field will readily admit that these practices, such as hand hygiene, are not followed well. We believe the perishability of safety and reliability is in part due to the lack of social proof. We contend that *knowledge* that a specific behaviour such as compliance with hand hygiene is necessary but largely insufficient to change the most ingrained habits in organizations. In these situations, social proof encompassing actual *behaviours* or observed *behaviours* of peers is needed to fundamentally change patterns in healthcare systems.

Relationships: Need for Increased Interconnectivity

Complex situations call for increased interconnectivity. Organizations or subsets of organizations overcome error when there are high levels of interdependence among people with varied experiences; this allows for the application of a richer set of observations, insights and resources. Increased attentiveness and resilience require denser webs of relationships in organizations. As interconnectivity increases, the healthy redundancy of a system increases (Newman et al. 2006; Wellman 2008). In other words, more eyes will be paying attention to the same issues, and there will be less risk of being dependent on a few key players, such as the IPAC workers. Using social network mapping, one can see how the social network of a system changes over time.

The FLO approach is not an intervention that offers a linear set of steps in order to reach a desired outcome. This approach does not yield solutions that can be copied from one setting where it worked, and then re-applied in the same way in a new setting and expected to work just as well. Instead, the FLO approach is context specific; and although the basic approach is consistent, the way in which it manifests will vary widely.

This approach usually begins with bringing together a group of interested persons who are willing to work on a problem *identified by the group* rather than something insisted upon by the traditional experts or leadership. It is important that everyone be *invited* rather than required to participate. LS are then used to engage the group members in a variety of ways and to get them thinking about the problem differently than they would have previously. The group members are then left to take the actions they deem necessary and re-group at regular intervals in a way that is determined by those involved. The group decides what solutions to implement,

how often to meet and who to include in the process. Typically, the FLO approach takes several months to a year to take hold, so this pattern of meeting as a group and then acting and meeting again is repeated over the necessary period of time. Depending on resources, coaching may be provided to help groups stick to the principles and break from the traditional patterns of engaging and functioning.

This approach focuses on the work being led by the front line, with traditional leadership adopting more of a supportive role. Simply put, with the FLO approach, staff are engaged to identify possible solutions to IPAC problems, such as poor compliance with isolation practices, and then allowed to adopt their own solutions. Minimum specifications (e.g., IPAC guidelines) are used to help structure and guide the work. The FLO approach is highly adaptable and fluid, which allows it to be used in a wide variety of settings and to be accepted by participants.

> "I liked the whole idea of identifying issues that surrounded us as front-line workers – identifying those issues and coming up with solutions that would suit us as opposed to having administration tell us how to [change]." –*Nurse*

> "It is a good way to point out the things that [staff] are doing wrong, but they're identifying it so they don't get defensive." –*Infection control practitioner*

> "There was never a lack of ideas. If people were asked, they always came up with ideas." –*Nurse*

The FLO Study

Following these principles, we undertook an 18-month study at five self-selected Canadian hospitals where we taught groups of health-

care workers to use the FLO approach, along with providing local and remote support. Self-selection was particularly important in choosing study sites as we wanted to work with organizations that were open to trying a very different approach.

We hypothesized that this intervention would create a more resilient culture where front-line staff would become more aware of HAIs, which would in turn result in changes in their actions and attitudes. Four of the study organizations focused their intervention on specific units, whereas one hospital introduced the intervention organization-wide. While we included more traditional measurement of HAI rates before and after the implementation of FLO in our analysis, we felt that measurements of organizational culture and behavioural shifts would be more relevant to our hypothesis. Furthermore, while we hoped this approach would result in fewer patient infections, we were even more interested about whether FLO would result in a more resilient culture where prevention breaches and other surprises would be more rapidly detected and acted upon by front-line staff.

We required study sites to prospectively measure several traditional IPAC indicators, including monthly healthcare-associated *C. difficile*, MRSA and VRE rates, volume of alcohol-based hand rub (ABHR) and soap used and the number of gloves and gowns used. While data definitions were mostly standardized, some local variation was permitted as hospitals were only being compared with themselves. We wanted them to own the monitoring of their progress against their history.

To measure changes in healthcare worker relationships and social interconnectivity, we generated pre- and post-intervention social network maps. Staff were surveyed at each hospital using a survey tool and mapping software (Smart Network Analyzer Web Survey Tool, June Holley's Network Weaver;

http://www.networkweaver.com/?page_id=2) to determine who they interacted with to control HAIs, and the information was used to develop the maps. The maps were used to measure changes in the way staff were interacting around IPAC issues, and they were also used to strategize how best to continue to weave the network to promote better communication and infection prevention.

At the conclusion of the study, 34 semi-structured interviews were conducted with key informants at all sites. The purpose of the interviews was to gauge whether local culture and behaviour changed over the course of the study, specifically around IPAC-related beliefs and attitudes. Purposive sampling was used to select key informants who were engaged in the project in various capacities and included senior leadership, managers, nurses, physicians, housekeepers and other front-line staff. Two interviewers conducted each interview in person, for approximately one hour. The interviews were audio recorded with permission from participants, and detailed field notes were taken following each interview. The interview recordings were subsequently transcribed verbatim for analysis. The interviews were reviewed using a priori codes to categorize the data based on topics outlined in the interview guides. The research team reviewed three interview transcripts, and amendments were made to the coding scheme as salient themes emerged in the data. Qualitative software (QSR-NVIVO 8, QSR International, Doncaster, Australia) was employed for thematic grouping and data management.

Study Results

We were encouraged and somewhat surprised to observe that the combined organism rate on the study units compared with their respective hospitals decreased roughly by half over the duration of the study. The majority of units witnessed a decrease in the combined rate compared with their respective hospital

rates; however, two units did not. On these units, we were particularly curious about whether the FLO approach had influenced how front-line workers responded to increasing rates of HAIs and outbreaks.

> "You have to show that it's going to have a measurable impact. You know, you can say that it's going to impact the way people communicate, it's going to impact the way your unit runs, but really in the end you have to show that there's a measurable outcome." –*Infection control practitioner*

There was a clear general decline in the combined organism rate over the first year of the intervention at one hospital; however, near the end of the study, the organization experienced a large *C. difficile* outbreak. This event had a strong influence upon the organization's commitment to and success in antimicrobial stewardship, which will be described later. Another hospital had previously not experienced any significant VRE activity; however, 9 months into the intervention period, the intervention unit experienced a large VRE outbreak that spread to other units of the hospital. The rate was further increased by enhanced case finding on that unit. Importantly, front-line workers on this unit felt they approached this new outbreak in a very different manner than previous outbreaks. Referring back to the second logic, that of containment/resilience, we heard in our interviews that this outbreak was recognized earlier and responded to more effectively than in the past. Rather than waiting for IPAC staff to tell them what to do, the staff began problem solving and addressed a number of practice and process issues on their own. This shift was

attributed to an increased sense of vigilance and the capacity to react faster due to a change in social networks.

Analysis of the process measures (the use of ABHRs, soap, gowns and gloves) failed to reveal meaningful trends, likely due to difficulty in obtaining complete data from the intervention sites. Referring back to the concept of social proof, however, several staff commented in the interviews that people were wearing gloves and gowns more often, as well as using more ABHR. Finally, hand hygiene compliance at the only hospital that measured this as a process measure increased by 30% over the intervention period.

> "[The front-line staff have] been able to actually reduce the rates, which has been very encouraging." –*Nurse*

Social network mapping revealed a great deal of information on shifting staff relationships. Table 1 shows the mean pre- and post-intervention interconnectivity, which is a measure of the number of staff members a given person interacts with on a regular basis about a particular issue, in this case HAIs. Although one organization experienced only a modest increase in interconnectivity, the other four saw relatively impressive increases, with one organization almost

Table 1. Percent change and interconnectivity scores for each healthcare organization, expressed as links per node

Organization	Pre-intervention (Links per Node)	Post-intervention (Links per Node)	Change (%)
1	24	33	+38
2	37	69	+88
3	50	63	+26
4	31	32	+2
5	25	31	+24

doubling its value. This positive shift indicates that staff became more integrated and inclusive after the FLO intervention.

In addition to numerical analysis, hard copies of the social network maps were created to visually display how individuals related to one another in each unit. The organization with the largest increase in interconnectivity (88%) experienced a visible shift in both social network density and interdisciplinary teamwork (Figure 1). In general, IPAC networks tend to operate as a hub-and-spoke model and engage a small number of IPAC experts at the centre of the network who drive the work. This pattern suggests a less resilient network: in a sense, it signifies that IPAC owns the problem. The FLO approach facilitated a shift toward a more dense, redundant and multidisciplinary model, thus making more resilient networks that were less dependent on IPAC professionals. We would predict this shift in network structure to result in patterns of interaction and behaviours that would be sustainable or "sticky" (Heath

and Heath 2007).

> "I was getting to the point where I felt like I took the ideas and I fixed it for them, and I didn't want to be that person anymore; I wanted to be able to engage people in changing their own environment. I stopped being the one to do it, and this seemed to give me a tool to follow." –*Nurse*

The interviews revealed some key paradoxes or tensions between existing traditional behaviours and those that emerged through the FLO approach (Table 2). Both sides of the paradox were evident in all organizations. The left-hand column highlights the ideas that are associated with the dominant hospital culture, whereas the right shows those emphasized through the FLO approach. Two coexisting systems or perspectives were revealed in the interviews, and we feel these systems allowed for greater breakthroughs in idea generation and behavioural changes. For

Figure 1. Social network maps from the organization with the highest percent increase in interconnectivity

Pre-intervention

Post-intervention
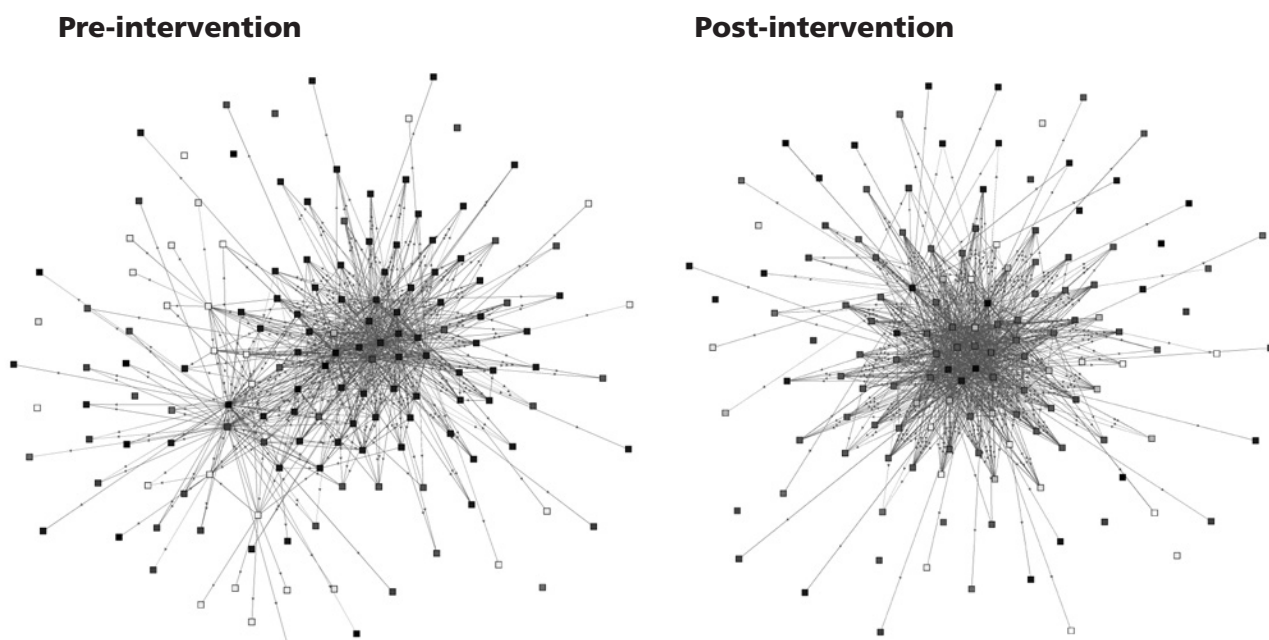
The various nodes indicate different job types.

example, traditionally there is a strong need to get things done quickly based on a perception of best practice; however, there also exists a strong desire for discovery and learning that may question or modify such practices to better fit the local context.

the value of front-line workers taking ownership for IPAC and made time for staff to meet, huddle and design new approaches. Hence, one of the key skills of effective managers working with FLO was knowing when to step back and not direct efforts.

Table 2. Paradoxes or tensions identified in the qualitative interview data

Traditional Healthcare Culture	Emergent Culture
In a "doer" culture, a need exists to get things done immediately	Taking the time for discovery and learning
Evidence-based practice (scientific proof)	Practice-based evidence (social proof)
Information/data are trusted	Stories and relationships are trusted
Culture change is complicated	Changes can be simple
Leaders need to "step up"	Leaders need to "step back"
Top-down leadership from traditional leaders	Bottom-up leadership from the front line

As previously mentioned, evidence-based practice is the legitimate mode of decision-making in healthcare, but social proof or PBE is also a natural mode of sense-making and decision-making. Traditional evidence sometimes preceded and sometimes followed changes in practice. The role of leaders was intriguing in that they needed to fluctuate between knowing when to "step up" and make a decision and when they needed to "step back" and let the decisions emerge from the front line. Neither top-down nor bottom-up leadership totally captured the change processes we observed. Instead, these two modes were in a dynamic tension. Sites where the two sides of the table coexisted in dynamic tension showed the greatest shift in the broader ownership of IPAC issues by all members.

Front-line managers were crucial in the culture change. Most of the sites had engaged front-line managers in FLO. They recognized

"It's definitely had a positive impact for our staff. I think that they believe they can make a positive impact on direct patient care, where before I think they felt they could only make a transitory impact where they could just offer contributions and ideas but had no real power to make a change…They're proud that they could use their own skills, their own knowledge of how the hospital operates and contribute in an area where they never had the opportunity before. …I think that's the biggest cultural shift that we've noticed for our department. Just the recognition that [the front-line staff] see a lot, and they may have good ideas of how to fix it." *–Manager, Security Department*

The engagement of individuals not normally part of IPAC-related issues, called "unusual suspects," enabled access to new ideas and approaches and encouraged new relationships. One example is a group of information technology (IT) personnel who created and led the "Wipe Before You Type" keyboard cleaning campaign. This novel participation of unusual suspects in IPAC issues played a critical role in the engagement and ownership among front-line staff that was observed with this work.

"I think that the thing that probably I focus on more now is relationships, whereas before it would have been more about information…I'm more cognizant of the interaction, the relationship and the information I provide back…as potentially fuelling further quality of improvement."
—Physician, infectious diseases

Although we saw the dynamic tension between the two sides of the paradox as ideal, we also saw the risk that one side of the paradox could overpower the other. In particular, we witnessed the dominance of traditional approaches in the language and highly directive-stated policies of many hospitals. This has the potential to dampen the impact of the FLO innovations and their sustainability. The goal of "all workers in the hospital believe they are IPAC agents" is elusive without using the best of both sides of the paradoxes.

There was frustration when progress had been made with FLO but was later undermined by a change in leadership or policy. FLO does challenge the traditional power structures. Once people have a taste of shared ownership and, hence, power, they can feel cynical if it is taken away. The risk of starting FLO but not fully embracing it is even greater resistance to top-down change directives.

"[We had] a whole environmental team that was so engaged and wanted to change practice. Then [administration] brought in these external contractors … The [environmental team had been] the most engaged, and they became very disengaged because it was actually a big blow to morale and they just felt that the way the institution was moving, they weren't going to be heard." *—Manager, IPAC*

"In my opinion, what we need is the support of senior management. Not just the support of "Go team go," but actually them saying, "Okay, this is where we flip the iceberg and … this is one of the methodologies that we now use within the organization." *—Clinical leader*

What Does FLO Look Like in Practice? How Does It Impact Change and Culture?

The FLO approach complements more traditional quality improvement techniques for patient safety. FLO helps participants to engage in novel and provocative ways, which in turn sparks creativity, excitement around the work and ownership over the work. Rather than providing detailed patient safety recommendations and guidelines that can be found in other places, FLO uses LS used to help healthcare workers to become engaged and begin to approach their work differently. FLO is typically implemented in a setting where a seemingly intractable problem has been identified.

Although the FLO approach was introduced to each of the study sites in the same way, the resulting actions and interventions varied widely between the sites. This was anticipated, based on FLO's emphasis on creating local and context-appropriate solutions. Over the 18-month study, each site implemented a wide variety of practice changes, and we highlight a few of them here as examples. At one hospital, a nurse identified she had observed a doctor removing a dirty gown after exiting an isolation room, and then disposing of the gown in a clean-linen bin instead of the dirty-linen bin. Other staff agreed this was a long-standing issue on their unit that needed to be addressed. This issue was raised in a group setting with both doctors and nurses present, and it was decided that the linen bins needed signage so that it would be clear to everyone which was clean

and which was dirty. (This was something regular staff on the floor knew, but transient staff had a harder time identifying.) The solution was suggested to create clear labels for each type of bin. This solution was very successful on the unit where it was originally implemented, and it ended up spreading organically to other units throughout the hospital. Eventually, the labels created went health-authority-wide, so that other hospitals could use this solution. The success of this deceptively minor initiative was due to the fact that the front-line staff created a sense of ownership and identified both the problem and the solution. Staff repeatedly referred to this change as a critical turning point in their approach to controlling infections, as this was the first time they had ever seen one of their ideas be put into action.

The hospital that suffered a large *C. difficile* outbreak during the study identified inappropriate antimicrobial use as an important issue that they felt was contributing to their outbreak; therefore, a group of front-line staff created an antimicrobial stewardship committee that would help inform the development of an antimicrobial stewardship program at their hospital. They met with staff in the intensive care unit (ICU), including physicians and nurses, to have a conversation about antimicrobial stewardship: what would it look like on their unit, and how they would know a patient was at risk of an antibiotic-related infection. Next, they came up with a list of antibiotics that they felt were often being overused, as well as a list of some conditions that seemed to be at higher risk for the development of infections related to antimicrobial use, such as *C. difficile*. The role of the nurses made them implicitly more likely to be able to identify the early signs of *C. difficile* or other negative effects of antibiotic overuse. The work then became about the nurses being vigilant, learning to accurately read all

laboratory results and focusing on increased communication between the nurses, doctors and pharmacists. The program has since been expanded to other units beyond the ICU and has become a model for such programs across the country. Of the shift that has happened through the implementation of this program, a physician in infectious diseases at the site stated how in the past, infectious disease specialists were often seen as outsiders, imposing rules and guidelines on staff. With FLO, the physician stated, "It's not me against them; it's everyone together for the patient."

The same hospital had a group of unusual suspects come together to lead the aforementioned initiative based on wiping down IT equipment between uses. The initiative was termed Wipe Before You Type and was led by three staff members from the IT Department, who came up with the idea themselves and then spearheaded its implementation. They collaborated with IPAC to help identify a clinical area interested in finding a better way to keep IT equipment clean in order to keep staff and patients safer. They started on two in-patient units, taking photos of all IT equipment and providing descriptions of how to clean them appropriately. Staff on the units worked with the three IT staff to help identify other frequently touched items for wiping on the unit. They decided on a system whereby staff would routinely wipe down equipment three times a day at shift changes and reporting times. The program's success later spread to other areas of the hospital, and the group from IT continue to be approached by others around the hospital to come to their area and help them start their own Wipe Before You Type initiative.

Several sites participating in this study experimented with the use of improvisational theatre, or "improv," in order to engage staff in their work around reducing infections. One site in particular had great success through

the use of this LS. The staff staged a familiar scene in front of other staff on their unit, in which a fictional nurse dubbed "Nurse Jackson" was moving from patient to patient without performing hand hygiene or using the appropriate personal protective equipment. The skit was such a success that it stuck with those who witnessed it, and calling out "Nurse Jackson!" turned into a phrase that staff in the hospital would use to remind each other if they noticed a colleague missing a handwashing opportunity or some other routine IPAC practice. The use of this reminder phrase later spread beyond the unit that conducted the improv and became part of the infection prevention culture hospital-wide. Other sites used improv involving the use of washable paint as a visible surrogate for bacteria to illustrate how common practices could spread organisms around the facility. This way of making the invisible visible was found to be fun and memorable.

Conclusion

Dr. Ross Baker recently reviewed the progress of Canadian patient safety initiatives over the past decade and noted, "Despite clear goals and considerable investments to improve patient safety, the gains have been limited" (Baker 2012: 8). After reviewing the literature and engaging in this unorthodox improvement study, we conclude that a main reason for limited success has been a traditional focus on adverse event anticipation and prevention at the expense of approaches that build system resilience and redundancy (Table 3). This approach relies heavily upon education, based on the assumption that if front-line staff knew and understood what they needed to do, they would do it. Our experience and the work of others suggests that while education and making practices easier to follow through the use of practice bundles are important, they are not sufficient to bring about sustained change. The FLO approach addresses the elephant in the room, namely that front-line staff actually know what steps need to be taken to improve patient safety, but that they have not be engaged in a way that encourages them to become part of the solution.

We have found that surprise is inevitable in healthcare, and we need to be ever vigilant, especially at the front lines. No preventative system will ever be perfect, especially in the realm of infectious diseases, where pathogens are constantly changing and emerging.

We and others have learned that context matters. While best practices are clearly important, importing solutions from elsewhere is often problematic. Rather than enforcing foreign solutions, we suggest that engaging front-line staff with the FLO approach will allow different groups to attain best practices in ways that make sense for them in their setting. While rebuilding the wheel may intuitively seem inefficient and unnecessary, we have found it to be an integral part of the ownership process. On that note, the difference between ownership and buy-in cannot be overstressed. Buy-in is frequently what patient safety initiatives hope to achieve; yet, again, there is ample evidence that this goal will not result in sustainable change.

Table 3. Study conclusions

A focus on system resilience and redundancy is critical to building healthcare safety culture.
Accept that surprise is inevitable and that prevention will never be perfect.
Context matters and will typically trump the importation of foreign best practices.
Strive for ownership rather than buy-in.
Social proof is foundational to driving sustainable change.
Increased interconnectivity leads to resilience.

A great deal of attention has been given to EBM, and while this approach is a foundation of modern medical care, it is not the only approach we need to pay attention to. Simply put, if the world followed EBM, none of us would smoke, be overweight, use illicit drugs or drive motorcycles. Clearly other social factors are at play in influencing human behaviour, and we are naive to think healthcare workers are any different. Social proof is vital to creating and maintaining patient safety culture. This social proof must live in dynamic tension with scientific proof, however, as clearly both are necessary.

Much has been written about the silos that exist in our current healthcare culture. Our study suggests that approaches such as FLO that change how different professions and staff in the healthcare system interact with one another have an ability to break down silos. This improved connectivity increases the capacity of the system to be adaptive and resilient.

Finally, the two safety logics of anticipation and resilience require different mindsets. We suggest that both are important and that for a shift in patient safety culture to occur, we must adopt additional approaches that strengthen the latter. In this paper, we wanted to tell some stories of the experiences at the hospitals that have experimented with FLO to address the challenges of HAIs, and engage in dialogue with other safety researchers and practitioners about the promise and the limits of this novel way of approaching healthcare safety. We would like to encourage healthy dialogue, not just a debate.

> "It's just a part of my practice – the way I do things now…I don't make a conscious effort or say, "This is [FLO]," but I think it's just something that I don't ever not think about now…It's just part of me."
> –*Nurse*

References

Baker, R. 2012. "The Challenges of Making Care Safer: Leadership and System Transformation." *Healthcare Quarterly* 15: 8–11.

Canadian Nosocomial Infection Surveillance Program. 2005. *Vancomycin-Resistant Enterococci (VRE) Surveillance: 1998–Present*. Ottawa, ON: Public Health Agency of Canada. Retrieved September 6, 2011. <http://www.phac-aspc.gc.ca/nois-sinp/projects/vre-eng.php>.

Canadian Nosocomial Infection Surveillance Program. 2006. *Surveillance for Methicillin-Resistant* Staphylococcus aureus *(MRSA) 2006 Results*. Ottawa, ON: Public Health Agency of Canada. Retrieved September 6, 2011. <http://www.phac-aspc.gc.ca/nois-sinp/projects/mrsa-eng.php>.

Canadian Nosocomial Infection Surveillance Program. 2007. Clostridium difficile *Associated Diarrhea in Acute-Care Hospitals Participating in CNISP: November 1, 2004 to April 30, 2005*. Ottawa, ON: Public Health Agency of Canada. Retrieved October 9, 2012. <http://www.phac-aspc.gc.ca/nois-sinp/pdf/c-difficile_cnisp-pcsin-eng.pdf>.

Duggal, R. and D.B. Menkes. 2011. "Evidence-Based Medicine in Practice." *International Journal of Clinical Practice* 65(6): 639–44.

Flanagan, M.E., C.A. Welsh, C. Kiess, S. Hoke and B.N. Doebbeling. 2011. "A National Collaborative for Reducing Health Care Associated Infections: Current Initiatives, Challenges and Opportunities." *American Journal of Infection Prevention and Control* 38(8): 685–89.

Gardam, M., P. Reason and L. Rykert. 2010. "Healthcare Culture and the Challenge of Preventing Healthcare-Associated Infections." *Patient Safety Papers* 13(5): 116–20.

Glouberman, S. and B. Zimmerman. 2002. *Complicated and Complex Systems: What Would Successful Reform of Medicare Look Like?* (Discussion Paper No. 8). Ottawa, ON: Commission on the Future of Healthcare in Canada, Health Canada.

Health Protection Agency. 2011. *Quarterly Epidemiological Commentary: Mandatory MRSA and MSSA Bacteraemia and* Clostridium difficile *Infection Data (Up to July–September 2011)*. London: Author. Retrieved February 2012. <http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1284473407318>.

Heath, C. and D. Heath. 2007. *Made to Stick: Why Some Ideas Survive and Other Die*. New York: Random House, Inc.

Hollnagel, E., D.D. Woods and N. Leveson. 2006. *Resilience Engineering: Concepts and Precepts* (e-book). Surrey, United Kingdom: Ashgate Publishing.

McCandless, K. and H. Lipanowicz. *Liberating Structures: Including and Unleashing Everyone*. Retrieved September 19, 2012. <www.liberatingstructures.com>.

Newman, M., A.L. Barabási and D.J. Watts. 2006. *The Structure and Dynamics of Networks*. Oxford: Princeton University Press.

Pascale, R., J. Sternin and M. Sternin. 2010. *The Power of Positive Deviance: How Unlikely Innovators Solve the World's Toughest Problems*. Boston, MA: Harvard Business Press.

Robert Wood Johnson Foundation. 2009. *Mastering MRSA: Pilot Project Lowers Rates 73 Percent*. Princeton, NJ: Author. Retrieved August 22, 2011. <http://www.rwjf.org/reports/grr/055726.htm>.

Siegel, J., E. Rhinehart, M. Jackson, L. Chiarello and the Healthcare Infection Prevention and Control Practices Advisory Committee. 2007. *Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings*. Atlanta, GA: Centers for Disease Control and Prevention. Retrieved February 2012. <http://www.cdc.gov/ncidod/dhqp/pdf/isolation2007.pdf>.

Sutcliffe, K.M. 2012, May. *Safety: Complex But Manageable Pathways to Reliability*, Presentation of the Canada Chapter of the International System Safety Society, Ottawa, ON.

Weick, K.E. and K.M. Sutcliffe. 2007. *Managing the Unexpected*. Jossey-Bass.

Wellman, B. 2008. "Review: The Development of Social Network Analysis: A Study in the Sociology of Science." *Contemporary Sociology* 37: 221–22.