DEVELOPING AND IMPLEMENTING A PRACTICAL MODEL OF REAL-TIME REDESIGN AND PROBLEM SOLVING FOR FRONTLINE HEALTHCARE PROFESSIONALS

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DEVELOPING AND IMPLEMENTING A PRACTICAL MODEL OF REAL-TIME, REDESIGN AND PROBLEM SOLVING FOR FRONT-LINE HEALTHCARE PROFESSIONALS

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University of Pittsburgh, 2008

This research develops and implements a practical model of real-time redesign and problem solving for front line healthcare professionals using systems thinking methodologies. Healthcare quality, safety and service issues have been well-documented and lamented, calling into question the current approaches for addressing these issues. The work environment for healthcare professionals has become overburdened with time pressure, workarounds, waste, and failure to learn from the small events which occur on a frequent basis at the front-line. Desensitization may occur until sentinel events stimulate an organizational reaction. Other industries have developed system engineering methodologies, including the Toyota production system, theory of constraints, six sigma and others, to address manufacturing quality, service and safety issues. Many of these concepts were developed within the context of a linear manufacturing environment, with solutions often derived "off-line" by external experts. Healthcare reality is considered more complex and requires adaptive approaches, suggesting that modifications based on complex adaptive systems theory may be necessary.

The development of the model evolved based on key systems thinking principles adapted to meet the needs of the healthcare experience and introduced to front-line healthcare workers using on-line problem solving. This research includes real-time understanding of what is working or not working in the current condition as it occurs, the ideas of the staff to improve the patient experience, including asset-based problem-solving and introduction of system thinking and design principles using ideas from various systems engineering methodologies in a healthcare worker friendly way. The research focuses on the deep systems of the organization (or clinical microsystem) and ability of front line teams to redesign processes in real-time using rapid cycle mini-experiments and the results of the redesign.

Using case study and action research design, the research analyzes the experiences of an intact work group of a clinical microsystem to test the implementation of a model, labeled an Excellence Makeover. The researcher acts as a participant-observer of the emergent experience and solutions from the staff. The model will then be analyzed and additional refinements will be suggested for additional research.

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PREFACE

Words cannot express true gratitude to many people who have assisted in this endeavor.

In many ways the gratitude starts with my first husband, Steve Lares, who encouraged me to pursue my doctorate as he was dying of brain cancer. Steve remains an important inspiration and a motivating factor in many lives, including mine. He is a significant reason this dissertation matters.

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I dedicate this dissertation to Karen and Kristen, my beautiful and bright daughters who experienced many frustrating times sitting in the hallways of the school waiting for me to get out of class or only had part of my attention to their stories and adventures as I perplexed over some academic problem or studied for hours on end.

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Finally, I extend my sincerest thanks to my committee, my co-workers, especially those who volunteered to be part of this research, and my many friends who contributed directly and indirectly to this effort through feedback, knowledge and encouragement.

1.0 INTRODUCTION

1.1 BACKGROUND

1.1.1 Healthcare quality is a problem

Healthcare quality has become increasingly criticized and many are frustrated with the rate of progress in healthcare improvement (Berwick, 2002). In 1999, the Institute of Medicine (IOM) issued an often-cited report, To Err is Human—Building a Safer Healthcare System quantifying the number of deaths because of medical errors at 98,000 per year (Medicine, 1999; Kohn LT, 1999). The risk of iatrogenic injury to patients in acute hospitals has been reported as 4-17% (Vincent, Taylor-Adams and Stanhope, 1998). An American observational study found that 45% of patients experienced some medical mismanagement and 17% suffered events that led to a longer hospital stay or more serious problems (Andrews LB, 1997). In a survey in 1997, reported in the American Journal of Nurses, 37% of RNs would not recommend a family member receive care in their hospitals, and while almost 15% would rate the quality of care at their facilities as poor or very poor, only 10% would rate the care as excellent (Foer, 1997). According to Paul Barach, underreporting of adverse events is estimated to range from 50%-96% which exceeds the number of deaths and injuries from motor and air crashes, suicides, falls, poisonings, and drownings together annually (Barach and Small, 2000). As articulated in the

United Kingdom's National Health Service (NHS) Lean Six Sigma: Some Basic Concepts, the defect rate of 45% in technical quality of US care, led them to conclude it was unlikely that clinical processes can improve until the basic processes are redesigned (Bevan et al., 2005).

1.1.2 Work systems and front-line workers are overwhelmed with problems, which lead to workarounds

The hospital work systems which fail frequently impact the time available for the patient. One study demonstrated the average nurse spends between 31-44% of her time on direct patient care, 10-25% of her time hunting for other staff members, facing 43 interruptions during a 10 hour shift with 10 of these interruptions occurring when necessary materials, equipment or personnel are not available (Tucker, 2006). Healthcare workers become used to workarounds (Spear and Schmidhofer, 2005; Tucker and Edmondson, 2003; Spear, 2005; Thompson DN, 2003). According to Dennis O'Leary, President of the Joint Commission on Accreditation of Healthcare Organizations in a personal conversation with Eugene Litvak of Boston University, nurse overloading leads to 24% of all sentinel events and when the level of training is limited, nurse overloading leads to 70% of sentinel events (Litvak, 2004). Workarounds create additional complexity, waste, and further distract healthcare professionals from the patient experience and result in overburdening of staff.

1.1.3 Errors are due to process and system design

Chaiken and Holmquest, Lucian Leape and others have concluded, "Errors occur because of defects in processes, not the unpredictability of human error. In fact, human error is quite

predictable and should be expected in all processes" (Chaiken and Holmquest, 2003). As Leape argues "[Errors] result from defects in the design and conditions of medical work that lead careful, competent, caring physicians and nurses to make mistakes that are often no different from the simple mistakes people make every day, but which can have devastating consequences for patients"(Leape, 2000). Chaiken and Holmquest recommend that all processes be redesigned to be less complex because intuitively the more complex the process, the more likely that an error will occur. "Also, it is intuitive that processes that have more steps are, by definition, more complex than processes with fewer steps" (Chaiken and Holmquest, 2003).

1.1.4 Complexity leads to errors

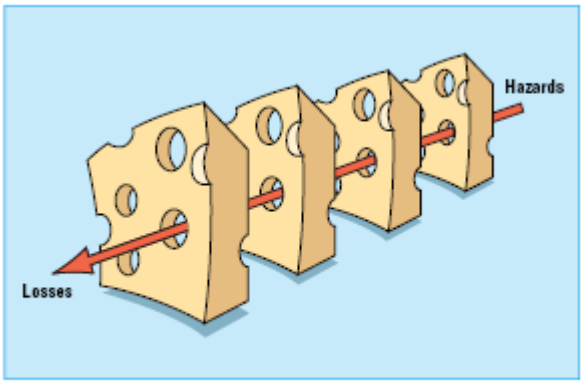
Complexity if not properly handled leads to healthcare errors which can harm patients. According to Thomas Nolan (Nolan, 2000):

> Complexity causes errors. Researchers who have studied this relationship have developed operational definitions of complexity of a task using measures that include: steps in the task, number of choices, duration of execution, information content, and patterns of intervening, distracting tasks. These measures provide a convenient list of factors to consider when simplifying individual tasks or multitask processes. However, many sources of complexity are readily removed. Leape provides some examples of a complexity inducing proliferation of choices resulting from personal preference. These include non-therapeutic differences in drug doses and times of administration, different locations for resuscitation equipment on different units, and different methods for the same surgical dressings. Complexity is also reduced by eliminating delays, missing information, and other defects in operations.

1.1.5 Small errors or failures can lead to big quality problems

Small errors, or failures, can cascade into the sentinel events as described by James Reason, a psychologist from the United Kingdom (Reason, 2000). Essential to the logic of Dr. Reason's

understanding of errors is the division between two approaches: the person approach (where we blame the person) and the system approach (where we understand the system in which the error occurred). He states "the basic premise in the system approach is that humans are fallible and errors are to be expected, even in the best organizations. Errors are seen as consequences rather than causes, having their origins not so much in the perversity of human nature as in "upstream" systemic factors. These include error traps in the workplace and the organizational processes that give rise to them" (Reason, 2000).



The Swiss cheese model of how defences, barriers, and safeguards may be penetrated by an accident trajectory

Figure 1: Swiss Cheese Model

(Reason, 2000)

Reason describes the system as slices of Swiss cheese that have defensive layers that continually opening, shutting, and shifting their location. In most situations, the presence of one hole does not cause an error because the catching of the error in the next layer of the Swiss cheese. However, the holes will tend to line up through coincidence and the trajectory of an accident occurs when active failures and latent failures in the system occur. Active failures are the unsafe acts committed by people who are in direct contact with the patient or system. They take a variety of forms: slips, lapses, fumbles, mistakes, and procedural violations. Latent conditions

allowed by top level management (such as delays or methods in responding to problems) (Reason, 2000).

1.1.6 Complex adaptive systems simple rules recommended by the IOM

Another Institute of Medicine (IOM) report dealing with healthcare quality, Crossing the Quality Chasm: A New Healthcare System for the 21st Century, followed in 2001 and lamented the continued poor state of the healthcare system in meeting the patients' or the healthcare workers' needs. In Crossing the Quality Chasm, the committee noted the framework for understanding complex adaptive systems which has been developing recently and used it as a guide for formulating its "agenda for change" (Crossing the Quality Chasm, 2001). In understanding complex adaptive systems it has been discovered that these systems follow simple rules. Some of the elements of complex organizational systems, such as healthcare, according to Paul Plsek, in Appendix B of Crossing the Quality Chasm, include adaptable elements, simple rules that are locally applied, nonlinearity (meaning small changes can have big effects), emergency behavior where constant creativity is a natural state of the system, not predictable in detail, inherent order even without central control, context and embeddedness such as systems within the system and co-evolution where constant tension, balance, paradox, uncertainly and even anxiety are healthy (Crossing the Quality Chasm, 2001).

The committee outlined specific recommendations to the nation for the new healthcare system using 6 aims:

- *Safe*: avoiding injuries to patients from the care that is intended to help them.
- *Effective*: providing services based on scientific knowledge to all who

could benefit, and refraining from providing services to those not likely to benefit.

- *Patient-centered*: providing care that is respectful of and responsive to individual patient preferences, needs, and values, and ensuring that patient values guide all clinical decisions.
- *Timely*: reducing waits and sometimes harmful delays for both those who receive and those who give care.
- *Efficient*: avoiding waste, including waste of equipment, supplies, ideas, and energy.
- *Equitable*: providing care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status.

The Institute of Medicine approach developed ten simple rules for healthcare to achieve the characteristics of quality (Kohn LT, 1999):

1. Continuous healing relationships
2. Customization
3. Patient control
4. Shared information
5. Evidence-based decision-making
6. Safety as a system property
7. Transparency
8. Anticipation of needs
9. Continuous decrease in waste
10. Cooperation among clinicians

1.1.7 System design principles could lead to improvement

Although the reports from the Institute of Medicine were widely cited and many responded to the call to action, a follow-up report five years later suggested that very little progress has been made from the first report to the present (Wachter, 2004). Wachter identified four main forces limiting progress. The first force is a flawed mental model and collective inattention which he describes as lacking a "tradition of systems thinking or an understanding of high-reliability organizations and the cost of complexity. Since most doctors and nurses were working hard caring for patients (especially in light of the ever-increasing complexity), many came to think of medical errors as the unavoidable collateral damage of a heroic, high-tech war they otherwise seemed to be winning" (Wachter, 2004). This is a type of desensitizing the staff or normalizing the deviation.

Jerome H. Grossman, senior fellow and director of the Health Care Delivery Policy Program, Harvard University, Cambridge, Mass who co-chaired an Institute of Medicine and National Academy of Engineering committee, concluded that healthcare is still deeply mired in crises related to safety, quality, cost, and access that pose serious threats to the health and welfare of many Americans ("Building a Better Delivery System: A New Engineering/Health Care Partnership," 2005). This IOM report also suggests that "collective inattention" has led to deaths, ineffectiveness and inefficiency (calculated at a half-trillion dollars wasted annually), progressively increasing costs and even the impact of 43 million people being uninsured ("Building a Better Delivery System: A New Engineering/Health Care Partnership," 2005). The summary suggests that the U.S. health care industry has "neglected engineering strategies and technologies that have revolutionized quality, productivity, and performance in many other industries."("Building a Better Delivery System: A New Engineering/Health Care Partnership," 2005). According to this IOM report:

We can summarize what we learned through direct observation of how frontline caregivers do their work:

- Most hospitals have evolved complex work systems that conspire against defect-free health care.
- Caregivers have come up with "work arounds" and other ineffective approaches to solving problems. Frontline workers spend a significant fraction of their time doing nonvalue-added work caused by fundamental failures in the design of work systems.
- The delivery of patient-centered care by nurses and other frontline caregivers is limited under current work systems designs.
- Systems approaches perfected by industrial corporations (e.g., Toyota's TPS) appear to provide useful models for improving health care work systems.

1.1.8 Front-line workers need to be part of the solution

The Institute of Medicine suggests these front-line workers be more involved in decision-making and the design of work processes and work flow. Possibly large-scale solutions in policy and technology may not improve the situation and may actually make it worse; instead of a billion dollar solution, healthcare needs a billion $1 solutions (Crossing the Quality Chasm, 2001).

According to Crossing the Quality Chasm:

> Redesign may well challenge existing practices, data structures, roles, and management practices, and it results in continuing change. It involves conceptualizing, mapping, testing, refining, and continuing to improve the many processes of health care. Redesign aimed at increasing an organization's agility in responding to changing demand may be accomplished through a variety of approaches, such as simplifying, standardizing, reducing waste, and implementing methods of continuous flow.(Crossing the Quality Chasm, 2001)

This research seeks to provide some early practical examples of how healthcare can apply some of these systems thinking methodologies, using complex adaptive systems theory and the expertise of the front line staff to redesign and problem solve towards achieving the IOM aims.

1.2 PROBLEM STATEMENT

How can healthcare be redesigned in real time by front-line teams to create a positive experience for patients and staff and result in achieving the IOM goals of safe, effective, timely, patient-centered, efficient, and equitable care?

1.3 RESEARCH OBJECTIVE

Many have described the healthcare system as complex and difficult to redesign because of its complexity. Many times healthcare workers are called upon to become heroes to compensate for broken or poorly designed processes. Has healthcare missed the implementation adaptations necessary for organizational transformation? Can we develop a model that includes systems thinking that works for the current healthcare culture and is practical for front line staff and leaders? Although manufacturing environments generally have progressed from an inspection model of quality, much of healthcare quality remains in the era of post process and post-error analysis using remote feedback in contrast to immediate feedback and process adjustments as recommended in some manufacturing environments.

The difference between real-time problem solving and system redesign and traditional problem solving culture will be explored. Most current rapid cycle process improvement has been is characterized by an off-line team guided by a "plan-do-check-act" cycle which last weeks or months. This research will instead focus on an on-line, real-time problem solving method which integrates ideas of the front-line workers. Much has been written about the quality crisis but the literature about practical approaches and solutions is sparse. This study focuses on the

methodologies of implementing quality improvement techniques rather than formulating broad policy or technology solutions.

The goal of this study is to propose a practical model for healthcare redesign to advance the Institute of Medicine's goals of safe, effective, timely, patient-centered, efficient, and equitable care.

2.0 BACKGROUND AND LITERATURE REVIEW LEADING TO THE DEVELOPMENT OF THE EXCELLENCE MAKEOVER MODEL

2.1 HISTORICAL BACKGROUND OF THE PROBLEM AREA

Why have system engineering concepts not already transformed the healthcare industry? According to the IOM report, ("Building a Better Delivery System: A New Engineering/Health Care Partnership," 2005) health care professionals often fail to recognize that they are part of a larger system. Most engineering professionals also have a limited understanding of the complex challenges involved in health care ("Building a Better Delivery System: A New Engineering/Health Care Partnership," 2005). However, part of the answer lies in the traditional approaches to healthcare quality. According to Grossman, "Unfortunately, the health care system has been very slow to embrace engineering tools and clinical information technologies that could transform it from an underperforming conglomerate of independent entities into a high-performance system." ("Building a Better Delivery System: A New Engineering/Health Care Partnership," 2005). According to the press release from the National Academies Press (July 20, 2005), "systems-engineering tools," developed for the design, analysis, and control of complex systems have been used by many industries to improve the safety and quality of products and services and to lower production costs. It states these same tools, in certain circumstances, have been shown to improve the quality and efficiency of health care. If adapted

and widely adopted, they could help deliver care that is safe, effective, timely, efficient, equitable, and patient-centered -- the six "quality aims" envisioned in a landmark report by the Institute of Medicine (Crossing the Quality Chasm, 2001).

2.2 ANALYSIS AND SUMMARY OF CURRENT KNOWLEDGE AND THEORY RELEVANT TO THE PROBLEM

There remain several conceptual frameworks embedded in the problem and potential solutions which will provide the organization of the review and analysis of current knowledge and theory.

First, we will explore and analyze the current approach to healthcare quality in most United States hospitals (section 2.2.1) which will provide a foundation to discuss alternatives. In 2.2.2 we will describe some of the experience from the United Kingdom's National Health Service (NHS) Modernization experience and learnings applying ideas from systems thinking which includes clinical microsystems, lean, theory of constraints and complexity science.

Included in section 2.2.3 Alternatives from other Industries, we will briefly describe six organizational approaches defined by the American Society of Quality (ASQ), an association of professionals with quality responsibilities. These approaches include the Baldrige award, ISO 9000, benchmarking, the Toyota production system (TPS), theory of constraints (TOC), and six Sigma. A study of the approaches of three automobile companies to problem solving will be provided to demonstrate the continuum of approaches within this manufacturing industry and the applications from aviation science will be described. The purpose of section 2.2.3 is to portray the landscape of current quality approaches as a foundation for future discussion.

Research from Dartmouth about clinical microsystems will be introduced in section 2.2.4 which provides insight into the focus at the point of care (POC). The section on classical systems thinking provides an introduction of systems, complexity thinking and learning organizations (section 2.2.5). Section 2.2.6 explores systems thinking concepts which go beyond a problem focused or deficit-based approach to an asset-based approach such as appreciative inquiry and positive deviance.

The purpose is to build the case for the logic of the Excellence Makeover Model which is the foundation for this study. In Section 2.2.7 the researcher will combine and analyze the multiple process improvement methods which will be incorporated into the Excellence Makeover Model. In section 2.2.7, we will review the literature, theoretical perspectives and rationale for the study. The theory behind the research is important because it provides justification for further adapting the concept for the Toyota production system (TPS), theory of constraints (TOC), and other systems thinking from a manufacturing environment to a healthcare environment framework. The complexity of healthcare is a barrier in implementing these manufacturing concepts so combining the complex adaptive systems is cited as a fresh approach necessary for effective healthcare quality improvement. This literature search will introduce each concept and provide the foundation of the concept's application to the problems of quality in healthcare in section 2.3.

2.2.1 Traditional Approaches in Healthcare Quality

Quality has been defined by the U.S. Office of Technology Assessment as, "the degree to which the processes of care increases the probability of outcomes desired by the patient, and reduces the probability of undesired outcomes, given the state of medical knowledge" (McLaughlin and

Kalunzy, 2004). Current approaches to address the well-documented healthcare quality issues by a state or Federal agency or by accreditation bodies continue to emphasize the discovery and reporting to outside groups of errors or near misses. For example, the Patient Safety Bill, signed on July 28, 2005 encourages clinicians to report anonymously medical errors which will be collected into databases and analyzed for insights to reduce errors (Kumar and Carson-Martin, 2005). Wachter calls this "the Achilles' heel of error-reporting systems:

> The flawed notion that reporting has any intrinsic value in and of itself. The problem is not limited to government reporting systems but is also seen within hospitals, where a growing number of incident reports is often taken as evidence that safety is improving (that is, there is now a healthy "reporting culture"), although there is no persuasive evidence to support this association" (Wachter, 2004).

The Joint Commission of Accreditation of Healthcare Organizations accredits more than 15,000 health care organizations and programs in the United States. Each healthcare organization voluntarily elects to seek accreditation through this independent, not-for-profit organization. The Joint Commission considers itself "the nation's predominant standards-setting and accrediting body in health care." The accreditation process reviews the organizations compliance with published standards and annually reviews and updates those standards including national patient safety goals. Most recently the Joint Commission went from a scheduled site visit which primarily focused on policies and procedure availability and completeness to an unannounced tracer methodology. The tracer methodology focuses on the implementation of the policies and procedures on specific patients. Organizations who seek Joint Commission accreditation have a three year review cycle and contribute data to Joint Commission which is made available to the public ("Joint Commission on Accreditation of Healthcare Organizations," 2005). Traditionally intense preparation for these site visits occurs in most hospitals to assure

that policy manuals are up-to-date and staff are knowledge and able to answer surveyors' questions. Joint Commission has recognized the intense preparation that healthcare organizations have embarked upon when a planned site visit is to take place.

Most of the approaches, such as the Joint Commission and regulatory agencies, to healthcare management employ the rational planning model (Glouberman and Zimmerman, 2002). The rational planning model includes planning, organizing, staffing, directing, coordinating, reporting and budgeting. Managers in the rational planning model are expected to control the organization in some way—e.g., by reducing errors. Hospitals approach quality from an inspection perspective through data reporting of errors and quality metrics. Many of these metrics are unknown to the public, although increasing pressure is being made to provide public report cards to insurers and consumers. The traditional focus on quality was to identify the low quality practitioners and sanction them. This punitive culture intended to assure healthcare quality and patient safety through reeducating, disciplining or removing defective clinicians or 'bad apples" (Kumar and Carson-Martin, 2005; Wachter, 2004).

Quality approaches have evolved over the last several decades. W. Edward Deming introduced industry to concepts of total quality management (TQM) and continuous quality improvement (CQI) and suggested key process data be collected but we mainly influenced the Japanese manufacturing environment. Avedis Donabedian, called the "father of quality assurance in healthcare" distinguished in the 1980s several aspects of quality care: 1) structural; 2) process; 3) outcome. Joseph Juran suggested quality control aspects including quality planning, quality control theory and use of quality improvement methods especially the planned reduction in variability. As hospitals focused their efforts, quality and performance/process improvement departments were formed which reported to Quality Committees which reported up

through the Board of Directors (Kumar and Carson-Martin, 2005). Key quality metrics using benchmarking data to compare performance have been applied to develop focus areas for improvement.

Many of the best models of improvement provided by the Institute for Healthcare Improvement (IHI) entail smaller scale quality improvement initiatives in contrast to whole hospital-wide or industry-level transformation. The underlying rationale is that the projects will aggregate to significant improvements overall and new projects will be developed specifically to resolve for newly identified problems.

The current methods of health care quality incorporate many of the traditional approaches including concepts from Joint Commission, the IHI, and TQM within the existing organizational structure and culture. Joint Commission requires an annual quality improvement plan in which the hospital specifies a defined approach to guide its process improvement efforts. Quality becomes implemented by committee processes at each level with a cascade of reporting structures of the organizational hierarchy from the Board of Directors down to the operating level.

2.2.2 The National Health Service (NHS) Modernization Experience and Learnings

As part of a long-term transformation of the United Kingdom National Health Service (NHS), a five year effort was recently completed in England through the NHS Modernisation Agency (established in April 2001). Its task was to modernize services and improve experiences and outcomes for patients. The British National Health Service (NHS) is the largest healthcare system in the world, with an annual budget in excess of more than £70 billion, employing 1.3 million staff.

The mission of the newly established the NHS Institute for Innovation and Improvement . is to support the NHS and its workforce in accelerating the delivery of world-class health and healthcare for patients and public by encouraging innovation and developing capability at the frontline.

The learnings from the NHS Modernization processes are compiled into thirteen Improvement Leadership guides organized across three themes. Review of the materials incorporate many of the process improvement concepts explored in this research such as using the theory of constraints, lean management, complexity and six sigma and other change concepts ("Improvement Knowledge and Skills," 2005). In the Guide, Improvement Knowledge and Skills, six improvement methods are defined including:

1. Care pathways
2. Clinical Microsystems
3. Lean Thinking
4. Six Sigma
5. Theory of Constraints (TOC)
6. Total Quality Management (TQM)

One Improvement Guide suggests that lean thinking is more effective when combined with the theory of constraints or six sigma ("Improvement Knowledge and Skills," 2005). The NHS process improvement suggested processes can be redesigned using what is called “simple rules.” For example, some simple rules might be:

- see things through the patient’s eyes
- find a better way of doing things
- look at the whole picture

- give front line staff the time and the tools to settle the problems
- take small steps as well as big leaps

Interestingly the NHS has defined these methods and their application to healthcare and incorporates a mixed approach to innovation and improvement.

2.2.3 Alternative Approaches from Other Industries

The modern manufacturing industry has taken alternative approaches to quality, aimed at transforming the organization's quality. The impetus for the additional quality focus by industry may be the work of industrial or system engineers to analyze and refine the manufacturing processes and the more competitive nature of the manufacturing industry globally. The American Society for Quality (ASQ) lists six organization-wide approaches on its website (Quality, 2005): Malcolm Baldrige National Quality Award, ISO and other standards, Industrial Models: Total Quality Management, Six Sigma, Benchmarking, TPS/Lean, and Theory of Constraints (TOC). This paper will describe each one of these approaches briefly and provide more specific information about the principles and tools of the Toyota production system since this research will incorporate several Toyota-like design principles.

2.2.3.1 Malcolm Baldrige National Quality Award The Malcolm Baldrige National Quality Award (MBNQA) is administered by the American Society of Quality and administered by the National Institute of Standards and Technology (NIST). Although the award started in 1987 for manufacturers, services, small businesses, education and healthcare categories were added in 1999. The purpose of the MBNQA is, "to raise awareness of quality management and recognize U.S. companies that have implemented successful quality-management systems." (Quality, 2005). A total of eight hospitals have been recipients of the award thus far. The quality award

is not specific to the traditional definition of quality since no defects such as infections, medication errors, falls or other traditional quality measures are recognized within healthcare organizations instead MBNQA provides a comprehensive framework for organizational quality. Although the organizations which have received the award, may be considered high quality, the small number of hospitals nationally who have received the award suggests the Malcolm Baldrige framework may be appropriate for some healthcare organizations but lacks widespread adoption.

The Malcolm Baldrige criteria are based on seven categories included in the Baldrige Criteria for Performance Excellence (Quality, 2005):

1. Leadership: How upper management leads the organization, and how the organization leads within the community.
2. Strategic planning: How the organization establishes and plans to implement strategic directions.
3. Customer and market focus: How the organization builds and maintains strong, lasting relationships with customers.
4. Measurement, analysis, and knowledge management: How the organization uses data to support key processes and manage performance.
5. Human resource focus: How the organization empowers and involves its workforce.
6. Process management: How the organization designs, manages and improves key processes.
7. Business/organizational performance results: How the organization performs in terms of customer satisfaction, finances, human resources, supplier and partner performance, operations, governance and social responsibility, and how the organization compares to its competitors.

Interestingly, there is a significant absence of performance criteria about the presence and the effectiveness of a quality department, committee or executive, *per se*, which may reflect the

perceived ineffectiveness of the traditional healthcare quality. The Baldrige criteria for healthcare include core values: visionary leadership, patient-focused excellence, organizational and personal learning, valuing staff and partners, agility, focus on the future, managing for innovation, management by fact, social responsibility and community health, focus on results and creating value and a systems perspective.

The Baldrige framework requires a systemic approach which is fully deployed, with a learning cycle and aligned and integrated to the organization's mission, vision and values. This Approach/Deployment/Learning/Integration (A/D/L/I) assessment in the six key process areas of leadership, strategic planning, customers, information, knowledge and analysis, human resources and process management distinguishes high performing versus lower performing organizations.

2.2.3.2 ISO and other standards International Organization for Standardization (ISO) 9000 Series are voluntary standards that can be applied to all types of organizations. Primarily these standards have been applied to manufacturing quality systems. The quality system (and not the entire organization) is considered to be registered or certified. The main purpose of these standards is to establish a consistent and high level of quality practices. The ISO standards focus on organizational policies, procedures and processes associated with identification and satisfaction of the customers' needs. The focus is on documentation, monitoring and controlling. However, ISO has not generated much interest in the healthcare industry because it appears to duplicate other inspection-like activities for healthcare, such as the Joint Commission and the state departments of health.

2.2.3.3 Other Industrial Models for Quality: Total Quality Management, Six Sigma, Benchmarking, TPS/Lean, and Theory of Constraints (TOC) American Society of Quality (ASQ) included Total Quality Management, Six Sigma, Benchmarking, TPS/Lean and the

Theory of Constraints as industrial models of quality management. For the purposes of this paper, a brief description will be provided of the first three but a more detailed description will be provided of TPS/Lean. Before the descriptions are provided, understanding the evolutionary development of these models would be helpful. The following Figure 2: Historic Perspective on Quality provides a chronological development of these industrial models for quality from automotive manufacturers. The Theory of Constraints is not included on in Figure 2 from Massachusetts Institute for Technology (MIT).

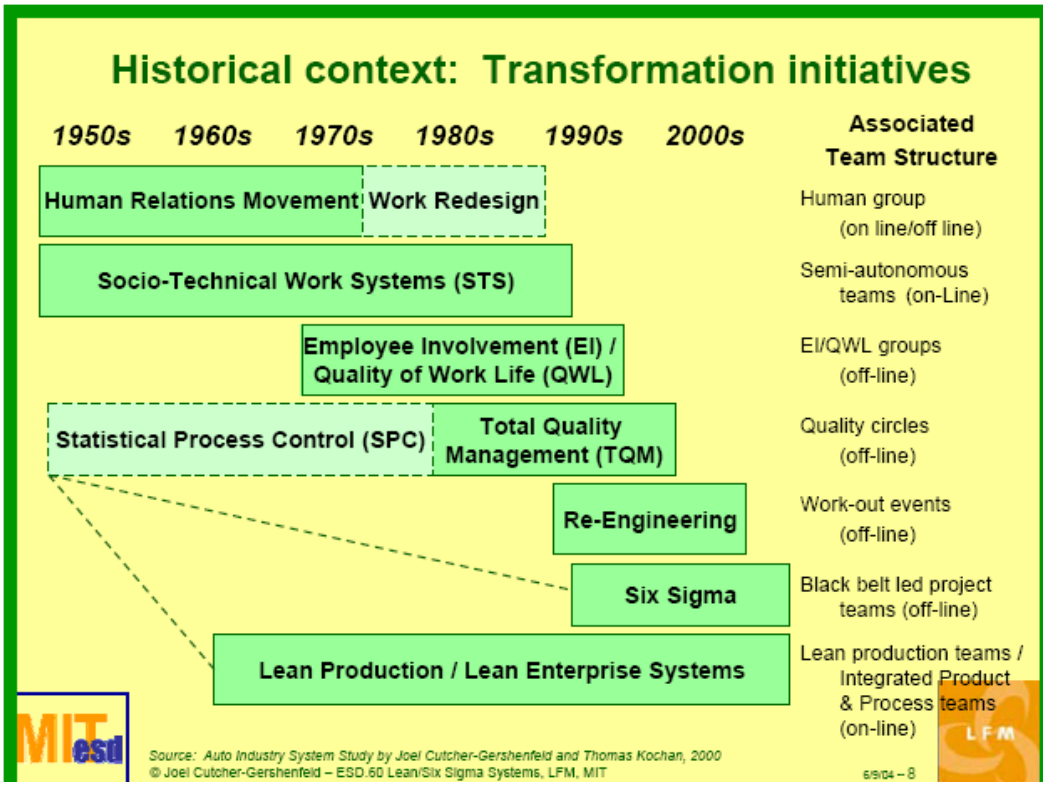


Figure 2: Historic Perspective on Quality

(Cutcher-Gershenfeld, 2004)

One interesting characteristic of transformation initiatives appears to be whether the process is off-line or on-line. On-line means the problems, solutions and experiment design occurs within the context of the daily work rather than being established as a separate project led by a project

team leader. As noted in Figure 2, lean production is an on-line team structure in contrast to six sigma which is an off-line team structure.

2.2.3.4 Total Quality Management As already mentioned, total quality management and continuous quality improvement were popular in the 1980s and early 1990s but have been less favored recently and are widely viewed as previous fads. The challenges have not been in the lack of worthy ideas but rather the implementation issues that create value-added. In the chain reaction of quality, Dr. Deming suggests 1) improvement of the process; 2) increase the uniformity of the output; 3) reduces rework and mistakes; 4) reduces waste; 5) lower cost; 6) improves quality; and 7) improve competitive position. He believed that blaming workers accomplished nothing and it was easy to blame them instead of the system.

2.2.3.5 Six Sigma Six sigma has become increasingly popular as a method of improving healthcare to decrease variation and increase quality. Six sigma focuses in a disciplined, statistical way to try to achieve only 3.4 defects per million opportunities or 99.99966 percent – very close to perfection. Six sigma is structured as a project team lead by an expert—a black belt or master black belt trained person- with a specific goal and target process. There are five steps in a six sigma project known as DMAIC (Define, Measure, Analyze, Improve and Control). The six sigma is a disciplined approach using various analysis that focuses on decreasing variation. Frequently a formal training program with a progression of "belts" or levels of expertise in six sigma is involved in implementation.

2.2.3.6 Benchmarking Benchmarking is defined by the ASQ as :

> An improvement process in which a company measures its performance against that of best in class companies, determines how those companies achieved their performance levels and uses the information to improve its own performance. The subjects that can be benchmarked include strategies, operations, processes and procedures.

Benchmarking in healthcare involves providing descriptive statistics to evaluate how the organization's performance compares to other similar organizations. Often this approach compares measures of performance, i.e. means or medians, versus a benchmarking standard that represents optimal performance in the industry.

2.2.3.7 Toyota Production System/Lean/Operational Excellence Because the focus of this research is to adapt concepts and tools from the Toyota production system, more detail will be provided about this quality approach. Although there are some minor differences between the concepts of the Toyota production system, lean and operational excellence, for the purpose of this research the terms will be used interchangeably.

The Toyota production system was developed by Taiichi Ohno based on his understanding of the needs of the Japanese car manufacturing industry after World War II. Mr. Ohno visited the United States in 1956 as he was trying to solve problems related to the Toyota Motor Corporation and while visiting an American supermarket, realized a vision of "pull" production which eliminated the waste of overproduction and better met the needs of the customer (Ohno, 1988). The design of this way of thinking and doing became known as the Toyota production system (TPS). This was a radical change of the in traditional manufacturing processes. The Americanized version of the Toyota production system has been called "lean" management.

The Toyota production system is sometimes referred to as the "thinking production system", being based on learning principles rather than rigid, top-down procedures as may be commonly thought. The Toyota production system is considered a total management system—integrating philosophical principles, with managerial and technical processes.

Mr. Taiichi Ohno and Eiji Toyoda, a member of the Toyota family, developed the House of Toyota (Figure 3) to help explain the Toyota's system. The focus of TPS is to eliminate all muri, mura, muda (overburden, unevenness, and waste respectively). The Toyota production system uses the PDCA approach to involve everyone in solving problems and improving quality, cost, delivery, safety, and morale.

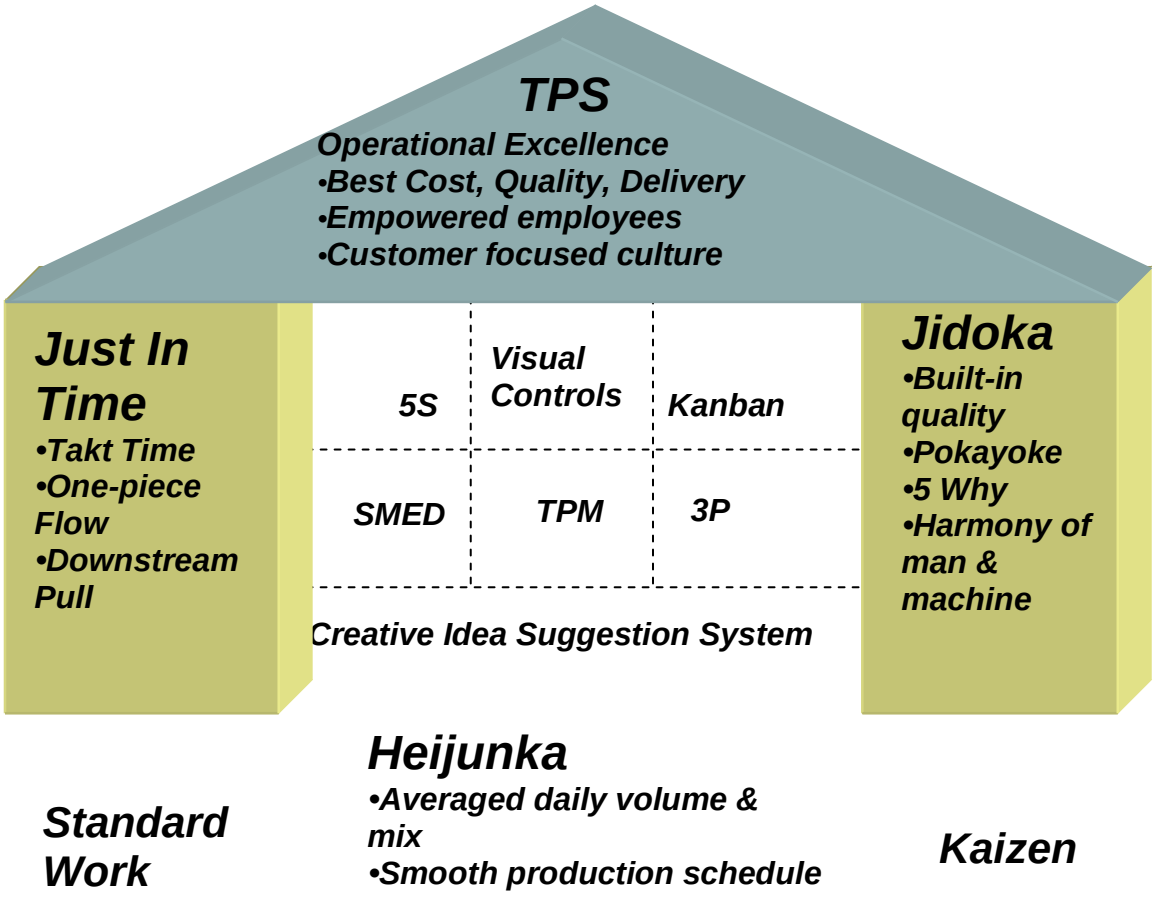


Figure 3: House of Toyota

The foundation of the House of Toyota includes standardized work, heijunka (meaning leveled work) and kaizen (meaning continuous improvement). The purpose of the foundation is to provide stability to the work process so further changes can take place. There are two pillars of the house—"just in time" and jidoka.

"Just in time" refers to efforts to minimize the inventory in the production process. Some of the techniques include pacing the organization to a takt time (calculated by dividing the total time by the customer demand), using one piece flow (versus batching) and pulling versus pushing downstream.

The other pillar refers to "jidoka" or autonomation. This pillar suggests that quality be built in the first time, the process be pokayoke (meaning fool proofed), problems be solved through asking "why five times" (called "the 5 whys"), and that machines be designed with some type of human intelligence, e.g. automatically stopping if a defect is generated in manufacturing.

In the middle of the house are concepts such as 5S. 5S refers to 5 Japanese words which translate to: sort, set in order, shine, standardize and sustain. Visual controls entails to making the process condition obvious through establishing visual signals. For example, when a process is stopped, this condition is evident through a red stop light indicator.

There are many more elaborate examples of visual controls, as well. Kanbans are also signals (literally meaning signals or cards in Japanese). These signals can be designed to indicate stock replenishment is necessary or that production of an additional product is necessary. The SMED abbreviation stands for "Single Minute Exchange of Die" indicating a rapid changeover is desired. TPM is total productive maintenance which can be summarized as a process to maximize the Overall Equipment Effectiveness (OEE) productivity of the equipment for its entire life. The 3P stands for Production-Preparation-Process. The creative idea generation completes the middle of the Toyota House.

The roof of the Toyota House is also called the Toyota Outcomes Triangle. Simultaneously achieving high quality, low cost and short lead time has been a hallmark of the Toyota production system.

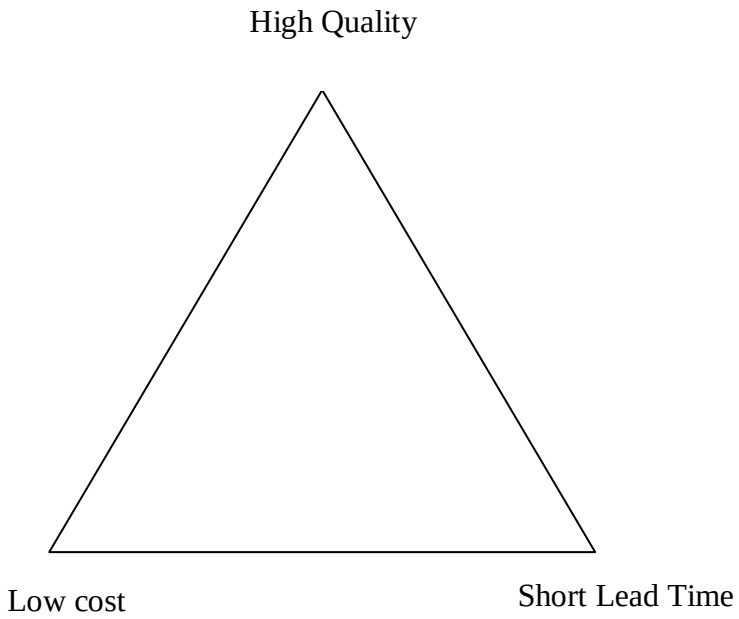


Figure 4: The Toyota Outcomes Triangle

As Toyota is successful, other car manufacturers attempt to mimic the techniques of the Toyota production system but are not usually successful, because they copy the tools and artifacts without the deeper understanding of the principles or "way of thinking" implicit in the Toyota production system.. Applying merely the technical aspects of TPS may result in some short term improvement but not deep systematic change in the "way we do things." But are tools sufficient to change the way problems are identified and solved? Will new tools alone transform organizations in ways that create an adaptive, collaborative and learning organization?

Several researchers have studied the Toyota production system and have contributed to the understanding of how to implement the Toyota production system in other environments including those outside of manufacturing.

Steven Spear, a Harvard Business School (HBS) faculty member, and Kent Bowen, an HBS professor, articulate the DNA of the Toyota production system based on Spear's years of observations of workers and work design at Toyota and the contrast with other manufacturing

environments. Spear also investigated the ability of other automobile companies and non-automobile companies to learn and implement the Toyota production system.

Spear defined four work design "rules" articulate the tacit understanding within the Toyota work culture. His purpose is to facilitate the application of 50 years of Toyota production system development to other companies and industries. Since these "rules" are not articulated within Toyota, they were labeled the "Rules in Use" (RIU). This researcher prefers to think about the Rules in Use in terms of principles than true rules. A rule is a command that must be obeyed and a principle acts as a guideline or a way to think about what to do. Being principle-based provides the flexibility for the local application of the concepts to specific problems within the context of the actual work. Table 1: The Rules In Use (RIU) below provides a systematic approach to the current condition and a work design rule that can be applied to the process, which is consistent with the Toyota production system.

Table 1: The Rules In Use (RIU)

Processes	**Design Level Critical questions**	**Element of analysis**	**Principle or Rule in Use**
System	What is the customer's need? What is the objective of the process? What are the individual needs and the aggregate customer's mix, volume, timing, location and definition of defect-free?	Purpose	Meet the customer(s) need by providing what the customer(s) needs, when the customer(s) needs, in the quantity that the customer needs
Pathway	Who creates what output (product, service, or information) for whom?	Chain of care providers and the "help chain"	*Specify* who will get what product, service, or information from whom over a simple pathway. *Test* this refutable hypothesis by asking, 'Was the actual supplier the expected supplier?' If the customer's need was met by an *unexpected* supplier, then the pathway was under designed; too few

Processes	Design Level Critical questions	Element of analysis	Principle or Rule in Use
			resources were committed. Conversely, if an *expected* supplier was not needed, then too many resources were committed to the pathway.
Connections	How do customers and suppliers communicate requests and responses?	Every couplet (customer and supplier)—may be an individual or a department	*Specify* how each customer will make 'unambiguous' requests that indicate what to deliver, when, and in what volume directly of an immediate supplier, and specify how each supplier will make responses directly to his or her immediate customers. *Test* this refutable hypothesis by asking, 'Was the actual response the expected response?' If the supplier fell behind and orders accumulated, then customer need was underestimated or the supplier capability was overestimated. Conversely, if the supplier produced and delivered ahead of actual customer need, then the customer need was overestimated or the supplier capability was underestimated.
Activities	How do people or machines produce and deliver outputs for which they are responsible given the connections they have with immediate customers and suppliers?	Every worker	*Specify* each activity's work-element content, sequence, timing, location, and outcome. *Test* this refutable hypothesis by asking, 'Was the actual activity performed as designed, generating the expected outcome?' If the work was not performed as designed, then something about the worker's preparation caused him or her to fail. If the work was done as designed, but an inadequate outcome resulted, then the design itself was inadequate.
Improvement	How are problems identified and solved? By whom, where? When? How?	Team assisted by teacher	*Specify* that the smallest group affected by a problem (i.e., the activity doer or the connection or pathway users) is responsible for its immediate resolution. *Specify* a qualified teacher to help in problem solving work. *Specify* that problems be solved by constructing bona fide, hypothesis testing experiments.

Processes	Design Level Critical questions	Element of analysis	Principle or Rule in Use
			Specify that improvement continue in the direction of IDEAL production and delivery. *Test* that problems are resolved by the affected individual or group as experiments by asking 'Are problems being recognized and 'counter-measured' when and where they occur by the people affected by the problem?' If not, then readjust the scope and scale of hierarchical responsibility to match better the actual nature and frequency with which problems are actually occurring. Individuals can be trained and groups can be re-formed based on updated expectations of the nature and frequency of problems.

Adapted from (Spear, 2002) and (Spear and Bowen, 1999)

Pictorially the rules in use were shown by Spear in the Figure 5: Pictorial Diagram of the Relationship between Activities, Connections and Pathways.

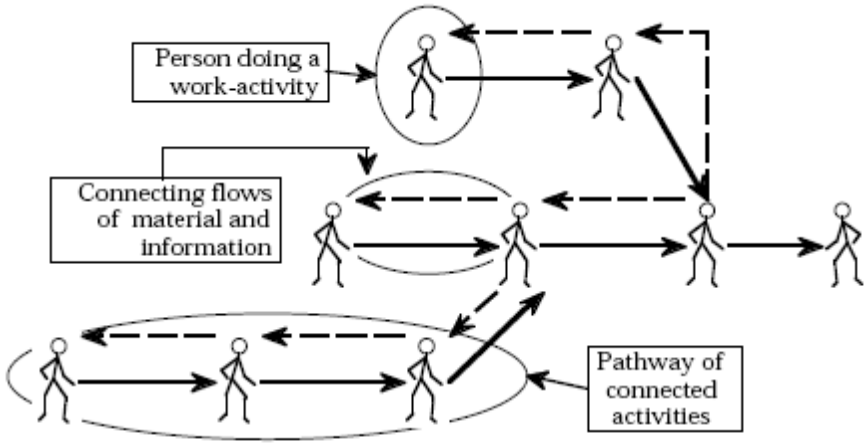


Figure 5: Pictorial Diagram of the Relationship between Activities, Connections and Pathways

Even the "rules-in-use" are implicit to the work design and not a fixed model of implementation. Thus TPS becomes more able to deal with the complexity within the current condition. According to Spear, "specific tools of the Toyota production system (TPS) such as pull-systems, kanban cards, and andon cords are artifacts of a general, comprehensive approach to managing collaborative work systems that allows frequent, fine-grained problem identification and improvement in overall organizational structure, coordinative mechanisms, and task-performance" (Spear, 2002) as articulated in the figure below:

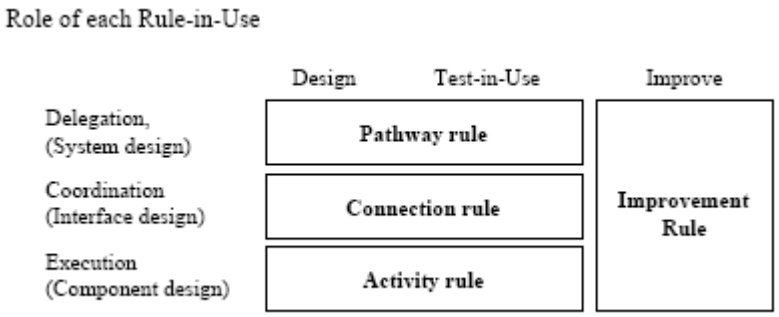


Figure 6: Role of the Four Rules in Use

(Spear, 2002)

An early understanding of TPS is articulated by Bowen and Spear in the Figure 7: Toyota XY Diagram below:

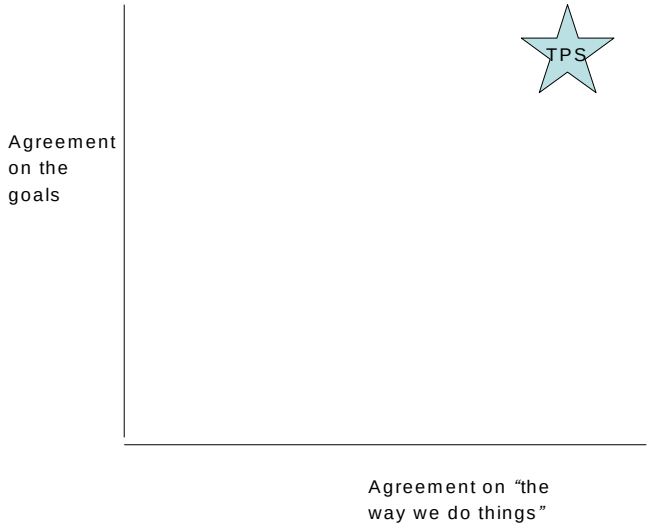


Figure 7: Toyota XY Diagram

As Figure 7: Toyota XY Diagram suggests, a high agreement on the goals and the methods would characterize the Toyota production system. Clearly, not only the Toyota production system would meet this criteria. Without agreement in the goals or methods, the organization would be less aligned and performance may suffer.

To provide another consistent but slightly different approach in describing the underlying ideas of the Toyota production system, Dr. Jeffery Liker articulated 14 Principles in his book, The Toyota Way (Liker, 2004):

1. Base your management decisions on a long-term philosophy, even at the expensive of short-term financial goals.
2. Create continuous process flow to bring problems to the surface.
3. Use "pull" systems to avoid overproduction.
4. Level out the workload (heijunka). (Work like the tortoise, not the hare.)
5. Build a culture of stopping to fix problems, to get quality right the first time.
6. Standardized tasks are the foundation for continuous improvement and employee empowerment.
7. Use visual control so no problems are hidden.
8. Use only reliable, thoroughly tested technology that serves your people and processes.
9. Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others.
10. Develop exceptional people and teams who follow your company's philosophy.
11. Respect your extended network of partners and suppliers by challenging them and helping them improve.
12. Go and see for yourself to thoroughly understand the situation (genchi genbutsu).
13. Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly.
14. Become a learning organization through relentless reflection (hansei) and continuous improvement (kaizen).

Some Relevant Tools of the Toyota Production System

The Andon Cord

In a typical day at Toyota Motor Manufacturing Kentucky (TMMK), the andon cord gets pulled between 10,000 and 15,000 per day. Each person on the production line averages about twelve andon cord pulls per shift and about one of these andon cord pulls results in a line stoppage. With the 7,800 team members pulling the cord when they experience a problem, every problem gets attention. Each problem has the potential to stop the line or stop production. Although counterintuitive, the line becomes much more reliable by the worker’s discretion to stop it (Ohno, 1988). The andon cord has an underlying purpose of drawing management’s

attention to the line processes. When an andon cord is pulled, the signal of a revolving light, the highlight of the specific workstation on an andon board and distinctive musical chiming occurs. Workers are expected and encouraged to signal that a problem has been identified. Instead of ignoring or hiding problems, they become extremely visible and the person owning the problem becomes identified. The organization design has a specific team leader who responds when the andon cord is pulled and supports the team in solving the specific problem. The team leaders support an average of four team members. The team leader must have interruptible work to be able to respond to the team problems immediately. The team leader responds positively each and every time the team members identify a problem.

Many automobile manufacturers have adopted the andon cord for building in quality. Below is a picture of the andon cord from the CAMI Automotive, Inc. ("Assembly,").

Quality:

Andon cords (call for help!) are pulled by Team Members who need assistance or to stop the line to perform repairs at their station.

Andon cords activate audio tunes, which are specific to each area and light up the overhead display.

Overhead displays are in place so when Andon cords are pulled, Team Members can easily identify the area where the problem is.

Figure 8: Sample of Andon Board

As the Detroit News reported (Tierney, 2004):

> Once a worker pulls the cord, if the problem is not resolved before the car reaches the next stage of assembly, the line stops. Toyota encourages employees to pull the cord, despite the line stoppages, to expose problems and address them quickly. In Georgetown, workers reach for their cords 2,500 times a shift, and stoppages amount to 6-8 minutes per shift. But, plant manager Convis said, "at Toyota, it's a problem if you run (the line) at 100 percent. Something isn't adding up, because life isn't (perfect) like that."

> For the past year and a half, andon cords have hung along the assembly lines at GM's Oshawa plant. But the concept can get muddled in translation. "We used to get 17 andon pulls per day," said Rod McVeigh, a supervisor in the assembly plant. "We're now targeting six a day." But that might encourage workers to look out less for glitches.
>
> Dennis Pawley, Chrysler's former manufacturing chief and now a consultant teaching Japanese manufacturing methods, says of the Big Three: "They don't understand that they don't understand."

The Toyota leaders spend hours each day on the floor, to set an example and to learn problem solving.

Frequently the Toyota production system is considered synonymous with waste (called muda) reduction. TPS identifies several types of waste. These include:

1. Overproduction—doing work before it is necessary or working faster than the customer of the process requires. In TPS this is considered the worst form of waste because it also creates additional inefficiencies such as defects, necessary inventory or unnecessary movement or transportation. For example, hurrying to ready a patient in preparation for surgery may lead to more errors and patient safety issues. This may result in a "hurry then wait" for patients in the process, if the downstream process is not ready for the patient.
2. Time on hand/Waiting—obviously, waiting for a patient or a next step in a process involves wastes staff time. Delays for patients in the emergency department or delays for an operating team can impact service, quality and financial outcomes.
3. Unnecessary transportation—In healthcare an example would be taking the patient to the electrocardiography department rather than bringing the equipment to the patient
4. Process wastes or over processing—This may result due to design flaws, requiring staff to intervene more than necessary, by having unnecessary steps in a process that do not

add value. In healthcare, many "just in case" steps are built into clinical processes. One example is a handwritten log sheet maintained "just in case" a physician might call and want to know the information immediately, unwilling to wait for the front-line worker to access this information up in the database/medical record.

5. Stock on hand or inventory—TPS focuses on "just-in-time" inventory management. Waste in handling and storage costs of inventory are inevitable. However, inventory can hide problems owing to an unstable process. For example, holding too much medication inventory on a nursing unit is not only costly but may lead to the use of expired medications and possible confusion leading to medication errors.
6. Unnecessary motion—for nurses this might include hunting for linens, searching for co-workers, or obtaining a bed from the other end of the unit.
7. Defects—Wrong site surgeries or incomplete medical histories entail wasted time, unnecessary costs, and effort in addition to potentially adverse consequences for quality of care.

According to a visiting Japanese scholar, "the excellence of TPS exists in its human resources management on the basis of inherent wisdom of each staff's own, than its technology, technique and skill." (Iwamoi, 2003). He made a series of suggestions after a site visit to two hospitals who were experimenting with the TPS concepts.

1. The 2 pillars of "just-in-time" and "autonomous machine" system stand on people's wisdom. The latter pillar means that machinery perceives abnormalities itself and stops automatically.
2. A lot of problems and troubles usually occur at first. They want to return to the old way. However, thinking of production will begin to demonstrate surely power, only wisdom is extracted and it continues an improvement. Don't be satisfied with slight success.

3. Not only middle management but top makes it a rule to inspect the spot every day.
4. We should have the feeling that a company collapses without any improvement.
5. The wisdom on the spot makes an improvement possible.
6. Too much information causes the unevenness and the impossible and the useless.

Kaizen, or rapid cycle improvement processes, often is considered to be the building block of all Toyota production or lean production methods. Kaizen focuses on eliminating waste, improving productivity, and achieving sustained continual improvement in targeted activities and processes of an organization within a short time period—called a kaizen event or sometimes a kaizen blitz. In Toyota the tension towards the ideal results in continuous improvement—either in small changes on the production line or large scale changes through process redesign. Embedded in the strategy is the goal of bringing together the workers from multiple functions and levels in the organization to solve a problem or improve a process. The team tries rapid cycle process improvement by implementing improvements within 72 hours of initiating the kaizen event, which naturally minimizes the large capital requirements ("Kaizen Rapid Process,").

This approach has driven a great deal of success in targeted areas and involves the people actively working in the process. Kaizen events can rapidly change the culture of the area undergoing the focused change. Toyota also uses small group improvement activities (SGIAs) and involves everyone in problem solving through total employee involvement.

2.2.3.8 Theory of Constraints This research will seek to also apply applicable concepts from the Theory of Constraints (TOC), another industrial quality model. The intention is to apply relevant concepts from TPS and TOC as needed for the specific problems focused by the team so that hybrid approach will provide a richer solution idea pool from which to draw. The Theory of Constraints (or TOC) described by Eliyahu Goldratt, in his book, The Goal, focuses on practical

aspect of making organizational decisions in situations in which constraints exist. The TOC is used as an organization's philosophy of continuous improvement.

A constraint is any element or factor that prevents the system from achieving a higher level of performance with respect to its goal. Constraints can be physical (i.e. a machine or process bottleneck), a lack of material, or managerial (policy or procedure). Inertia is a commonly experienced constraint. Focusing on local optima, or the efficiency of a department or function, is seen by Goldratt as one of the fundamental flaws of traditional organizations and limits their ability to generate profits. TOC contrasts the "cost world" with "throughput world" system by continuous improvement in decision making around dealing with constraints at critical points. TOC logic is applied to identify what factors are limiting an organization from achieving its goals, developing a solution to the problem, and getting the individuals in the process to invent the requisite changes for themselves.

The steps in applying TOC are as follows:

1. Identify the system's constraints. Prioritization is necessary in this step to identify the constraint that is limiting the organization from reaching its identified goals.
2. Exploit the system's constraints. The sole focus is on the limits of the constraint—the other steps in the process are not allowed to produce more than is consistent with the constraint. To do so only wastes resources.
3. Subordinate everything else to the above decision in Step 2. The organization focuses resources to breaking the constraints to reduce or eliminate them.
4. Elevate the system's constraints. Break the constraint by increasing its capacity above the level of demand. This can be done by increasing resources at the bottleneck or increasing capacity of the constraint through problem solving.

5. If the constraint is broken, return to Step 1. Once the constraint is addressed, it is expected to be overcome but another constraint will inevitably appear.
6. This newly identified constraint must then be addressed to the extent it is limiting progress to the goal.

Some companies have long established rules, policies, and procedures that have developed over time. Healthcare organizations may have policy constraints and physical constraints, such as patient throughput issues.

The Theory of Constraints refers to each system as a chain. In any chain there is one weakest link which limits the performance of the entire chain. The links are connected in the linkages (i.e. relationships), which commonly are not the focus of traditional improvement efforts.

2.2.3.9 Comparing Problem-solving Capability across Automobile Plants MacDuffie conducted a study on the problem solving approach of three automobile manufacturing companies and the results of their quality. His analysis involved shop-floor analysis of three complex quality problems which are universally found, have multiple sources, and can only be resolved with high levels of interaction and coordination among individuals from multiple departments or function groups (MacDuffie, 1996) He considered the plants' capability for process quality improvement. He considered these problems as ill-structured, ubiquitous, meaning no assembly plant in the world has succeeded in permanently eliminating the defects, and interrelated problem categories. He noted that ill-structured problems require "learn by doing" or adaptive learning in which the identification and diagnosis of problems emerges during the interaction among the problem solvers (MacDuffie, 1996).

The three plants included in the case study a GM, a Ford and a Honda plant:

Table 2: Problem Solving in Automobile Plants

Theme	GM	Ford	Honda
Quality System			
Structure	By department	By subsystem	By problem
Composition	Stable membership; no design engineers	Core members plus design engineers	As needed for problem Design engineers
Motivation/Incentives	Managers only; no payout from profit sharing	Managers; large payout from profit sharing	Managers; plant level bonuses for problem solving
Problem Definition			
Sources of data	Internal	Internal and customer	Customer and internal
Categorization of problems	Plant versus corporate	Plant versus design versus vendor	Fuzzy, problem-oriented
Problem framing	"Avoid corporate"	"Don't touch metal"	"See it"
Lens used	Cost	Cost/quality	Quality/cost
Problem analysis/Generation of Solutions			
Purpose	Accountability	Documentation	Diagnosis
Processes	"Who shot John?"	Definition as diagnosis	Root cause
Scope of search	First-level cause	First-level cause	"Five Whys"
Experiments	No systematic data	"after data"	"Before" and "after" data
Quality (defects per 100 vehicles)	200-220	120-140	100-120
Productivity (hours per vehicle)	20-25	15-20	20-25

(MacDuffie, 1996)

The defects or errors are lowest in the study when the problem solving is conducted by the people who have the most knowledge of the problem, with plant wide incentives, when a problem is seen and redesigned using root cause analysis, the five whys and the use of experiments.

Pil and MacDuffie concluded that high involvement work systems are known to be effective although very difficult to implement. This high involvement work system has five characteristics: On-line work teams, problem-solving groups, job rotation, suggestion programs,

and decentralization of quality efforts. Based on the research in manufacturing process, implementing any or all of these practices can lead to considerable improvement in overall performance in areas such as improved quality, higher productivity, decreased defect rates, and lower employee turnover (Pil and MacDuffie, 1999).

2.2.3.10 Learnings from Aviation Healthcare can also draw from the learnings from another industry, aviation, which has dealt with complexity and error. "From aviation to medicine: applying concepts of aviation safety to risk management in ambulatory care" (Wilf-Miron et al., 2003), the primary objective of designing safe systems is to make human error difficult to occur and rare. Some errors inevitably occur, but the aviation industry has learned that systems must be designed to anticipate and absorb these errors. The systems are designed to detect errors and stop the process or intercede to minimize the impact. The airline and nuclear power industries have considered human factors in process design since the 1940s and developed a systems approach to quality. The approach of focusing on the system rather than blaming the individual has provided proven results in decreasing errors (Wilf-Miron et al., 2003). However, the aviation industry is more mechanistically complex than adaptively complex and may not be appropriate for healthcare translation (Wachter, 2004).

2.2.4 Clinical Microsystems

When many speak of a system approach they anchor system change very high in the system, usually at the executive management level. A "system" is defined as the coming together of parts, interconnections and purpose. When we speak of the healthcare system, we could be relating to several aspects. One definition of the healthcare system entails a macro-level approach, such as the various institutional entities comprising the whole system, i.e. hospitals,

government, physician offices, ambulatory surgery centers, insurers. The meso level, in between the macro and the micro, focuses on the interplay between the levels. Clinical microsystems are the smallest unit of the macro-meso-micro paradigm. Clinical microsystems are the front line units where actual care is provided. Dartmouth Hitchcock Medical School has done considerable research in the functioning and improving of clinical microsystems.

The 5 P's are the building blocks of the microsystem: purpose, patients, processes, patterns and professionals. The patient is intended to be the center of the clinical microsystem. As Dartmouth states, the microsystem is where:

- Care is made
- Quality, safety, reliability efficiency and innovation are made
- Staff morale and patient satisfaction are made

(Godfrey, 2005)

A key assumption is that the cumulative quality can not be better than the quality of the clinical microsystems that are intended to work together to provide a quality patient experience.

The hospital quality equation is:

Hospital quality=quality of microsystem 1+ quality of microsystem 2 + quality of microsystem 3 (Godfrey, 2005)

2.2.5 Systems, Complexity Thinking and Learning Organizations

According to Peter Senge, systems thinking is a discipline for seeing wholes or a framework for seeing interrelationships rather than things (Senge, 1990). System thinking is a method of seeing otherwise invisible "structures" that underlie complex systems (Senge, 1990). The interconnectedness and interdependence of people and processes which develop patterns of

behavior is a principle of dynamic complexity rather than detail complexity. Senge and others suggest we usually consider the world, organizations and processes with characteristics of being linear, quantitative, static and fragmented. In contrast, complexity thinking looks at the non-visible processes or implicit world and suggests it is non-linear, qualitative, dynamic and holistic.

According to Paul Plsek, a complexity science expert, a complex adaptive system is a collection of individual agents with freedom to act in ways that are not always totally predictable, and whose actions are interconnected so that one agent's actions changes the context for other agents (Plsek and Greenhalgh, 2001). Plsek suggests units of analysis are structures, processes and patterns (Plsek, 2003). The patterns become the relationships between different persons and departments that lead to the results.

To further illustrate the contrast between Complex Adaptive Systems and traditional systems see the Table 3: Comparison of Organizational System Characteristics.

Table 3: Comparison of Organizational System Characteristics

Complex Adaptive Systems	Traditional Systems
Are living organisms	Are machines
Are unpredictable	Are controlling and predictable
Are adaptive, flexible, and creative	Are rigid and self-preserving
Tap creativity	Control behavior
Embrace complexity	Find comfort in control
Evolve continuously	Recycle

("Applying Complexity Science to Health and Healthcare," 2003)

Complex adaptive systems (CAS) compare systems to the human body with adaptive characteristics locally. With the autonomic nervous system the different parts of the body are able to response appropriately to the local environmental changes without possible delays related to the control of the centralized nervous system. With complex adaptive systems solutions are self emergent from the group without direct control from the expert or hierarchy. Systems theory suggests that the system unfolds that which is enfolded with a presupposition that a designer outside the system controls the actions of the system. Rather than the power being held by the designer, the interactions between the parties (which Plsek terms "patterns") create the internal control. Complexity thinking suggests that an emergent behavior, such as capability building, can be helped by some minimal structure, for example, minimum specifications and feedback loops (Fraser and Greenhalgh, 2001).

Some of the key characteristics of complex adaptive systems are:

- The system comprises large numbers of individual agents;
- These agents interact with each other according to rules that organize the interaction between them at a local level.
- Agents endless repeat interaction referring back to their rules
- Agents' rules of interaction are such that the agents adapt to each other in a non-linear interaction.
- Processes are ongoing

The behavior of a chaotic system is a collection of many orderly behaviors (Ditto and Pecora, 1993). Zimmerman developed a diagram to illustrate the relationships between simple,

complex and chaos. The two axis are the degree of agreement and the degree of certainty. A high degree of agreement and certainty leads to simple decisions (see Figure 9: Zimmerman Diagram.). Unless there are clear agreement and certainty, most decisions fall into the complex zone. If the uncertainty and lack of agreement become too high, the environment becomes chaotic. Healthcare situations appear to have characteristics ranging from simple to chaos and thus may require different approaches depending on the circumstances.

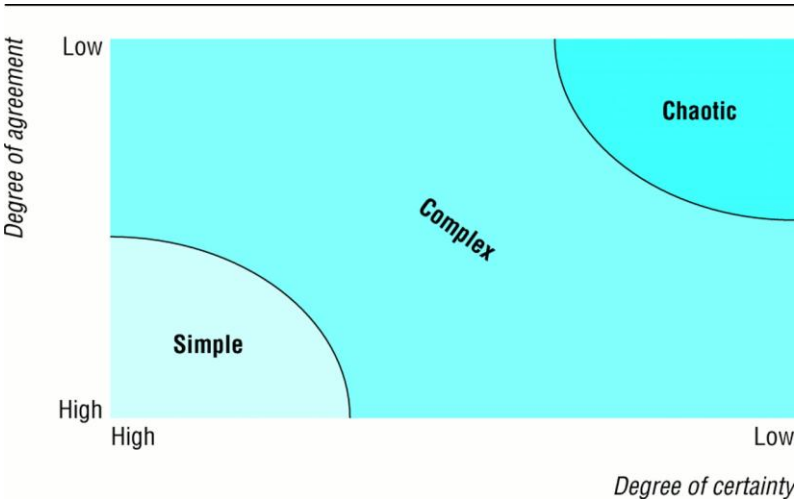


Figure 9: Zimmerman Diagram

(Plsek and Greenhalgh, 2001)

There are no simple or complicated answers to complex problems (Glouberman and Zimmerman, 2002). Glouberman and Zimmerman suggest specific examples of decision-making in the zones of simple and complex from Stacey's diagram. They also add the complicated decisions which are typically solved through standards or rules and experts. Simple problems like following a recipe can be reproduced reliably with the same recipe and the same ingredients. Complicated problems contain subsets of simple problems cannot be reduced to simple problems because they require additional scale, coordination and expertise. Complex

problems include both complicated and simple problems, but merely thinking of them as such does not increase understanding.

Table 4: Comparing Decision -making for Simple-Complicated-Complex Problems

Simple, Complicated and Complex Problems		
Following a Recipe	**Sending a Rocket to the Moon**	**Raising a Child**
The recipe is essential	Formulae are critical and necessary	Formulae have a limited application
Recipes are tested to assure easy replication	Sending one rocket increases assurance that the next will be OK	Raising one child provides experience but no assurance of success with the next
No particular expertise is required. But cooking expertise increases success rate	High levels of expertise in a variety of fields are necessary for success	Expertise can contribute but is neither necessary nor sufficient to assure success
Recipes produce standardized products	Rockets are similar in critical ways	Every child is unique and must be understood as an individual
The best recipes give good results every time	There is a high degree of certainty of outcome	Uncertainty of outcome remains
Optimistic approach to problem possible	Optimistic approach to problem possible	Optimistic approach to problem possible

The application of simple or complicated solutions to complex problems only further exacerbates the problems leading to negative results (Glouberman and Zimmerman, 2002). The Taylorism which reduced workers to machines and organizations to clockwork factories describes a simple organization (Glouberman, 2002). For these organizations a hierarchical command control seemed appropriate. However, our understanding of the stages of the organization have evolved over time as demonstrated in Table 5: Three Stages of Organizations from a simple organizational structure (common in 1935) to complicated (seen in 1985) to the complex organizations of the present.

Table 5: Three Stages of Organizations

Three Stages of Organizations			
	Simple (1935)	**Complicated (1985)**	**Complex (present)**
Pace	Measured	Faster	Unstable and unpredictable
Structure	Command control	Functional Chimneys	Self organizing
Strategy	The Top	Executive Board	Project team
Action	Boss decides	Standards	Customization
Worker Type	Supervised	Division of Labor	Mutual adjustment
Worker	Machine Extension	Skilled	Adaptable professional
Values	Smooth Running	Exact knowledge	Learning
Survivability	Stability	Cost efficiency	Adaptability
Motif	Tradition	Change	Order from messes
Planning Style	Just do it	Strategic Planning	Relationship building

(Glouberman, 2002)

The typical analysis of a system is to perform a three-part process (Kofman and Senge, 1993):

> (1) break the system into its component parts,
> (2) study each part in isolation, and
> (3) assemble an understanding of the whole from an understanding of the parts.
>
> The implicit assumption is that systems are aggregates of parts that interact relatively weakly and in a linear fashion. In this notion of systems, one can restrict attention to the parts and trust that optimizing each one amounts to optimizing the whole. Decomposition is a time honored way of dealing with complex problems, but it has big limitations in a world of tight couplings and nonlinear feedbacks.

Self-directed work microsystems are consistent with the local control of complex adaptive systems theory. By forming communities of individuals within the work microsystem all focusing on the goals of the organization consistent with the values of the individuals and the

organization, the microsystems can develop ownership of the work and can generate experiments to solve the problems which are inconsistent with the expected outcome for each work process. For example, if the microsystem locally provides the right feedback and information about infections, in the course of their work, those responsible can begin immediate problem solving and trying to improve the work processes to eliminate the work problems. The analogy is that of a spider plant (Zimmerman, Lindberg and Plsek, 2001). Each baby spider plant can function autonomously but is connected to the mother plant for nutrients or support.

According to Kofman and Senge, once the workers become "workers" and the supervisors became "supervisors," a rigidity which is counter to the capacity for learning and change sets in (Kofman and Senge, 1993).

Mintzberg suggests there are six basic mechanisms to integrate or change systems:

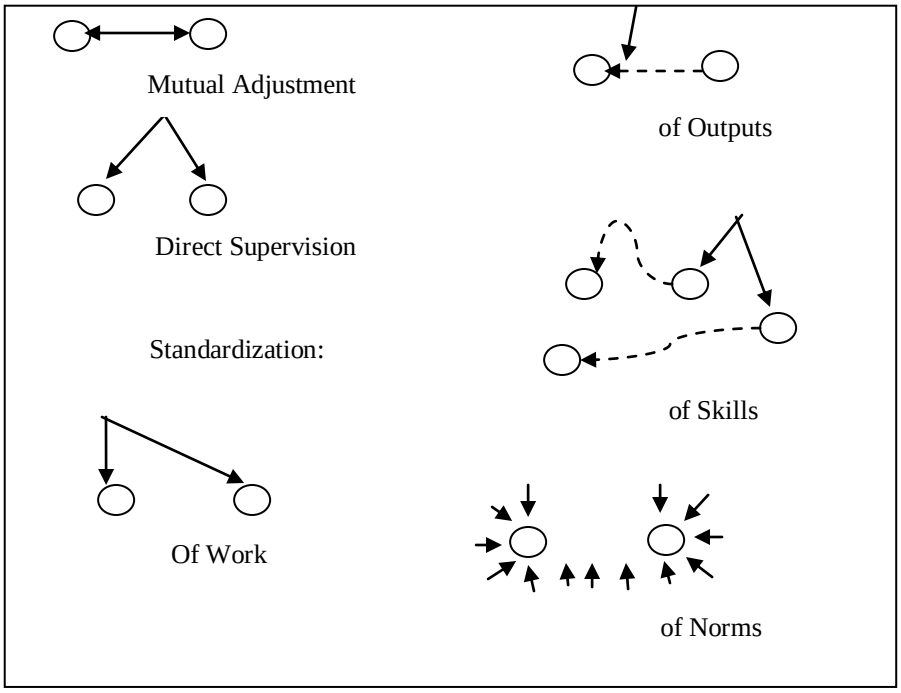


Figure 10: Mintzberg Integration Models

Mintzberg notes although most organizations use all six types of coordination mechanisms, healthcare tends to favor standardization of skills and knowledge (used by independent professionals) which frequently fails us. Instead healthcare should consider greater use of mutual adjustment and standardization of norms (Mintzberg and Glouberman, 2001). Collaboration replaces top-down programs, and the organization operates as a problem solving web coordinated through open discussion.

Zimmerman suggests the terms clockware and swarmware. Swarmware applies to on-linear situations in which creativity and innovation are important.

> "Empowering an engaged team to improve complex patient-flow processes so as to avert emergency room back-ups is a quintessential example of putting swarmware principles to work. The empowered team would use some traditional measures (for instance, length of waiting time in the ER) to help evaluate the involved processes but would appreciate that some variables might not be as easily quantified. For example, staff might intuitively know that "things feel better" after the implementation of some process changes but find it difficult to precisely characterize all the subtleties of the improvement." (Benson, 2005)

For organizations to evolve innovation and change need to occur. How do teams or organizations learn? The complex real world is not pretty but is made up of messy, fuzzy, unique, and context-specific or "wicked" problems (Fraser and Greenhalgh, 2001; Glouberman and Zimmerman, 2002). The context and social interaction aspects of adult learning cannot be ignored, especially if there is a need to perform multiple steps of creative problem solving. Such nonlinear learning requires a different adult education model to teach concepts. The solution to a specific problem becomes merely an artifact that provides value to the problem within the context of the specific area. The solutions cannot act as recipes to help us solve future problems (Glouberman and Zimmerman, 2002). Complex problems can encompass both complicated and simple problems but cannot be reduced to a series of simple and complicated problems (Glouberman and Zimmerman, 2002).

Similar to the problem solving described at the front line, without creating a learning organization, any model has the potential to be considered the latest fad. As Kofman and Senge describe (Kofman and Senge, 1993):

> Most consultants operate from the analytic tradition. They fragment complex situations into symptoms, treat the symptoms, and rarely inquire into the deeper causes of problems: how we learn and act together with a sense of shared aspiration. Consequently, management experts have very little ability to influence organizational health. All too often, their solutions contribute to a vicious pattern of "programs of the month" that fail and get replaced by the next program of the month.

One finding from Schiff's research of diagnostic errors and learning is the need for "space" to allow open reflection and discussion. They note the adversarial atmosphere in dealing with problems needs to be transformed into a more collegial atmosphere for "honest reflection" (Schiff et al., 2004).

The more reactive response to large problems leads people to assume the small problems are not really creating any long-term problems. The assumption is that the process is not broken because the organization has numbed itself to the multitude of small problems. The "if it ain't broken don't fix it" mentality prevents the constant improvement which then allows the problems to aggregate to the point of an occurrence of sentinel event or a combination of problems enough to generate an unfavorable report. If the response to sentinel events is to seek the expert to solve the problem, the organization does not allow itself to learn and build organizational capability to generate creative solutions (Kofman and Senge, 1993).

Kofman even suggests a creative, generative response by managers requires a different focus than the traditional problem solving focus. The problem solver tries to avoid an event from an external influence while creativity requires an internal drive described as a "genuine sense of individual and collective power"(Kofman and Senge, 1993).

In Heidi Benson's words in the *Journal of Healthcare Quality*:

> It may feel comfortable to develop an annual quality plan with sharply defined strategies and targets, but a better approach is to outline general goals and boundaries for improvement through which the organization moves toward the desired emergence. Similarly, it is important to realize that traditional measurement approaches, though vital, may not hold all the answers and that any answers may be deceptive because of hidden variables. Through application of the insights offered by the sciences of chaos and complexity, healthcare quality professionals can guide their organizations in the exploration for new approaches to understanding and positively affecting vital processes. (Benson, 2005)

2.2.6 Beyond a Problem Focused Approach to an Appreciative Inquiry and Positive Deviance Approach

Appreciative inquiry (AI) was designed from research by David Cooperrider at the Cleveland Clinic. The focus of AI is to "learn of moments of joy, wonder and excellence" or intentionally asking positive questions and imagery to inspire empowering change (Mohr and Watkins, 2002). Appreciative inquiry is a constructionist-based change approach versus a deficit-based change approach (Mohr and Watkins, 2002).

Table 6: Deficit-based Approach versus Constructionist-based Approach

Deficit-based Approach	Constructionist Based Approach
Identify the problem ***What is the need?*** ↓ **Analyze causes** ***What is wrong here?*** ↓ **Analyze possible solutions** ***How can we fix it?*** ↓ **Action Planning** ***Problem solved!***	**Discovery** ***Discover the best of what is*** ↓ **Dream** ***Imagine what might be.*** ↓ **Design** ***Dialogue what should be.*** ↓ **Destiny** ***Create what will be.***

Consistent with the system thinking, is an approach of achieving deep, true organizational change is amplifying positive deviance (PD) which suggests the solutions only exist within the expertise of the system. The six steps of positive deviance are (Bertels and Sternin, 2003):

DEFINE

What is the problem, the perceived causes, and related behavioral norms? What would a successful solution/outcome look like (described as a behavior or status outcome)?

DETERMINE

Are there any individuals/entities in the community who already exhibit the desired behavior or status?

DISCOVER

What are the unique practices/behaviors that enable these Positive Deviants to outperform/find better solutions to problems in their community?

DESIGN

Design and implement intervention that enables others in the community to access and practice new behaviors (focus on doing rather than transfer of knowledge).

DISCERN

What is the effectiveness of the intervention?

DISSEMINATE

Make intervention accessible to a wider constituency (replication/ scaling up).

The logic of focusing on the positive deviance or positive self-discovered ideas from the group is to honor the collective intelligence of the group. This is contrasted with the benchmarking approach as show in Table 7: Comparison of Benchmarking and Positive Deviance.

Table 7: Comparison of Benchmarking and Positive Deviance

	Bench marking	Positive Deviance
FOCUS	External	Internal
CRITERIA	Process performance	Successful behavior
LEVEL OF DETAIL STUDIED	Low	High
DURATION OF STUDY	Short	Ongoing
EASE OF TRANSFER	Low	High
ACCESSIBILITY	Low	High
RISK OF FAILURE	High	Low

(Bertels and Sternin, 2003)

The system thinking behind positive deviance suggests that sharing best practices leads to limited implementation if they are presented as conclusions or finalized solutions only. The culture of the organization needs to be readied to embrace best practices. Many times healthcare professionals attend conferences and are exposed to specific solutions. Although enthusiastic about the new ideas, they attempt to transfer the ideas to their work environment and are not able to successfully graft them into the organization's thinking. What seems appropriate for one work setting may be totally inappropriate for another work setting (Hackman and Oldham, 1980). The emphasis is on the artifacts or the solutions rather than the thinking that developed the solutions.

2.2.7 Combining and Analyzing Multiple Process Improvement Methodologies

System thinking combines social sciences, management and engineering (Senge, 1990) and many sources include the Toyota production system, theory of constraints and six sigma concepts as methods of system thinking. In manufacturing many similar concepts are expressed in these methodologies, e.g. the concept of giving the customers the product that they ask for, the delivery time they need (and no sooner), the quantity needed (and no more), individual behavior identification, process/pathway or flow focus, problem solving emphasis, a short lead-time and high quality (Werling, 2005). The basic premises of Dr. Deming, for example are consistent with the principles of the Toyota production system and complex adaptive systems thinking (and vice versa). Although each of these models has a unique reputation or primary focus such as speed, waste, throughput, emergent solutions, front–line involvement, positive focus, innovation or modernization and quality or reducing variation. Just as the NHS has combined these concepts, many in healthcare and industry are using a combination of the concepts to use the best of each in achieving the organization's goals.

Several highlights of these methods seem appropriate as we weave the concepts together towards the development of the Model

2.2.7.1 Full of paradoxes versus common thinking Thus, although TPS, TOC and complexity were designed separately, there are many areas of overlap. For example, many of the ways of system thinking, the Toyota production system are counterintuitive or paradoxical. How can giving up control actually lead to a process that is more "in control"? How can avoiding batching lead to more efficiency? How can complexity be adaptive? How can multitasking increase lead time instead of decreasing it. Similarly, the Toyota production system was

articulated to have a unique characteristic of high agreement on the goals and high agreement on the “way we do things”.

2.2.7.2 Based on natural systems—autonomic nervous system versus fixed, centralized command and control Complex adaptive systems seek to improve constantly described as “natural, adaptive improvement” ("Quality Management," 2001). Taiichi Ohno also suggests a business organization is like the human body (Ohno, 1988). The autonomic nervous system of the body allows local response to changing internal or external environmental changes—such as salivating when smelling a lemon, increasing heart and respiratory rate when exercising, shivering when cold, or withdrawing a hand when touching a hot surface. At Toyota they try to set up an autonomic nervous system for the business so the factory workers can respond without checking with production control. The flexibility of the spine is necessary to the human body and likewise with the business organization. Through the Rules in Use, TPS has adaptive characteristics.

2.2.7.3 Nested modularity, web, patches or quilt motif versus the functional silos or chimneys The complex adaptive systems theory describes patches of a quilt. Traditionally, manufacturing environment there is a desire to optimize each one of the patches. The breaking down of systems into patches may be a fundamental approach evolved to solve difficult problems. Although the patches do not overlap, there are connections between parts of separate patches across patch boundaries. This means that finding a good solution in one patch will change the problem to be solved by the parts in the adjacent patches. These parts will themselves make adaptive moves that in turn alter the problems faced by yet other patches. The patches described in CAS seem familiar to the small teams with a team leader described in TPS. A team can be dynamic within its sphere through constantly using improvements processes to redesign

itself. Similarly TOC focuses on throughput across chains of interdependent processes or pathways.

The Theory of Constraints is critical of local optima but looks at how the pieces fit together (the quilt analogy) and management of the "patch" (constraint) that limits the overall system. Complexity science would suggest that organizational design using a nested hierarchy would be more appropriate for localized decision-making and the emergent solutions to occur, For example, for a hospital, rather than a functional design (i.e. the nursing department, registration department, accounting department) with co-workers from different departments reporting to separate managers, a more appropriate organizational design might be to encapsulate all the different departments for a patient pathway under one manager, director and vice president--thus providing streamlined decision-making to more rapidly respond to patient problems. This would transition from a siloed approach to "nested modularity" in structure and in decision-making.

An article in the Washington Post titled, "Being Misread: a Lesson in Vigilance" describes a producer and author of Dr. W. Edward Deming's work on quality, Ms. Clare Crawford-Mason's healthcare experience. She asked many questions about a laboratory test and avoided unnecessary major surgery. Dr. Paul Batalden, director of Healthcare Improvement and Leadership Development at Dartmouth Medical School responded to her experience as a common problem with the siloed approach taken in healthcare:

> The way that patient care can be improved is to see it as a system within the larger hospital, healthcare and social systems. Otherwise each case…is a single event in the past and nothing is learned from it about improving the system. Health professionals must learn to mentally grasp larger systems of care and understand how systems work and why they can produce results more or less than the sum of their parts (Crawford-Mason, 2002).

The Toyota production system has an implicit nested modular design with the production line organized into teams of approximately four team members to one team leader who reports to a group leader. The intention is for the team leader to have interruptible work and be available to his/her four team members for immediate small problem solving.

2.2.7.4 The power of observation or focus on the reality versus the perception Both CAS and TPS emphasize the power of observation. CAS suggests, "observation may be the keenest sense for managers to develop, the ability to postulate associations -- their greatest skill, and their ability to take risk in facilitating the association -- their greatest attribute," (Zimmerman, Lindberg and Plsek, 2001). According to Taiichi Ohno, "Find a subject to thing about, stare at an object until a hole is almost bred into it, and fid out its essential nature" (Ohno, 1988). He used the example of Toyoda Sakichi who stood and watched a neighborhood grandmother's hand loom for a whole day and was able to observe the incredible waste of human talent when a thread breaks and a whole day of weaving was ruined. Theory of constraints suggests the bottleneck becomes self-evident through operations.

2.2.7.5 Based on simple rules versus regulations, policies, procedures and experts CAS emphasizes that complex systems need simple rules or principles that can be applied in many situations. Therefore, the concepts of the Toyota production system and the theory of constraints may need adaptation to provide value to healthcare problem solving. However, there are many concepts from TPS that do parallel the IOM Simple Rules as Table 8: IOM Simple Rules and Toyota Production System demonstrates:

Table 8: IOM Simple Rules and Toyota Production System

IOM 10 Simple Rules	Toyota Production System Concepts
Continuous healing relationships	Continuous flow
Customization	1x1
Patient control	On customer demand—pull systems

IOM 10 Simple Rules	Toyota Production System Concepts
Shared information	Kanban systems and information flow design
Evidence-based decision-making	Scientific method embedded into the improvement rule
Safety as a system property	Processes are designed to incorporate safety
Transparency	Front-line worker focus
Anticipation of needs	Starting with the customer need
Continuous decrease in waste	Waste is called “muda” and is a focus on constant elimination
Cooperation among clinicians	People connect the system

Interestingly, Spear identified essentially simple rules, or tacit understandings that the workforce at Toyota used and labeled them the “DNA” of the Toyota production system.

Table 9: Comparison of the Elements of Various Models shows the concepts of the various models described and how they compare to each other in terms of customer, individuals and behaviors, processes/pathways/chains or flow, problem-solving and the primary focus or the reputation.

Table 9: Comparison of the Elements of Various Models

Concepts	TPS, Liker: 4 Ps	TPS, Spear: 4 rules in use	Theory of constraints (TOC)	Complexity, Paul Plsek	Appreciative Inquiry/Positive Deviance	Clinical Microsystems: 5 Ps	NHS Modernization	Six Sigma
Start with the customer	Philosophy	What does the customer need; System objective	Start with the customer		DEFINE What is the problem What would a successful solution/outcome look like	Purpose/ Patients		Voice of the customer
Individuals and behaviors	People and partners	Activities	Tasks		DETERMINE If individuals have solved	Providers		
		Connections		Patterns		Patterns	Functions	
Processes/ Pathways/ Chains/ Flow		Pathways	Processes/ Constraints	Processes	DISCOVER What are the practices that enable these Positive Deviants to find better solutions to problems in their community?	Processes	Processes	Balanced scorecards Analysis of variance Process design/redesign SPC Process management Design of experiments
			Systems/Chains		DESIGN Design and implement intervention that enables others in the community to access and practice new behaviors (focus on doing rather than transfer of knowledge).			
				Structure	DISCERN What is the effectiveness of the intervention?		Pathways	
Problem solving	Problem-solving	Improvement	On-going improvement		DISSEMINATE share			Continuous improvement
								Creative thinking
Primary Focus/Reputation	Waste elimination, speed		Throughput	Changing through emergent solutions	Focus on the positive within the community	Front-line focus	Modernizing, innovating	Quality, reducing variation

2.3 RELATE LITERATURE, THEORETICAL PERSPECTIVE AND RATIONALE FOR THE PRESENT STUDY- DEVELOPMENT OF A PRACTICAL MODEL

Healthcare is clearly in need of new ways of approaching its quality, patient safety, satisfaction and workforce engagement problems. The current healthcare quality infrastructure and approaches may have become a non-value-added activity. How does the healthcare industry design effective industry wide transformation to achieve a demanded higher level of personalized service, quality, and safety and eliminate waste? Clearly the current results are disappointing.

The outline of the literature suggests that new approaches are promising to a difficult problem in quality and safety affecting healthcare but there will not be a magic bullet that will address all problems. According to the IOM, "Fortunately, useful redesign principles that are now used widely in other industries can be (and in some cases have been) adapted to health care" (Crossing the Quality Chasm, 2001).

However, there remains a challenge in modifying manufacturing process improvement or quality methodologies to service industries. In describing the Toyota House, it becomes obvious the translation difficulty in adapting the manufacturing concepts to a healthcare environment. For example, takt time appears appropriate for a linear production line with predictable customer demand, and control of the variability of the customer needs or product, yet very impractical for a healthcare environment such as an emergency room where demand is highly variable.

The development of the Excellence Makeover Model was initiated by this researcher after experience with Steve Spear, from the Harvard Business School and the Pittsburgh Regional Healthcare Initiative (PRHI). The goal of PRHI was to implement concepts from the

Toyota production system, similar to the adaptation achieved for Alcoa, called the Alcoa Business System. Over four or more years, educational programs and learning lines in units in Pittsburgh hospitals were developed. We tried to understand the hospital as a complex system of activities, connections, pathways intended to meet system objectives. Although we learned about useful concepts application, there remained a constant struggle to get traction and barriers in leadership and front-line acceptance.

Prior to development of the Excellence Makeover Model, there were pilots of change in an Ambulatory Care Center (ACC) (described in Appendix D) using observation and implementation of rapid cycle change using the concepts of the Toyota production system.

Similarly the Medical Intensive Care Unit (MICU) and Coronary Care Unit (CCU) used real-time process improvement to achieve dramatic changes in the number of central line associated blood stream infections (CLABS). This work titled, "Using Real-time Problem Solving to Eliminate Central Line Infections" was published in the Journal on Quality and Patient Safety with the researcher was the second author. Within a year the number of CLABs decreased from 49 to 6 (10.5 to 1.2 infections/1,000 line-days), and mortalities from 19 to 1 (51% to 16%) despite an increase in the use of central lines and number of line-days. These results were sustained during a 24-month period (Shannon et al., 2006).

Beginning in January of 2005, further exploration of the application of these concepts has led to the development of the Model. Several informal or formal observations and pilot tests have been completed by the researcher to test the Model prior to implementation. In June 2005 with the model having been applied to the patient flow process within a hospital and is described in Appendix D as the Extreme Team.

This led to the refinement and formalization of the Excellence Makeover Model and its further application within two nursing units (a telemetry and a med surg) in March 2006 at the same hospital as the Extreme Team. At this point the Model was called an Excellence Makeover: Hospital Design, primarily because of potential trademark concerns from ABC's Extreme Makeover: Home Edition.

Since March 2006, additional Excellence Makeovers have been conducted in a tertiary hospital Emergency Department (ED), two step-down units, in a quaternary hospital Emergency Department (ED), Central Sterile, and Cardiac Lab Unit (CLU), and in a community hospital to optimize the orthopedic patient's care (including physical therapy, occupational therapy and an orthopedic nursing unit). An Excellence Makeover was also tried in the risk management/patient safety department but the nature of the work led to a traditional team approach rather than the rapid cycle changes designed in the Excellence Makeover Model.

2.3.1 Observations about the Pilots and Refinements in the Development

Several preliminary but informal observations can be made. The Excellence Makeover Model has continued to be refined with each implementation based on these observations:

- Each Excellence Makeover is unique and the level of interest and results are unpredictable prior to the event. Overplanning seems to have little value. This is consistent with the ideas of complexity science that "within the framework of healthcare quality, one of the first lessons to be learned from chaos and complexity is that highly structured forecasting and planning may be of limited value (Benson, 2005).

- The nursing units are the toughest to get participation, to see results and to sustain efforts. The complexity of the work of the nursing units is likely the reason that sustainability in nursing units is challenging.
- Sustainability has been disappointing; even when full and enthusiastic participation occurs during the Intensive.
- The interest in the teaching varies considerably and in some situations, no teaching was chosen by the leaders or the staff
- In 2 situations out of the initial 10 Excellence Makeovers, pre-determined experiments in changing the work design were introduced and in both cases, the staff became resistant and the experiments were either discontinued or redesigned by the staff. In both cases, the staff kept some of the original "new way" but actively complained or passively resisted the change, even to deny the need for any service changes.
- In the community hospital there was the most active hospital wide participation with 720 tickets placed in a box (as an incentive system to encourage participation) over 6 days of the Excellence Makeover Intensive.
- The leaders have reportedly become "exhausted" with the Excellence Makeover and have needed time to recover from the experience. In one recent event, 10/07, the director took a sick day the following week because she was so tired after the Excellence Makeover Intensive even though the event was within the normal working hours for the manager. The managers and leaders express they have to "get back to my real job" and are concerned about not completing their normal responsibilities while participating in the Excellence Makeover. This catch-up of

the normal job appears to interfere with the sustainability of the concepts of the Excellence Makeover

- Active participation in identifying glitches has occurred although the volume of ideas has not been as robust. At a community hospital over 410 glitches were identified and 360 ideas were generated. Glitches frequently exceed the space of the poster (3 feet x 5 feet) and extend over the wall. The generation of ideas has also exceeded the space of the poster in some situations.
- Senior leadership involvement has been disappointing even after numerous attempts to encourage full involvement. In one situation, the Chief Nursing Officer did actively participate and continues to participate in about once a month refreshers, for at least part of the day, even over a year and a half after the Intensive event. At a community hospital the vice president of operations actively supported the planning and the Intensive event, up to the Reveal about 6 months after the Intensive but has not continued any regularly scheduled redesign work afterwards. In several situations, senior leaders will stop in at the kick-off or at the end of the Intensive but have not been as actively involved in understanding the glitches or supporting the implementation of the ideas.
- Staff have been proud of the results and some have been honored by board of director recognition for their efforts and results. Stories and pictures have been shared in the internal newsletter, The Latest Word.
- When the dream room remains intact, it appears to improve sustainability but none of the Excellence Makeover Intensives have continued to use the method of daily collecting glitches and ideas. Occasionally staff have posted a glitch after the

initial Intensive event but there is not a systematic approach to dealing with new glitches. In fact, several senior leaders state they are "overwhelmed" with the number of glitches after the first 24-48 hours and they seem to continue to own the glitches, rather than the front-line staff owning their work.

- The feedback on the Excellence Makeover has been positive from engaged staff.
- Some staff in some of the Excellence Makeover do not want the glitches and ideas to be in their handwriting because they reportedly afraid of getting in trouble. In these cases, the researcher or another person from outside the unit writes the glitch or idea.
- There is on-going interest in new Excellence Makeovers with typically 3-4 additional opportunities for other departments after one is complete. After explaining the process and the commitment, some of these opportunities have failed to mature.
- Every unit has done something different with the glitches and the ideas gathered. For some, they typed up both and have used them for periodic reference. Others never typed them up and other typed them but did not use them. The hospital put them on a shared hard drive and distributed ownership throughout the senior management team with a requested progress report about 6 weeks after the Intensive Event. The CEO is concerned about the lack of continuing the progress about 8 months after the Intensive event.
- An informal observation when there has been a review about 12 months after the initiation and without direct connection of doing action planning after the events, there appears to be significant progress on the glitches and the ideas in most cases.

It seems exposing the glitches and the ideas allows a collective but unconscious change in the unit.

This research further explore the theoretical development and implementation of the Excellence Makeover Model for work process redesign and implements the Model of real-time, on-line, point of care process redesign and problem solving adapting the principles from industrial process management models (such as Toyota production system as well as other methodologies) as they are consistent with complex adaptive –all generally labeled systems thinking. The Model would be a comprehensive organization wide implementation combining a hybrid of the process improvement ideas and concepts. The practical implementation of the model in one area will be pursued as the research component for this dissertation but the concepts are broader than just an one implementation at one organization.

Some of the basic premises on which the Excellence Makeover Model is based:

- Healthcare is so complex we cannot figure out one right answer.
- We need to create an intelligent organization that can apply practical wisdom to dynamic circumstances.
- The front line staffs are the experts of the system. They care about the patient, know what the patient needs, know what works, what doesn't work, understand the barriers and how to fix it.
- Leadership/management's entire role is to support where the value exchange occurs in any business—for healthcare, that is at the point of care.
- Healthcare has extreme variability in need and demand for services, requiring constant adaptability

- No one process improvement methodology is sufficient to meet the complex adaptive needs of healthcare but many of the principles are applicable.

Weaving together the concepts and developing the Model:

Table 10: Process Improvement Methodologies and Their Use in the Excellence Makeover Model

	Excellence Makeover Model includes-why	**Excellence Makeover Model does not include-why**
Malcolm Baldrige	•Systematic approach, deployment, learning cycle, integration and alignment •High performance thinking	•Does not use the full framework but could be used within the framework
ISO	•None	•All aspects—requires inspection versus design
Benchmarking	•Benchmarking from within the group only; •Use of comparisons if the group determines is valuable	•Best practice solutions from others identified and used—potentially not relevant within the local context •Avoid complacency of median or even best practice benchmarking
Total Quality Management	•Philosophically consistent	•Implementation less top-down; more bottom-up or front-line focus
Toyota production system	•Andon cord and Kaizen methods are primary	•Linear manufacturing concepts—cannot apply

	Excellence Makeover Model includes-why	**Excellence Makeover Model does not include-why**
	focus •Uses Steve Spear RIU Framework	to a complex environment without adaptation
Steve Spear Rules in Use	•Adapted but embedded as the Beautiful Design Principles •Use concepts of design, test in use and experiments as improvement	•Tight alliance with the Toyota methods—one right way
Theory of constraints	•Global optima focus	•Over focuses on flow/constraints and still top-down
Six Sigma	•Understanding and use of statistics and variation	•Off-line problem solving and use of the expert (master black belt) continues hierarchal top town –complicated model
Clinical Microsystems	•Front-line focus	•Formal assessment tools for analyzing the 5 Ps—remains an off-line and top-down implementation
Systems thinking	•Autonomic nervous system •Emergent solutions •Learning organization	•Lacks any process focus—the Model adds some process focus

	Excellence Makeover Model includes-why	**Excellence Makeover Model does not include-why**
	•Complexity methods •Dynamic	
Appreciative inquiry/Positive Deviance	•Community provides collective wisdom; focus on the creative future and gather the collective understanding of the group	•Sequence of questions •Model adds design principles to the mix

2.3.2 Introduction to the Excellence Makeover: Hospital Design Concept

This research involves the beginning of a systematic system-wide comprehensive approach to redesign of care processes called the Excellence Makeover: Hospital Design. The programs developed under this name are intended to create a unique and exceptional patient experience using the systems thinking concepts. The focus is achieving sustainable process changes that change how the organization thinks and learns rather then just a fad or a "program". The improvements that are designed by the embedded staff are expected to have more sustainability than the traditional benchmarking or best practice transplanting approaches.

The goal is to provide the opportunity for all levels of the organization to have a shared way of thinking to systematically designing and improving the patient experience through improving flows, connections and activities. This creates a real-time learning organization close in time and space to the patient experience. Significant involvement of many levels of the organization (front-line staff, leadership, middle management, staff in quality, risk management,

infection control,…) will be coordinated in the redesign of the patient experience with a highly adaptive environment driven to eliminate waste and improve the patient and the staff's care experience. The front line workers, or the people who do the work, will be the people who solve problems or improve the patient experience.

The vision of the organization is stated: "the patient is the focus of everything we do" and even expand the concept to be "Everything we do will make our patient's and our staff's lives better". There is an intentional order and focus on the experience on the patient but not by having the staff work harder to compensate for broken systems.

The stated and communicated objectives of the Excellence Makeover: Hospital Design are:

- To provide examples within the healthcare system where there was an innovative design of the care experience.
- To refine and define powerful management strategies and "outside-the-box" thinking using the science of management to design a care experience-leading to higher quality, service and financial outcomes across the healthcare system.
- To create capacity of experts within the system who can lead and facilitate rapid cycle change processes using system specific design principles.

The Excellence Makeover method of process redesign is a hybrid of contemporary process redesign principles drawing from the models and fields of:

- IHI Improvement Framework including focused PDCA
- Complexity and systems thinking, including positive deviance
- Toyota Production System/Lean—the Perfecting Patient Care System concepts from PRHI

- Six Sigma
- Theory of Constraints (TOC)
- Industrial/Management/Systems Engineering
- Clinical Microsystems
- National Health Service (NHS) Modernization Agency in the UK

2.3.3 Integrated capacity building

Excellence Makeover Thinkers (EMTs) are people who want to learn how to facilitate such an effort will also apply for the training. The Excellence Makeover Thinkers will become the coaches of future Excellence Makeovers.

2.3.4 Leadership Commitments

Each Excellence Makeover is co-designed with the leadership/management of the area of focus. Although each one will have slightly different format, the following information as recommendations are provided:

The vision is for the Excellence Makeovers are at least a one-year (12 month) commitment by leadership and front-line teams. [For the purposes of this research the experience of the initial Intensive will be studied and for the six-week time period after the Intensive.]

The Ground Rules would stay in place 24/7. The ground rules are:

- No blame
- Have fun and generate high energy

- Creativity before capital
- Never say ”because that’s the way things are done here”
- Design mini experiments
- Open systems—involving everyone with open communication about glitches and solutions
- Keep going no matter what

A unit based Dream Room will be established and used throughout the Excellence Makeover and as long as possible afterwards. The Dream Room would be kept intact and daily glitches and ideas generated and even extended to include patient specific glitches and ideas with active participation by patients and families.

Intensive—the first aspect of the Excellence Makeover is an intensive redesign experience. This is initiated with a kick-off and then a 72 hour redesign with a specific sequence of events.

- 0-24 hours—Understanding the current reality;
- 25-48 hours—Visioning and gathering ideas;
- 49-72 hours—Designing and trying experiments.

At the end of the Intensive are a celebration and a launching of additional improvement efforts. About 6-12 weeks after the launch we have a “reveal” where we celebrate the results and encourage on-going work.

After the 3 day Intensive, we will continue the experiments by focusing on Refreshers 3 days per week for the next 2 weeks, then 2 days per week for the next 2 weeks and then dedicate a full day each week to refreshing the work.

Expectations for CEO and Senior Leadership in order to have a successful Excellence Makeover:

- Pre-meeting to set scope and expectations, communicate support and articulate anticipated results
- Understand and support the Excellence Makeover process including the glitches and ideas.
- Actively work at eliminating barriers
- Attend the kick-off, the launch and the reveal
- Provide a daily check-in (formal or informal) during the Intensive, and a formal weekly check-in the first month and then monthly check-ins
- Celebrate the efforts and recognize the participants in private and public ways
- Learn more through activities such as attending the Power Ups!

Expectations for Immediate Manager and Director in order to have a successful Excellence Makeover:

- Plan the event
- Conduct some of the training
- Build trust and energize the team
- Provide progress reports
- Hands-on management support for change
- Requests assistance from leadership
- Celebrate the efforts and recognize the participants in private and public ways
- Attend the Power Ups! (longer all day educational sessions about key concepts)

2.3.5 General Description of the Excellence Makeover Intensive

The Excellence Makeover Intensive is an intense redesign (for example a 72 hour redesign) and training opportunity. For 24-hour units, the Intensive covers all shifts to engage the workers during off-shirts. The specific duration may vary with different units, depending on their needs. This intense period will merely be the beginning; the hope is insights from the intense period would be the beginning of some new ways of approaching problems. We want the team, including leadership, to self-commit to on-going process improvements. Depending on the course of the improvement, several Excellence Makeover events along a patient care experience in the focus areas.

After a kick-off event, which establishes ground rules and focuses everyone on the purpose, we will start with understanding the current condition. This will include observation, process mapping and glitch gathering.

After describing the definition of a glitch, glitches are gathered using Post-it™ notes which are given to all participants or are made available in the Dream Room. A poster will be placed in the Dream Room for placement of the glitches.

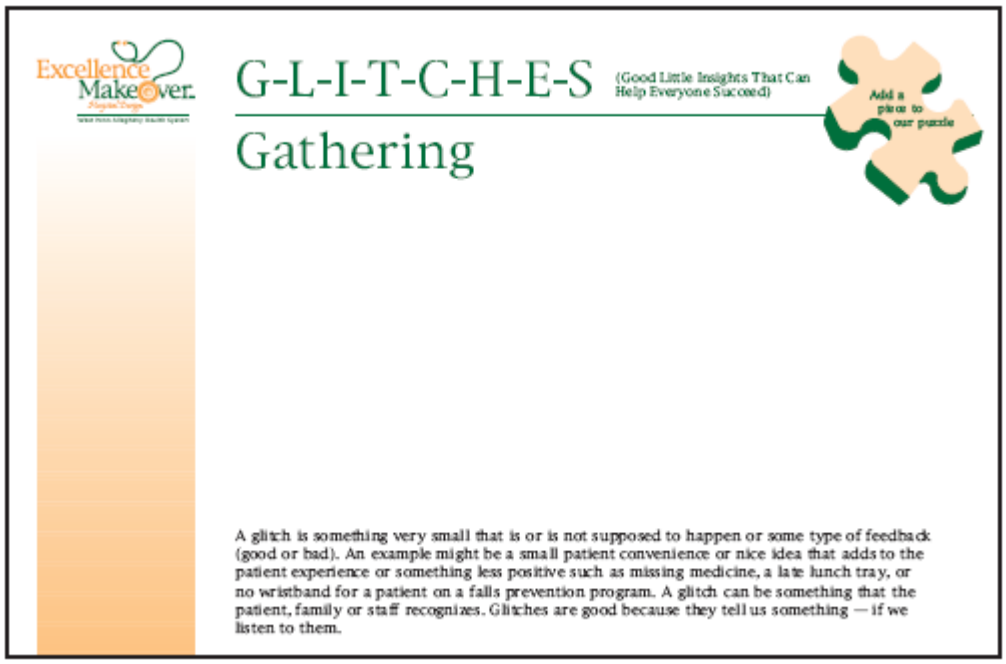


Figure 11: Good Little Insights To Help Every Succeed (GLITCH) Poster

For the first 24-48 hours, the emphasis is on documenting the glitches. The staff are asked to take the Post-it™ notes with them as they do their work and document any "good little insights" on the Post-it™ notes. The Post-it™ notes are placed on the poster and the wall in random fashion initially. Previous experience is that most of the glitches would be things that do not go well, but the gathering of glitches is not intended to be a deficit-based approach. The glitches are information about the current—what is working and not working currently.

Figure 12: Picture of Glitches

After the initial time period of 25-48 hours, the glitches are organized based on their natural affinity and header cards are placed above like glitches. This creates deep system information from the front-line staff perspective of what is working or not working and organizes the information into topics. Ideally, the front line staff own the information and organize the Post-it™ notes into the affinity diagram.

Figure 13: Glitches with Affinity Headings

Intermixed with the identification and solving of real problems will be Healthcare Hero Challenges, which will be short teaching exercises for front line staff. The Healthcare Hero exercises are short and generally interactive exercises to teach simple design principles from some of the system thinking methodologies. The Healthcare Hero Challenges are necessarily short because they are intermixed with the actual care of the patients and occur within the dream room or in the unit space. The intention is to bring design principles to the problems that are occurring and share openly the logic beneath the Excellence Makeover. We call this the FUI for Fun User Interface, because the exercises are intended to be fun and interactive. The use of PowerPoint or lecture style teaching are discouraged. Using the existing glitches the teaching can pull from practical examples and try to illustrate the application of design principles. Sample modules for the Healthcare Hero Challenges are provided in Appendix __.

The teaching will utilize an adapted framework from Steve Spear's work. The adaptations are intended to "feminize" the terminology for the primarily female workforce in healthcare. For example, instead of "war rooms" the Excellence Makeover Model will use a "dream room".

Instead of Rules in Use (RIU) the concepts will be simplified and called The Beautiful Design Principles. The Beautiful Design Principles are:

- Define and simplify every pathway and streamline flow
- Clearly connect customers and suppliers
- Specify every activity
- Improve with each glitch to move closer to the ideal

adapted from (Spear and Bowen, 1999)

The methodology will be underemphasized to avoid distraction about industrial models not being appropriate for healthcare. Additional adaptations will occur for the specifics of the issues being addressed. An Excellence Makeover Owner's Manual will be available for the teaching and reference (available in Appendix A). The Owner's Manual is organized using the basic framework from Steve Spear's work:

- Purpose/System Objective
- Pathways
- Connections
- Activities
- Improvement

Table 11: Framework Understanding and Excellence Makeover Planned Steps

Framework understanding	Planned step for excellence makeover
Start with the patient as a person—	Maintained as a goal for the project: "the patient is the focus of everything we do" Repeated often by the project management
Employee needs—establish emotional safety (a blame-free environment) for employees with the opportunity for healthcare workers to reconnect to their reason or going into healthcare as a profession. The ability to enhance "touch time" by eliminating wasted time for healthcare professionals. The only people who have the right to change the work are those who do the work	Ground rules Introduction to the TPS definition of the ideal via the "decoding the DNA of the Toyota production system" or through teaching. The ideal includes emotional safety.
Setting the goals and communicating them by leadership within the group. The goals should be specific to the objective of the organization and connected clearly to the values of the organization and the individuals within the organization. For example, for common healthcare errors such as infections,	Metrics were defined and repeated in daily interactions and forums

Framework understanding	Planned step for excellence makeover
falls, or medication adverse events set zero error as the goal with an aggressive timeframe. For processes between departments, rather than standards, common performance agreements would be made. Focus on the areas of organizational pain and relieve the pain.	
Develop a relentless focus on creating a perfect process for every value creating activity—consider the ideal process (no defects, immediate, on demand, without waste, 1x1 and safe)	Visioning session
Observe to understand the current condition Find meaningful data about the patient Go and see the work	Processes which will be observed are: On the unit observations and process mapping
Solve the problems in real-time to "root" or action cause in the course of work by the people doing the work with proper teachers/coaches. Let the system teach you. The Toyota production system principles will	Glitch gathering and idea center

Framework understanding	Planned step for excellence makeover
be used to redesign the processes or systems. Timing is not retrospective but now and we can design virtual andon cords to virtually stop the line to focus leadership attention on the latent problems.	
Use applied common sense system design principles from the Toyota production system or other system design methodologies: such as leveling, building quality in and fool-proofing systems, pull systems versus push systems, no forks or loops and clear connections.	To be determined by the team
Design immediate countermeasures and try them; test in each use to create a learning system (the organization is constantly redesigning its processes towards the ideal). Compare results to past and world class experience. Never stop asking "how could we do this better?" And then do it.	Daily experiments refinements and feedback sessions

In addition to the short teaching, at lunch or other break times, longer teaching opportunities may be completed. For many of the teaching, there is a short or a longer version. These sessions are called the Excellence Makeover Thinker (EMT) sessions because they are intended to develop additional capability within the organization to develop coaches.

Figure 14: Excellence Makeover Teaching Session Six Thinking Hats

Figure 15: Excellence Makeover Teaching session The Web of the Patient Experience

The next stage will be generating ideas to solve these problems and beginning mini-experiments to solve them. Ideas will also be placed on another poster for Ideas.

Figure 16: The Idea Center Poster

Additional skill building will be woven into the experience for the Excellence Makeover Thinkers.

Lastly, we will focus on sustaining the changes and the new way of thinking. The process of making improvements would be consistent with proven scientific methods of problem solving—a rapid cycle PDCA.

2.3.5.1 The Logic Beneath the Design of the Excellence Makeover To highlight important aspects of the focus of the research additional drilldown into the logic behind the research will be pursued. Many of these concepts are part of the Excellence Makeover Model and the teaching of the Model concepts. These aspects include:

1. Finding Slack Time and Creating Touch Time
2. Documenting the Current Condition Hairball

3. Listening to the System
4. Refocusing the Role of Leadership, the Management Philosophy and Adopting a Systems Approach
5. Changing When and How Problems are Solved
6. Focusing on the Point Of Care—the Point of the Value Exchange
7. Asking "What Does the Patient Need and How Does the System Respond to that Need?"
8. Focusing on the Process and Creating Adaptability
9. Refining Problem Solving Levels
10. Taking an Constructionist-based Approach to Problem-Solving
11. Understanding Normal State, Dysfunctional Normal State, Contingencies and the Creative State
12. Conducting Very Rapid Cycle Experiments
13. Using Data
14. Creating Tension Towards the Ideal
15. Designing a Learning Organization
16. Start Anywhere

2.3.5.2 Finding Slack Time and Creating Touch Time As part of the quality improvement work of the National Health Service (NHS) Modernization Agency, they quoted Winnie the Pooh, "It is as, as far as he knows, the only way of coming down stairs, but sometimes he feel that there must be another way, if only he could stop bumping for a moment and think about it." Could healthcare workers redesign their processes if they took the time to stop and think about it?

The core purpose of the healthcare profession is to add value to the patient's live in restoring vitality and health through caring for the physical, emotional and spiritual needs. Dr. Reinertsen suggests the core process of healthcare is developing healing relationships which are dependent on the time available for the healthcare worker (Reinertsen). Healthcare workers are deeply frustrated by the lack of available time to provide the level of quality care that they know they should provide. According to Dr. Reinertsen:

> Frustrations about their work are about time: fear that rushed patient visits will cause them to make serious mistakes, anger about the time they waste in cumbersome regulatory and organizational workflow processes, and a profound sense of loss of control over how they spend their time. (Reinertsen)

Every person and organization has a "way of doing things" that becomes the organizational habit. The growth of these ideas comes from the past practice of adding additional components over time. Eventually processes become complex that they break down, meaning they no longer meet the purpose of the process—either from a patient (or customer perspective) or from an employee or even an employer perspective.

In a stressed, pressured, low reimbursement healthcare environment, freeing up the time for improvement is one of the first obstacles. A first step in point of care problem solving is capturing the attention and willingness of the care providers present. Several challenges exist for the staff involved indirect patient care being able to pause and even identify the problem. The fragmented, chaotic environment is frustrating already for the nurses and other healthcare staff. The front-line healthcare workers experience is described as time-pressured, harried, fast-paced and fraught with a wide array of annoyances (Tucker, Edmondson and Spear, 2001). Suggesting problem solving should also be an added responsibility for them becomes a more increasing pressure instead of a relief.

The design of "slack time" for problem solving seems to be of high priority initially. Dr. Jim Reinertsen suggests that the theory of complex adaptive systems suggests a simple rule be applied to hospitals that leaders systematically remove everything that steals 'touch time' from doctors and nurses. He admits that applying this rule is more difficult than it sounds (Reinertsen). Dr. Reinertsen describes the work done at the Pittsburgh Regional Healthcare Initiative, implementing the Toyota production system as a way to avoid or decrease the "touch time toxins" such as filling out forms required by payers and regulators, navigating a complex maze of organizational and external environmental requirements.

The clinical microsystems research agrees that although finding time for a clinical microsystem to improve care is a challenge. However, it is the only way to improve and maintain the desired characteristics of quality, safety, efficiency and flexibility by blending the work of analyzing, changing, measuring, and redesigning into the regular patterns and way things are done for front-line professionals (Godfrey, 2005). It is necessary to having the combined efforts of everyone continuously to sustain the change. Front line staff have extensive tacit knowledge from which the organization can learn and can impact the risk adjusted mortality through participation and collaboration, particularly through participation in process improvement efforts (Nembhard et al., 2007).

Healthcare workers are all so busy individually that they do not have time to redesign the patient's care experience. Healthcare workers' lives can become so hectic and out of control they lose the joy in their own work. The "system" is so complex that it is difficult for anyone to change the processes. Yet, they recognize that certain things they do just don't work. They become tired, frustrated in changing things and they get used to the workarounds or the path of least resistance.

The Excellence Makeover Model sets aside time initially through the Intensive when all shift focus is conducted. The analogy is similar to getting the rust off of the flywheel as referenced in Jim Collin's *Good to Great* book (Collins, 2001). The on-going refreshment keeps the flywheel moving.

2.3.5.3 Documenting the Current Condition Hairball The figure below demonstrates the observations of a nurse on a stepdown unit for 4 hours in which 60% of her time was "non-value added" and there were 36 potential patient safety issues observed—this named "the hairball". The hairball includes many small potential items of friction for the patient and the staff.

These small failures are also called, friction. The "friction" unfortunately absorbs capacity and artificially decreases real capacity. From the book Beyond the Theory of Constraints, friction is summed up in a quote from On War:

> Everything in war is very simple, but the simplest thing is difficult. The difficulties accumulate and end by producing a kind of friction that is inconceivable unless one has experienced war…Countless minor incidences—the kind you never really foresee—combines to lower the general level of performance, so that one always falls short of the goal. … Fog can prevent the enemy from being seen on time, a gun from firing when it should a report from reaching the commanding officer. Rain can prevent a battalion from arriving, make another late by keeping it not three but eight hours on the march, ruin a cavalry charge by bogging the horses down in mud." (Levinson, 2007)

Friction an also be defined as "the little things that get under the workers' skin but are never quite important enough to make them come to management for a change." Friction was recognized by Henry Ford who noticed the little things that when added together become very big things (Levinson, 2007). Healthcare has many, many glitches, which create friction, slow flow and potentially create problems. Understanding the glitches can reveal the complexity and simplifying can potentially eliminate the errors.

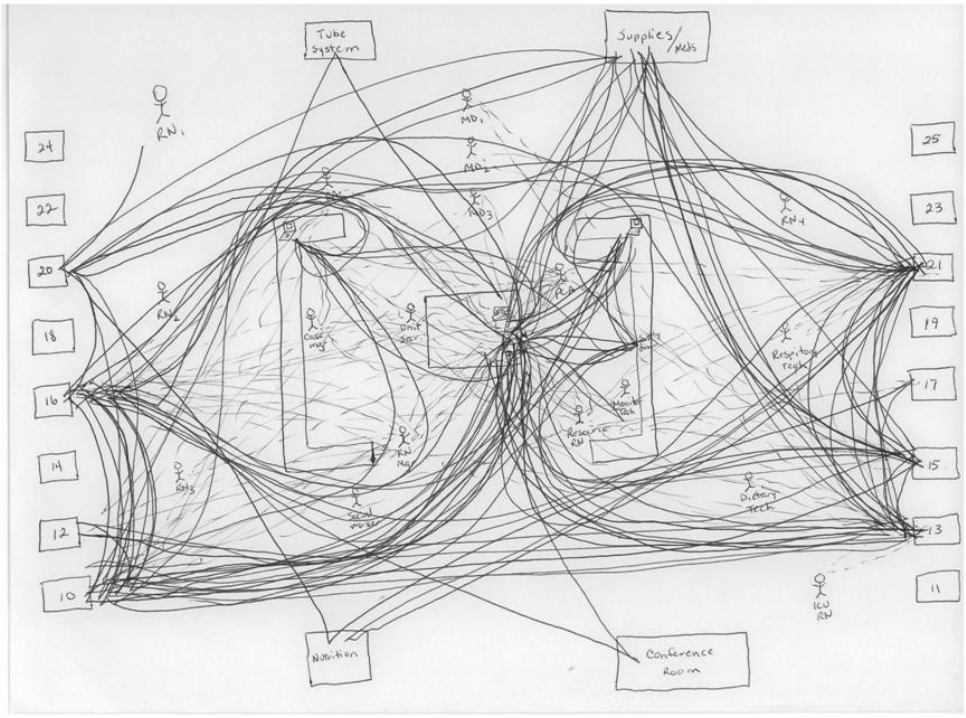


Figure 17: The Hairball of the Current Condition

The Excellence Makeover Model focuses on the current condition and the usual "messiness" of the reality. In the Intensive, the focus is on "The Healthcare Reality Show" within the first 24 hours when participants understand the current condition as from the patient and the staff perspective and document important processes.

2.3.5.4 Listening to the System The Excellence Makeover Model suggests the system is constantly communicating what is working and not working through the patient experience and the staff experience. Essentially the system is talking or even groaning in a way through numerous small failures which occur within the course of work. Data from Tucker suggestions (1) most operational failures stem from breakdowns in the supply of materials and information across organizational boundaries and (2) employees quickly perform a quick fix or compensate

for the system (also called restoring the system and first order problem-solving) (Tucker and Spear, 2006). The organizational reaction or opportunity to learn is thus lost and the workarounds multiply creating a bulky and fragmented working environment.

Listening or diagnosing the current is an important step before redesigning work systems (Hackman and Oldham, 1980). The Excellence Makeover Model listens to the system by gathering the good-little-insights-that can-help-everyone-succeed (GLITCHES) through distribution of the Post-It™ notes and instructions to gather the glitches as part of the process.

2.3.5.5 Refocusing the Role of Leadership, the Management Philosophy and Adopting a Systems Approach Typically with the command and control leadership style the organizational pyramid has the CEO at the top of the organization and the front-line or point of care staff at the bottom. The figure below demonstrates the typical organizational chart in a simplified way.

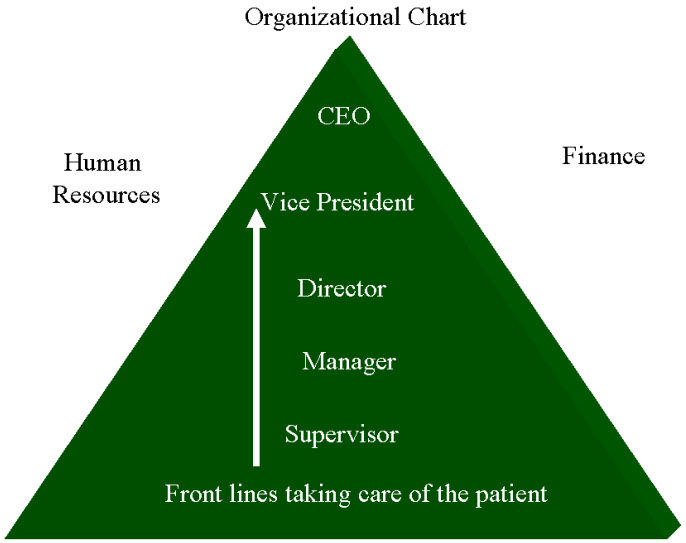


Figure 18: Traditional Pyramid of Leadership

The Excellence Makeover Model will attempt to invert the pyramid by focusing on the front lines where the value exchange occurs. The inversion will only be theoretical but exchanges the customer supplier relationships between leadership and the front line workers. The supervisor is the supplier to the front line of resources necessary to create the value exchange. Likewise the manager is the supplier to the supervisor an so forth, up through the CEO level. Khatri, et all suggests a control-based organization is where there is a tall hierarchy and communication is mostly vertical and from the top-down, versus a commitment-based management approach which organizational commitment is extensive and involves teams, cooperation and employee involvement (Khatri et al., 2006).

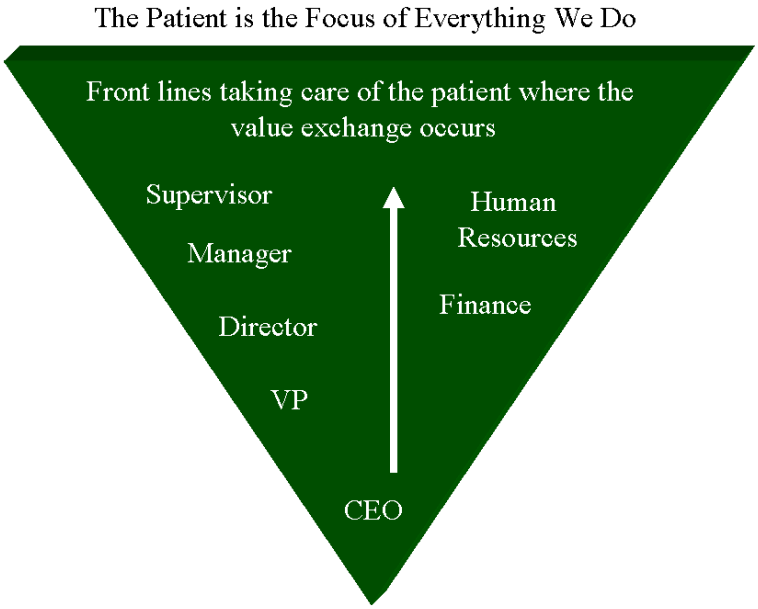


Figure 19: Inverted Pyramid of Leadership

The Excellence Makeover Model has leadership style consistent with the Complex Adaptive Systems style of leadership("Applying Complexity Science to Health and Healthcare," 2003).

Table 12: Complex Adaptive Systems versus Traditional Leadership

Complex Adaptive Systems	Traditional Systems
Are open, responsive, catalytic	Are controlling, mechanistic
Offer alternatives	Repeat the past
Are collaborative, co-participating	Are in-charge
Are connected	Are autonomous
Are adaptatable	Are self-preserving
Acknowledge paradoxes	Resist change, bury contradictions
Are engaged, continuously emerging	Are disengaged, nothing ever changes
Value persons	Value position and structures
Are shifting as processes unfold	Hold formal position
Prune rules	Set rules
Help others	Make decisions
Are listeners	Are knowers

Most of the current approaches to healthcare reform are based on a rational planning approach and are inconsistent with the principles of complex adaptive systems (Glouberman and Zimmerman, 2002). Likewise healthcare organizations have evolved through stages of development. The Excellence Makeover Model is designed as an implementation of the third stage healthcare system labeled "Complex" in Table 13: Three Stages of Healthcare Systems.

Table 13: Three Stages of Healthcare Systems

Three Stages of Healthcare Systems			
	Simple (1935)	**Complicated (1970)**	**Complex**
Organizational Type	Hierarchy	Functional Hierarchy	**Interactive network**
Accountability	Upwards	To silo and upward	**Down, across and up**
Elements of system	Hospitals, Practices	Multiple health	**Health and related**
Organizational	Levels of Care	Silo	**Self-organization**

Three Stages of Healthcare Systems			
	Simple (1935)	**Complicated (1970)**	**Complex**
method			
Main hospital Type	General	Specialist	**Networked**
Who knows	Doctor	Experts	**Collaborative groups**
What they know	General medicine	Niche knowledge	**Horizontal and vertical**
Knowledge Distribution	Clinical experience	Scientific journals	**Electronic networks**
Planning	Green Field	Problem focus	**Appreciative**
Boundaries	**Highly external**	**High in and out**	**Good cross boundary**

(Glouberman, 2002)

As mentioned, managers in the rational planning model are expected to control the organization in some way—such as reducing errors. However, because of the nature of the hospital where independent agents such as physicians interact with the organization in a voluntary way, control is very difficult. In fact, the nursing shortage increases the 'power' of the nurses as fairly independent entities all interacting with a changing environment. What the administrators are trying to control is essential a "patchwork quilt of more or less autonomous enclaves, which renders the management of the hospital as a single entity problematic at best" (Glouberman and Mintzberg, 2001).

Healthcare organizations tend to be functionally organized. The registration department, laboratory, operating room and nursing units may all report through different administrative

chains of command. The complexity of redesigning the process is exponentially increased as the various managers are all being provided with different priorities and directions from their respective managers. Just one department cannot measure those actual results for the patient. For example, the CT department for example is only one subset of a massive complex system so making changes becomes difficult in the CT department alone without understanding the implications across the system. An appropriate diagram might be:

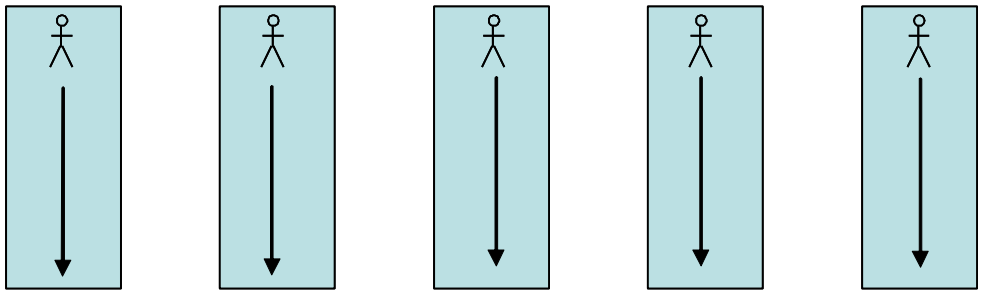


Figure 20: Silos

By creating a more systems approach, we connect the silos to form a more cohesive group.

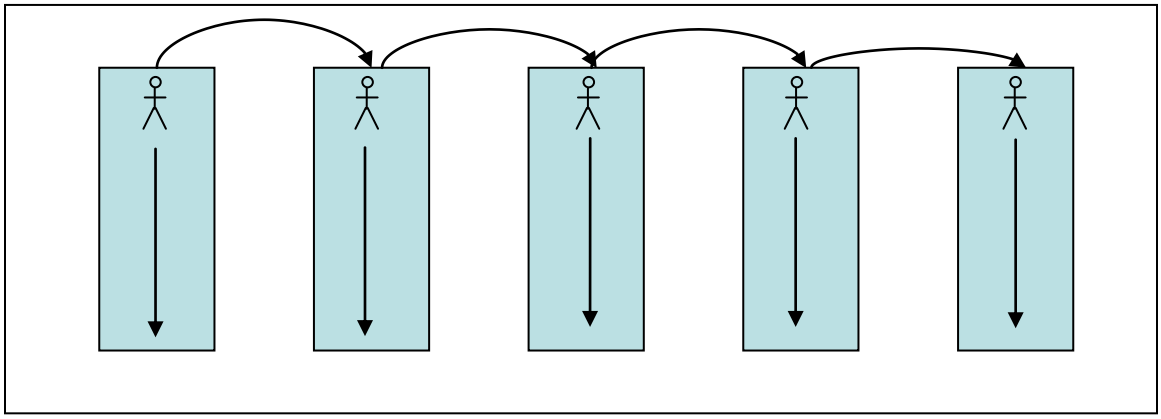


Figure 21: Connecting the Silos

The patient is the link between the silos because similar to a product flowing down a production line, the patient flows across many silos in the course of care. In Toyota this stream across function silos is called a value stream. Many tool based approaches will map the value stream as a way to understand the current condition.

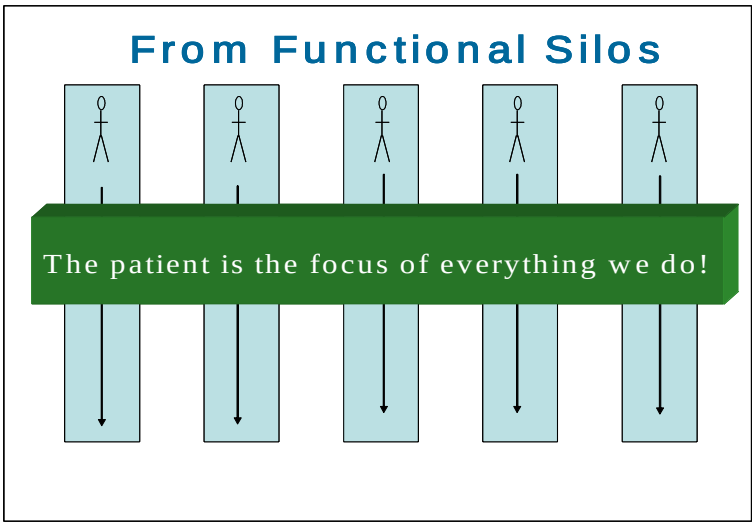


Figure 22: The Patient Links the Silos

Trying to find the problem/solution was similar to the shell game—hunting the issue and the resolution under the moving coconut. Local decision making within silos seems to create a sense of homeostasis or stability. This seems consistent with one of the "Laws of Organizations" articulated in as "organizations have basins or stability separated by thresholds of instability (Bellinger, 2005). Further, Finding 3.1 in the Building a Better Delivery System research, concludes that the healthcare delivery system does not function as a system but as a collection of entities that consider their performance in isolation (Building a Better Delivery System: A New Engineering/Health Care Partnership, 2005). Within hospitals, departments function and behave as operational silos. This is confirmed in actual work within hospital entities by many who try to

understand the redesign of healthcare. Manufacturers use concepts such as "concurrent engineering" to describe a process of designing products using a multidisciplinary microsystem to overcome the silos of responsibility and function. The aim is to develop products the first time that meet the needs of the stakeholders, including customers, and that are defect free, and can be produced cost effectively (Building a Better Delivery System: A New Engineering/Health Care Partnership, 2005).

A siloed, function approach has also been called, a tribe and can result in tribal warfare, defined as when the loyalty is to the internal department (or even profession) rather than to the organization as a whole or even the customer (Zimmerman, Lindberg and Plsek, 2001; Auty and Long, 1999) Tribalism was described in the situation of the Royal Bristol Infirmary where mortality rates were high and yet the organization continued operating with business as usual.

As noted by a Lean or Toyota implementation there are multiple differences between the command and control thinking and systems thinking (implying lean thinking) as articulated in the following table:

Table 14: Comparing Command and Control versus Systems Thinking

Command and control thinking		Systems thinking
Top-down	**perspective**	Outside-in
Functional specialisation	**design**	Demand, value and flow
Separated from work	**decision-making**	Integrated with work
Output, targets, standards: Related to budget	**measurement**	Capability, variation: relate purpose
Contractual	**attitude to customers**	What matters
Contractual	**attitude to suppliers**	Co-operative
Manage people and budgets	**role of management**	Act on system
Control	**ethos**	Learning
Reactive, projects	**change**	Adaptive, integral
Extrinsic	**motivation**	Intrinsic

(Seddon, 2005)

2.3.5.6 Changing When and How Problems are Solved Many times traditional problems are addressed by managers and executives through meetings. Managers have learned to manage quality in this traditional way. Managers have been taught to manage in school and in experience and they are comfortable with the methods of managing, even though the methods are no longer working by many measures (Dobyns and Crawford-Mason, 1994; Flinchbaugh, 2005). Getting managers to change from a quantity way of thinking to a quality way of thinking will be an on-going challenge.

Often leaders are unavailable to help solve front line worker's immediate problems "because they are in a meeting". Although the leader's role is to support where the value exchange occurs at the point of care (POC), not being available does not provide support at the POC—it pulls the care providers from the POC later or pulls the leader from the issues relevant

to the POC. By further spacing out meetings—no meeting time available for the next three weeks when everyone can get together leads to the "reactive organization" rather than the responsive—instead of focusing on real-time process understanding and design, the organization begins to constantly "restore the system"—not true problem solving behavior which compounds workarounds and adds layers of complexity. As front-line workers learn to live with these problems, they become desensitized to the problems and become increasingly busy, distracted by the workarounds. Potentially large problems start as small problems. Top down interventions to large problems may not work because of the disconnect between the real condition at the POC and the perception by the leadership. More open access scheduling by leaders so they could be available to support system redesign at the POC is a concept both intriguing and perplexing; it makes intuitive sense, and yet at the same time seems impossible.

In the traditional quality or process improvement models, the first step is to conduct an off-line meeting. The underlying purpose of a meeting is to involve the decision-makers and solve problems. However, most meetings occur in time and place distant from the actual problem. Executive's schedules fill up with meetings scheduled weeks or even months ahead and stifle the ability to respond to small problems in real-time. Are meetings effective with the separation of time and space or have they become efforts which seem to solve problems and yet are just useless efforts? What if executives cleared schedules and only allowed meetings to be scheduled which deal with problems that are occurring within the last three days (closer to real-time)? We do not have an adaptive framework to quickly call executive attention to the systems that were not producing the desired and designed results. The Iceberg of Ignorance diagram below notes that front line workers know 100% of problems.

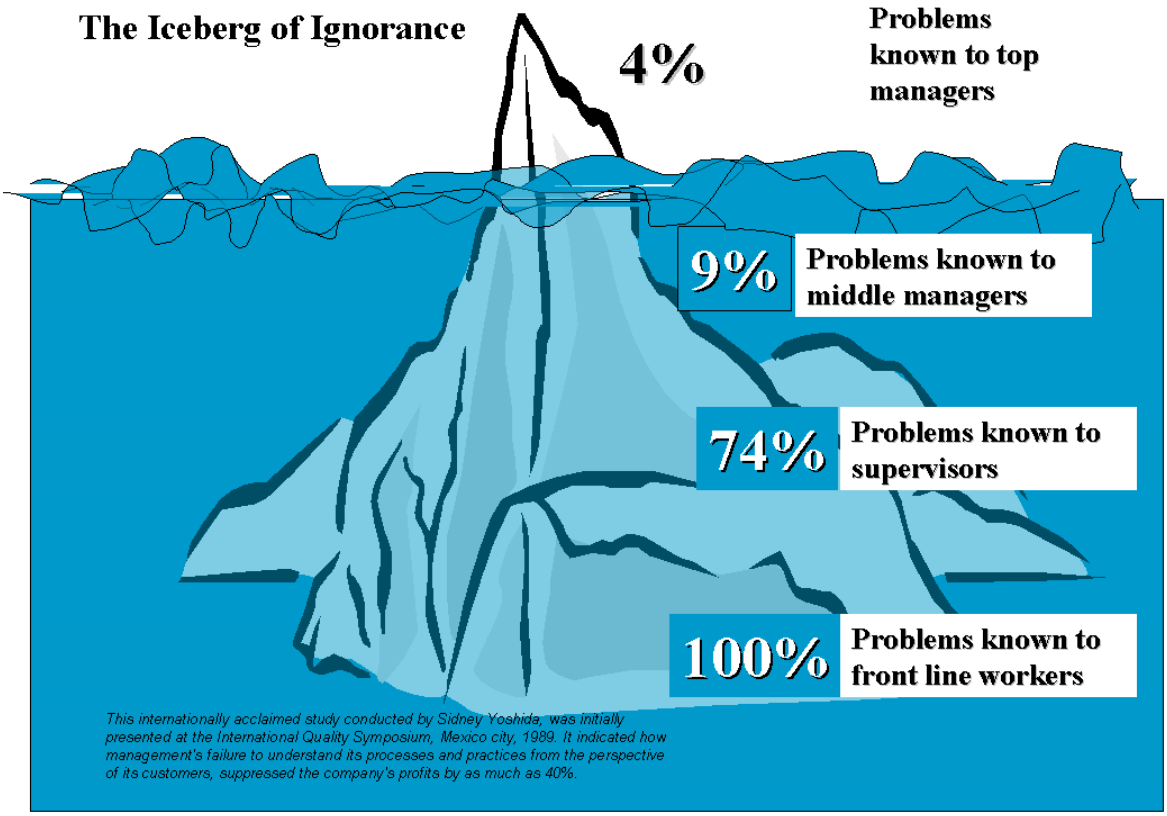


Figure 23: Iceberg of Ignorance

Adapted from ("The Iceberg of Ignorance,")

Upton and Kim describe "in-process" learning in the manufacturing shop floor as operational learning which are derived from the experience of the production workers (Field and Sinha, 2005). In the process described in the study, the work teams acquire knowledge by eliciting and sharing knowledge possessed by individual team members and generating new knowledge through interaction and collaboration between team members (Field and Sinha, 2005).

Focusing on the front-line workers input has become increasing recognized as important to improving care. Using positive deviance, front line workers are decreasing the prevalence of MRSA at the VA Pittsburgh Health System (Crawford, 2007). There may be many reasons for the front-line staff not sharing their experiences and knowledge because of interpersonal, psychological and structural factors, and the challenge is to how to achieve true front-line staff

input (Nembhard et al., 2007). A bottom-up approach is recommended within the IOM Crossing the Quality Chasm report, “change needs to come from the bottom-up as front-line health care teams recognize opportunities for redesigning care processes and acquire the skill to implement those new approaches successfully” (Crossing the Quality Chasm, 2001).

Serious or sentinel events are only the "tip of the iceberg" of processes that indicate the system is not meeting its purpose and highlight the possibilities for organizational learning (Wilf-Miron et al., 2003). The issues really start much deeper in the system where activities, connections and pathways either are poorly designed or fail to work properly. Most current healthcare quality work occurs above the water line or when there are reportable results or sentinel events. Errors are part of the current condition. Small errors are where the bigger problems start (Reason, 2000; Dovey SM, 2001). Currently most of the hospitals focus is on the larger problems or more frequent problems rather than design of activities, connections and pathways. What makes up complexity or chaos? Many small problems that can be eliminated will smooth out the process and lead to more predictability of process measures and then immediate response when a problem does occur. Kyoshi Uchimaru recommended making the processes visible and eliminating errors earlier. One way to accomplish this is to have many short stages in processes and to create a reflective practice (Walden, 2003).

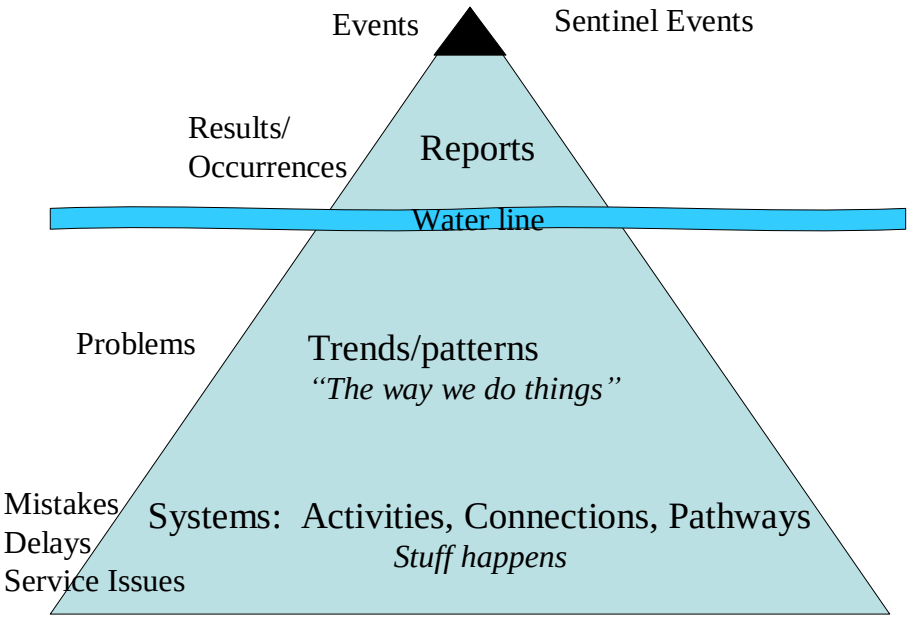


Figure 24: Pyramid of Problems

If management responds only to the issues above the "water line", they may be creating latent failures within the system. As the diagram below demonstrates, many activities, connections and pathways are occurring deep in the system and will ultimately be apparent above the water line through reports, occurrences, and sentinel events. If the organization only responds to these in retrospect, opportunities to influence the events so organizational performance and patient care may suffer.

The Excellence Makeover Model uses some of the ideas from the complex zone solutions in its approach to front-line problem solving such as good enough planning, simple rules, multiple actions, experimenting and tuning the system using PDCA, listening to the shadow system, applying intuition and muddling through, chunking, teaching using metaphors and asking wicked questions.

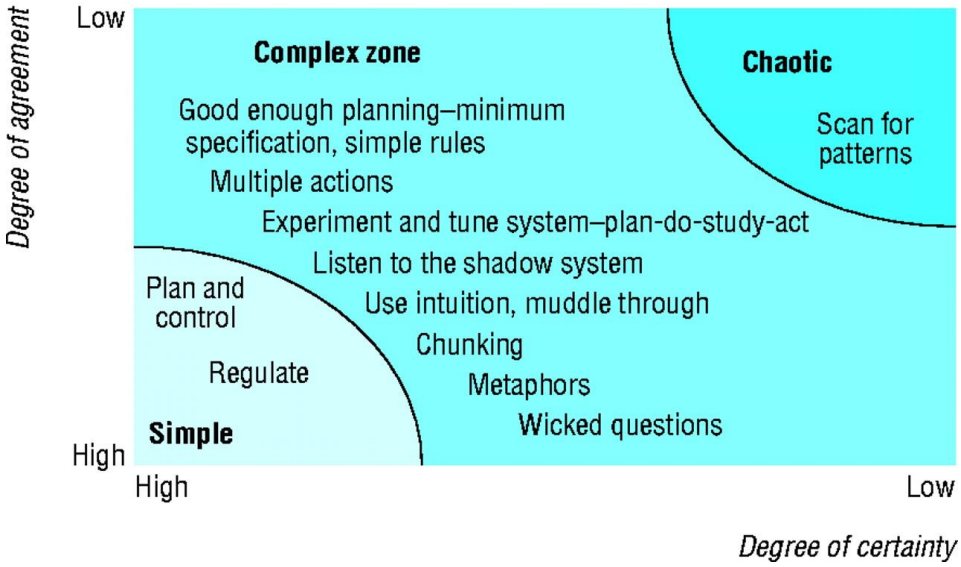


Figure 25: Responses to Simple, Complex and Chaotic

(Wilson, Holt and Greenhalgh, 2001)

2.3.5.7 Focusing on the Point Of Care—the Point of the Value Exchange Where does the value exchange occur within a hospital? If you consider the value exchange with a product such as a car, the value exchange occurs at the time the car is delivered to the customer. Toyota focuses on delighting the customer in this value exchange. Similarly, the value exchange in healthcare occurs when the patient receives care from the front-line worker. This may be the nursing assistant who provides a bath, a nurse who changes a dressing, a dietary aide who delivers a food tray, or a physician who examines, diagnoses and determines a treatment plan. The exchange occurs when the patient receives a service of some value. The purpose of a hospital is to provide health or medical care. Medical care is intended to provide some additional value to the patient to relieve pain, cure or optimize health. What level of support occurs for the point of care to enhance its function?

How those activities are organized and are they standardized or do they occur randomly? For example, what is the job of a nurse? After spending time observing the work of the nurse, it

seems the nurse's work is functionally organized. In other words, a nurse starts his day with a report of the patients and then has a sequence of work that is relatively independent of the unique needs of the patient or customer. So the nurses' work is to administer meds, document conditions, manage IVs …. The typical patient experience is a rushed nurse doing his work rather than the work being designed based in the unique needs of that patient.

Since healthcare tasks are highly interdependent, requiring multiple disciplines to work together, the lack of sufficient integration and coordination of activities (such as poor communication and teamwork) is a major source of medical errors and poor quality of care (Khatri et al., 2006).

2.3.5.8 Asking "What Does the Patient Need and How Does the System Respond to that Need?" How a well-functioning organization performs evolves based on the needs of the customer and the understanding of the organization which provides for those needs. The well-functioning organization of 1935 would be considered dysfunctional today (Glouberman, 2002). Currently in many hospitals, healthcare quality improvement has been approached from meeting the requirements of Joint Commission or government regulators. Quality is defined in many ways by these regulators or accreditors either as existing or not existing. Increasing pressure on hospitals with pay for performance measures intensify the focus on quality metrics, practice guidelines and following of protocols (Kumar and Carson-Martin, 2005). Many times the implementation of these mechanism results in additional cost, staff or bureaucratic requirements such as additional documentation specialists who inspect or audit charts and then alert the healthcare professionals of the requirements.

2.3.5.9 Focusing on the Process and Creating Adaptability Much of the engineering literature suggests standardization is necessary to decrease variation within the process to

eliminate the risk of error. Healthcare workers intuitively reject high standardization because of the variability of the individual patient's need and the variability of the demand on a day to day basis. How much specification or standardization is appropriate for healthcare processes? In considering the balance between no process and a rigid process potentially an adapted diagram from the Center for Quality of Management, can illustrate the improvement in effectiveness by defining the process but a diminishing of effectiveness at the extreme of defining a rigid process (Walden, 2003). Too much standardization can actually paralyze the ability to meet patient's needs and decrease the effectiveness.

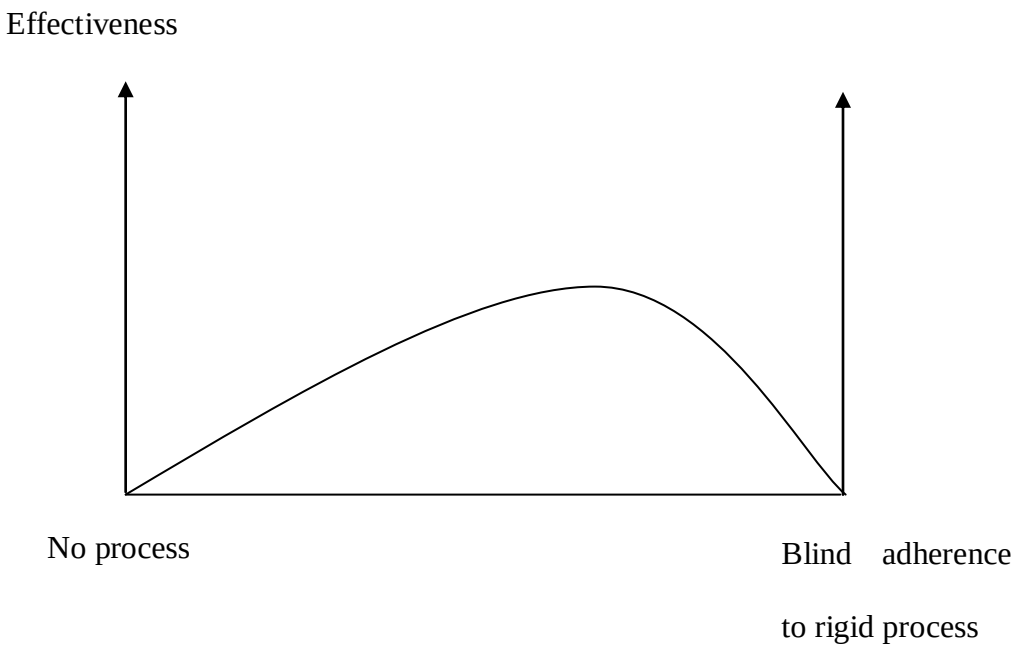


Figure 26: Paradox of Rigid Process

There remains a paradox between highly specifying processes and allowing for adaptation. What has been termed "evil flexibility" provides an ambiguous work environment where processes, patterns and outcomes are vague so how do we know or recognize the best pay of performing. Daily experiments are not occurring and improvements occur in spurts generated and managed by top management, responding to big problems.

Hospitals typically have a high volume demand and high variety to its demand and customer needs. Healthcare has a need for maximum flexibility but this can lead to a chaos which can lead to error.

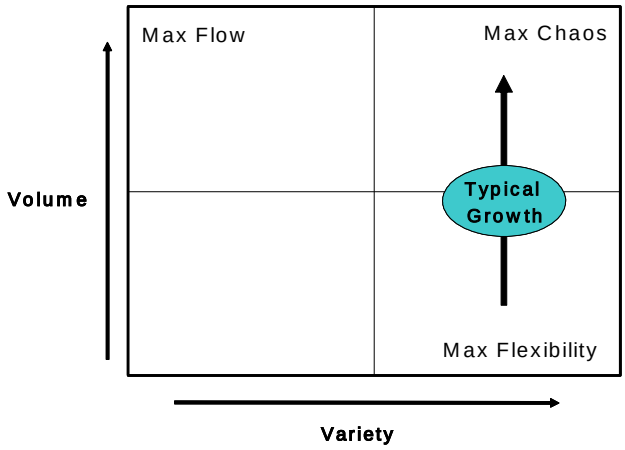


Figure 27: Relationship Between Volume and Variety
(Werling, 2005)

The adaptability is necessary because of the human variability of specific patients with variable healthcare needs as well as the autonomous physician healthcare culture which exists currently.

The Excellence Makeover Model intends to develop the intellectual capacity of the staff and eventual head towards increased value-added standardization. One concern is that many implementations of the Toyota tools overly and prematurely emphasize standardization which can create a rigidity. This Excellence Makeover Model includes an activity principle but intentionally lists it as after the pathway and the connection principles are understood to avoid the paralysis of meeting patient needs if inappropriately implemented.

2.3.5.10 Defining Problem Solving Levels There are two orders of problem solving within organizations, including hospitals and health systems: first order and second order problem solving. The first type is essentially "restoring the system" or correcting the immediate problem before the front line worker. These short term remedies are also called patches or "first order problem solving" by Anita L. Tucker who cataloged 194 failures of process through

observations in hospitals (Tucker and Edmondson, 2003). Examples might be missing medications, linens, or other supplies. For 92% of the observed problems workers responded with only first order problem-solving—essentially restoring the system (Tucker, Edmondson and Spear, 2001).

There is an apparent limit to the level of organizational learning from level one problem solving. According to Kofman and Senge (Kofman and Senge, 1993):

> The quick-fix mentality also makes us "system blind." Many of today's problems come from yesterday's solutions, and many of today's solutions will be tomorrow's problems. What is most perplexing is that many quick fixes, from cost cutting to marketing promotions, are implemented even though no one believes they address underlying problems. But we still feel compelled to implement these "solutions." We need to show results, and fast, regardless of the long-term, system-wide consequences.

In fact, the quick fixes actually delay the actual long-term fix. This is diagramed in the systems thinking as a system archetype called, “Shifting the Burden”. For example if the symptom or a problem occurs, a person or a group comes up with a solution (the quick fix) which really only addresses the symptom, not the underlying problem. However, the quick fix represents the “path of least resistance”. Usually as a result of feeling pressured by time, cost or complexity the staff choose the quick fix and the reduction of the problem appears to “solve the problem” because the patient’s need is met or the staff continue to complete their work. However, by relieving the pain from the system, there is less pressure to discover an internal, long term solution. The quick fix becomes “the way things are done” and the staff are desensitized and consider the problem and the quick fix normal, and assume it will always be there (Balestereire, 2005). Attention is not given to the underlying, structural or system beneath the problem since the quick fix relieves the symptom. Unfortunately, the quick fix has side effects which weaken the natural ability of the system to learn and to correct problems. So the

system becomes dependent on the quick fix, and its internal ability to help itself is disabled. This is diagrammed as the causal loop of Figure 28: Shifting the Burden.

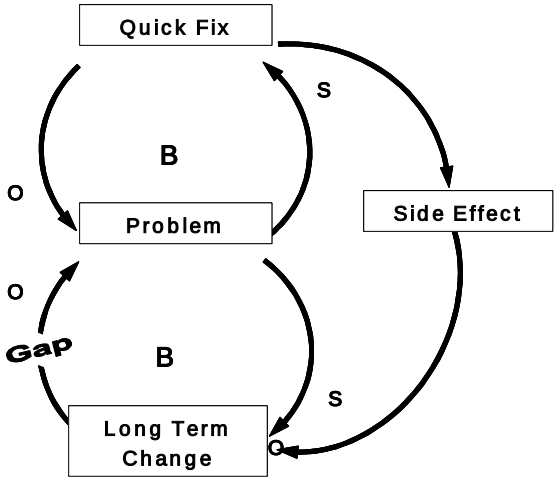


Figure 28: Shifting the Burden

The second order problem solving involves the long term system redesign necessary to more creatively solve the problem so it does not occur again for the same reason. Only 7% of the nurses responses indicated they implemented second order problem solving such as: communicating to a person or department responsible for the person; bringing it to the manager's attention, sharing ideas of what cause the problem and how to prevent the reoccurrence with someone in the position to implement the change (Tucker and Edmondson, 2003). Tucker concluded that the reason the nurses did not implement second order problem solving was not because of their lack of caring, laziness or incompetence but rather three factors: norms of individual vigilance, efficiency concerns, and empowerment (Tucker and Edmondson, 2003).

The Excellence Makeover Model suggests:

- We accept preventable, needless events, by creating workarounds.
- Workarounds are symptoms of a system or process problem

- Many acts of modern day heroism are immediately preceded by acts of utter insanity requiring the very acts of heroism that we are bragging about in the first place
- Instead of workarounds, why not respond, "since we can't ____, let's find out why and do something about it"

2.3.5.11 Taking an Constructionist-based Approach to Problem-Solving For the purposes of this research, we will consider these glitches (rather than problems or in addition to problems) and ideas from the front-line staff. Small pre-problems focus may be more of a constructionist-based approach and be an easier discussion among the group. The acronym "good little insights that help everyone succeed" or g-l-i-t-c-h-e-s will help staff understand the level of focus. To demonstrate the difference we will use the fall analogy. Falls occur in hospitals when patients who may be unsteady and fall. Prevention programs have been developed which would take preventive steps to avoid a sentinel event such as a fall with an injury. A fall without an injury may not be considered by many to be a problem. A glitch might be when a bright orange bracelet that would identify the patient is at risk for falling is not placed on the patient as expected in the falls prevention program or if a team has developed a method to always have the bracelet available. Frequently the failure to place the bracelet on the patient is not recognized and is not likely alone to directly contribute to a fall. However, the steps which were designed with the hypothesis that the steps would prevent a fall, did not function as designed. The bracelet not being placed would be a glitch.

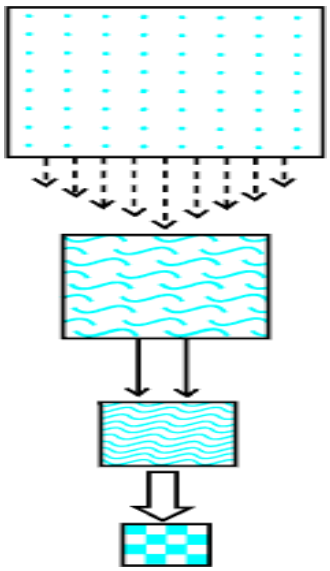


Figure 29: Toxic Cascade

Another model of understanding errors is the toxic cascade which relates medical errors to trickles, creeks, rivers and streams (Dovey SM, 2001). In this model, a trickle receives almost no attention and is rarely recognized. An example might be misfiled records which are a very common occurrence. They only result in a frustration, unrecognized waste and irritation. Their connection to downstream errors is unknown. But they flow into creeks. Creeks are more obvious than trickles because the work needs to stop and correct because they "create barriers to passage". The example of a creek is mistakes such as prescribing drugs to patients who have allergy as a contraindication. Clinicians worry about creeks because of the potential seriousness of the harm they could cause patients. Creeks are corrected when they are detected but rarely are their upstream sources investigated and the downstream consequences are usually unknown. Rivers however are much too big to ignore. Dovey et al suggest rivers may be quiet, but they continuously redefine the landscape. Rivers can result in actual harm to patients and the example used by Dovey is undiagnosed fractures. The quality or patient safety staff will react to these errors by dealing directly with the department or persons who created the errors. Unfortunately

this results frequently in blame of individuals who may be punished and removed. The upstream error sources unexplored. But eventually torrents occur which are very powerful and seem impossible to stop. The noise of torrents can be so intense that they drown out conversation and make critical thinking difficult. The example of a torrent in health care is the reports from the IOM that draw media attention and regulatory action. Glitches are analogous to the trickles in the toxic cascade model.

Consider the genesis of a blister on the foot created by a shoe that does not fit. The initial pain is mild and a small area of redness will develop in the spot of the friction. If no attention is paid to the small red area and continued use of the shoe occurs, the blister will form. The purpose behind the blister is to protect the foot from the damage of the poorly fitting shoe. In fact the blister is filled with sterile inflammatory cells that are ready to fight for the survival of the body. For most people, the blister creates pain and the shoe is not worn or the area inside the shoe corrected. If, however, the person has a problem such as diabetes, which can numb the foot, the blister will still occur but the signal to the body is interrupted and the person may continue to use the shoe, which could lead to a bigger problem such as an ulcer. The ulcer is much more difficult to fix than the small red area or even the blister. In fact, diabetics end up with a leg amputation because of a simple problem of a misfit shoe that was not attended to properly.

Similarly, systems that have small problems (similar in scale to the red area of the foot), if numbed to the pain, can develop an inability to change until a more catastrophic situation develops. Hospitals are overwhelmed with demands and pressures with antiquated systems that have evolved over time. They are unfortunately numbed to the daily pain of small errors and then

organizational blisters develop, they may be uncomfortable until a sentinel event (analogous to the amputation) occurs and then the organization responds to try to react to the situation.

We will also focus on the ideas from the staff on how to deal with problems or glitches. All ideas or glitches will be welcomed and evaluated by the rest of the group. The glitch or idea sharing will be seen as a positive versus a negative approach. In addition, the goal is to maintain ownership at the front-line level for the glitches and the ideas. Rather than buy-in, the Excellence Makeover Model seeks ownership at the point of care.

2.3.5.12 Understanding Normal State, Dysfunctional Normal State, Contingencies and the Creative State In many healthcare processes there appears to be a dysfunctional normal state. A dysfunctional normal state is different from an abnormal state. In an abnormal state, the normal is designed to be functional and the abnormal state is a highlight that the normal state has become unstable. In contrast the dysfunctional normal state is an under designed or poorly designed normal state. In some situations, the process merely happens but is not actively designed nor has a tension towards an ideal.

- Input disconnected from output
- Starving the process for resources so cannot achieve the quality, service or efficiency—may seem to make sense in the short term
- Optimizes one department's goals over the system goals (i.e. make more money in this department)
- Fully utilizes a shared resource with one type of demand and sub-optimizes other demands
- Becomes disconnected from the purpose
- Focuses on interpersonal conflict or friendships to solve problems rather than alignment and contribution to ultimate purpose
- Fragmented or designed delays, waits, waste
- No tension to better towards the ideal

- Does not learn or experiences decay over time
- System becomes desensitized to what normal means and thinks and behaves as if dysfunctional normal is really normal
- Rarely in true normal state

One important step for the cross-function group is to define the normal state. In the normal state of patient flow within the hospital input ~=output. Normal is how the team defines who the process or the work activity, connection or pathway is designed to work.

- A designed process with a whole system understanding
- Streamlined positive experience for patients and staff—designed consistent with the *purpose*
- Designed with high quality, service and efficiency—the normal state should work
- Normal state should be informed by contingencies and creative states
- If process does not work the way it is designed, there is a way to pull management attention to the "abnormal state"
- Involves performance agreements (mutually understood standards) for what is normal (for example, 30 minutes for this step)
- "In process" visual controls or data assures the process that it is in normal state
- The budget is appropriate for supporting the normal state—the Goldilocks approach (just right)
- The organization stays in normal state at least 80% of the time or the normal state is refined.
- Because of the dynamic state of healthcare and the need for adaptability to the variability of demand and specific patient needs, contingency states need to be defined based on the process's potential variability or vulnerability.

Contingency states have the following characteristics:

- In contingency states, input > output or input < output.

- Designed contingencies at each step of the process and they should be activated for specific situations
- Someone with human intelligence needs to analyze the situation and activates the contingency
- Contingencies are constantly learning
- Contingencies are design principle-based
- Contingencies are understood by many and activated on the front line as appropriate without management approval for each instance
- Contingencies should be used occasionally (<20% of the time)

Occasionally, any process design will fail to meet the needs of the stakeholders. In this situation, a creative state is defined. This state is also called "crisis mode" and unfortunately many processes run in crisis model most of the time. The characteristics of the creative state are:

- Sense of urgency and "on the fly" solutions
- Going into creative state should be a rare (<5% of the time) and thus an event that gets attention
- Try completely unusual solutions
- Use when contingencies fail or are likely to fail
- Not pre-designed so may require "breaking the rules" to meet the purpose of the process
- Provides the agility of the organization in extreme situations

2.3.5.13 Conduct very rapid cycle experiments The Plan-Do-Study-Act (PDSA) [also called the Plan-Do-Check-Act (PDCA)] is intended to embed the scientific method into change approaches.

Don Berwick the president of the IHI, suggests:

> "In many circumstances, the most powerful way to make such changes is to conduct small, local tests -- Plan-Do-Study-Act (PDSA) cycles - in which one learns from taking action. Learning in these cycles has much in common with learning from prudent clinical work, in which therapies are initiated under close observation and adjustments are made as data and experience accumulate." ("How to Make Systems Changes for Improved Care,")

The IHI Model for Improvement asks three important questions:

1. What are we trying to improve?
2. What change can we make that will result in an improvement?
3. How will we know that a change is an improvement?

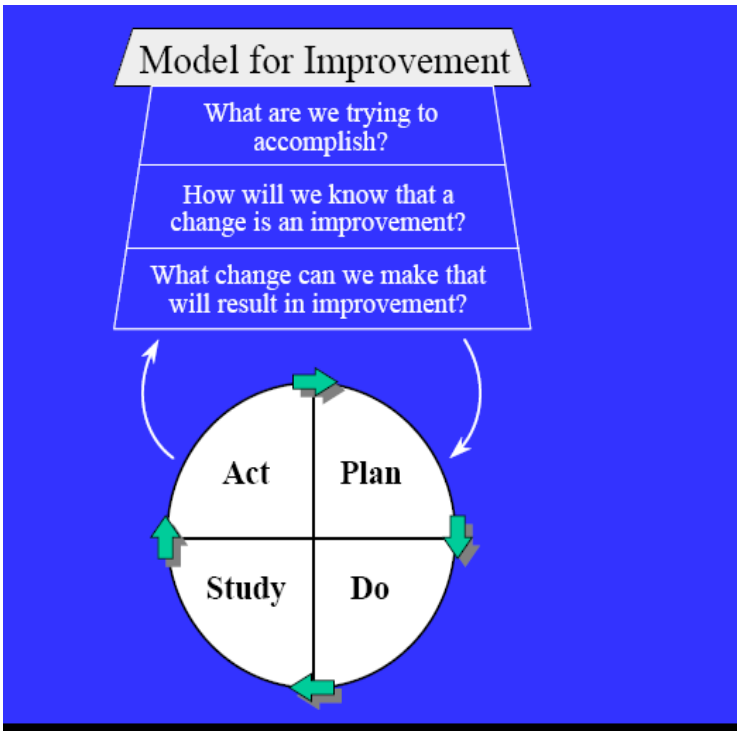


Figure 30: Model for Improvement

(Langley et al., 1996)

Plan the improvement process.

- Determine your objective
- Predict the outcome.

Do the new experiment and collect data about the process.

- Document any unforeseen problems or other unexpected observations.

Study the results of the new process.

- Analyze the data and compare them to the predicted results.
- Summarize what was learned from performing the cycle.

Act to hold the initial improvements and continue to seek the further improvement.

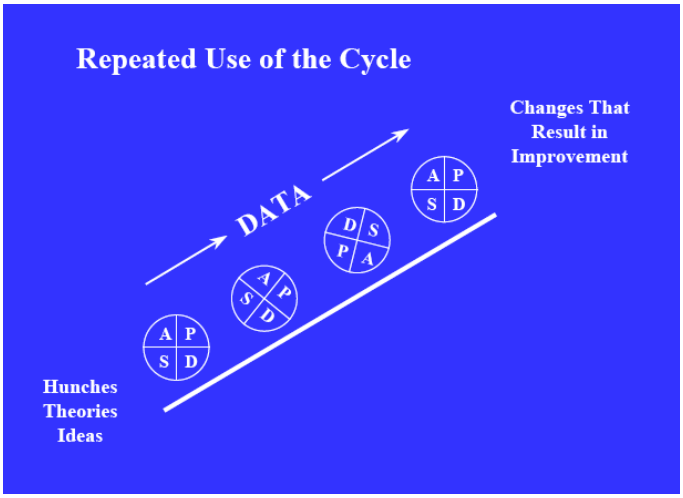


Figure 31: Repeated PDSA Cycles

(Langley et al., 1996)

By designing experiments in the course of work, the trialability and the observability of the success is visible are achieved.

2.3.5.14 Using Data Traditional quality has used retrospective data and tremendous energy and efforts have been expended to develop elaborate information systems that allow complex data analysis. However, these reports are presented with such a time lag that the specifics of the problem are unable to be reconstructed so the real root cause or action cause are identified. The analysis is completed by analysts who are not intimately involved with or knowledgeable with the processes.

The use of data as a trap to catch another person in being responsible for the data is an on-going issue. Too many times support managers will track a department's performance and

present the data as a defect rate in a public meeting. The person responsible for the data becomes embarrassed and the meeting participants are relieved that their department or performance was not the one caught in the negative spotlight. Another data use is retrospective data presented month, quarters or even years after the fact. This type of data is not actionable because many times the circumstances have dramatically changed since the time period being reviewed. Retrospective data is helpful for before and after comparisons but very ineffective in providing useful change data after the fact. Hospital unit managers receive daily, monthly and quarterly information and are unaware what to do with the data and how to make it useful. Key process and outcome information is not collected because most information systems are still administrative data rather than clinical systems.

Proper use of process data is within the process itself. According to Wachter, "Error reporting systems can be powerful tools when the reports are used to improve systems or educate providers, and they are particularly valuable when those who submit reports subsequently learn that their submissions made a difference" (Wachter, 2004). By making the data collection integrated into the process design, the data provides useful information and intermediate outcome data could provide insight into the effectiveness of the intervention.

The Excellence Makeover Model uses dynamic data or data meaningful to the front-line workers with process tracking information and a dynamic data poster is available so staff become used to using data on a real-time basis. The actual metrics are determined based on the processes occurring on the front-line and the information considered valuable to understand whether the process is 'normally' performing or not.

2.3.5.15 Creating Tension Toward the Ideal As Gene Bellinger on a systems thinking website states (Bellinger, 2005):

> Organizations are typically the result of a large set of decisions over an extended period of time, each of which made sense to someone at the time they were made, though collectively taken together they end up creating an organization that seldom serves its customers, and almost no one is interested in working in. The situation arises because decisions are generally made to solve problems rather than create a desired future state. Focusing on creating a desired future state turns out to be far more beneficial than simply solving problems, because it actually tends to get the organization somewhere it want to be.

No matter what the process is, it has certain characteristics of performance. Essentially the current condition is what it is—neither good or bad for the purposes of understanding. By being open to understanding the current process, we diffuse the natural blame, judgment and then protection behaviors that unfold. So we always start with a current condition. To understand the current condition, we would observe the process in real-time so we see the reality of the interactions between activities, connections and pathways. We will diagram this as being "where we are" or a point in space.

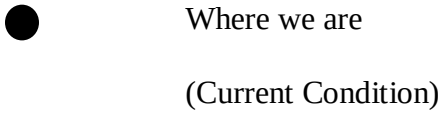


Figure 32: Beginning at the Current Condition

We also have a direction towards some change. In TPS we would seek out the "ideal" which is our true north. It however is just a point in space separate from "where we are". Our diagram thus becomes:

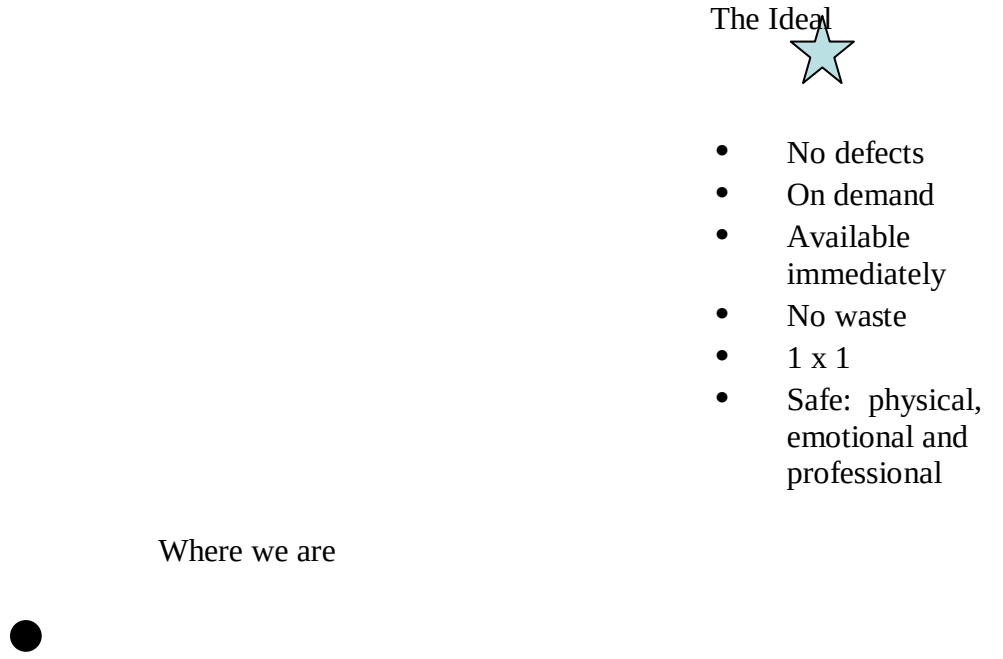


Figure 33: Defining the Ideal

Obviously, with a desire recognition that we are not at the ideal, we can create a tension towards the ideal. Senge calls this a creative tension. But we have several options or paths to create the tension. Lowering the "ideal" decreases the tension or moving toward the ideal can decrease the tension. Clearly lowering the ideal compromises the results, rather than maintaining the creative tension toward to the ideal. We can take small steps or incremental change steps toward the ideal. Pictorially this would look as follows:

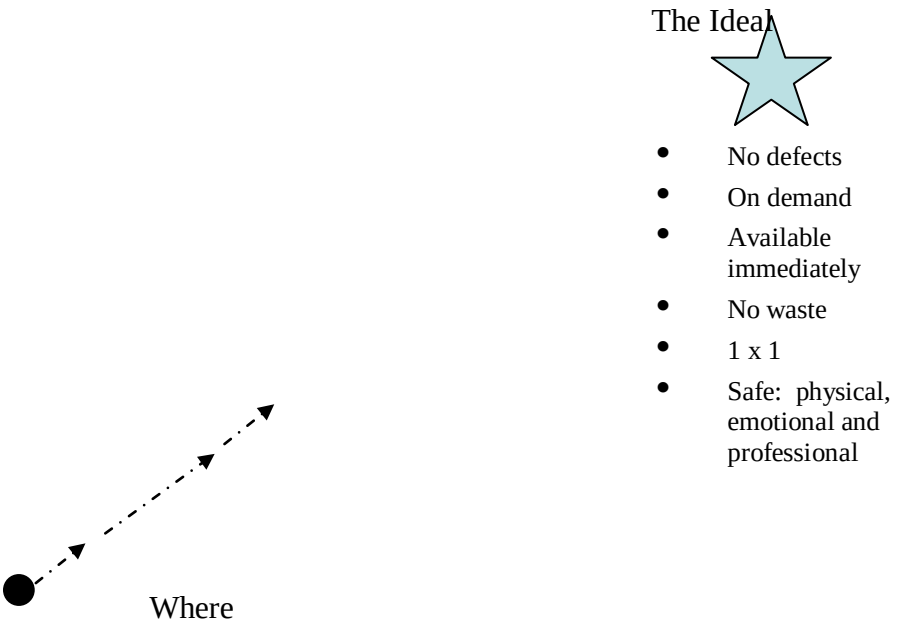


Figure 34 Incremental Movement towards the Ideal

Another option is to take a leap toward the idea (theoretically at least) by asking the question, "Why don't we have the ideal?"

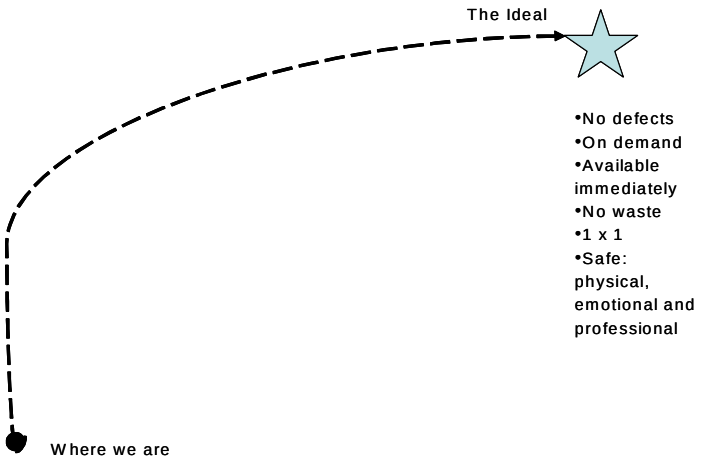


Figure 35: Direct Movement to the Ideal

In healthcare, our beginning point is known to have errors or problems such as the central line infections (CLABs), ventilator associated pneumonias (VAPs), as well as service issues impacting the patient. In addition, healthcare workers are increasingly frustrated with the work arounds and ambiguity and are leaving the profession. So our beginning or current condition includes these known undesirable situations.

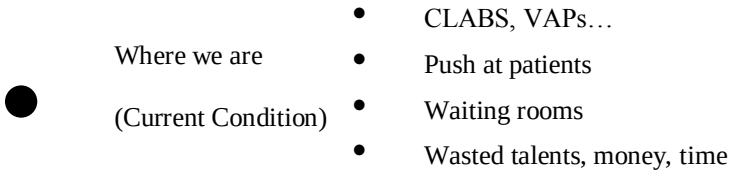


Figure 36: Healthcare Beginning Current Condition

So by contrasting the current healthcare condition with the ideal, we can illustrate the gap in healthcare. Now the journey to close the gap can begin but where does one start to close the gap? Again, we could choose to go directly from the current condition toward the ideal in a theoretical way.

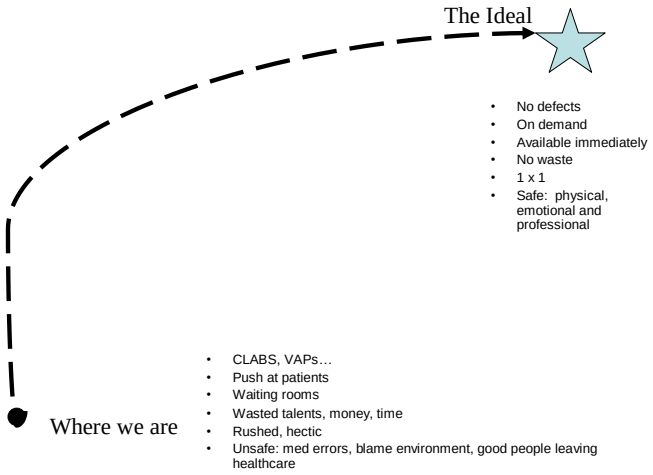


Figure 37: Driving to the Ideal First

Current conditions exist for good reasons and result from some implicit logic. But as we create the tension towards a different state or the ideal, the recognition of the gap and the barriers may emerge. These barriers will force us back down the line between the current condition and the ideal towards where we start.

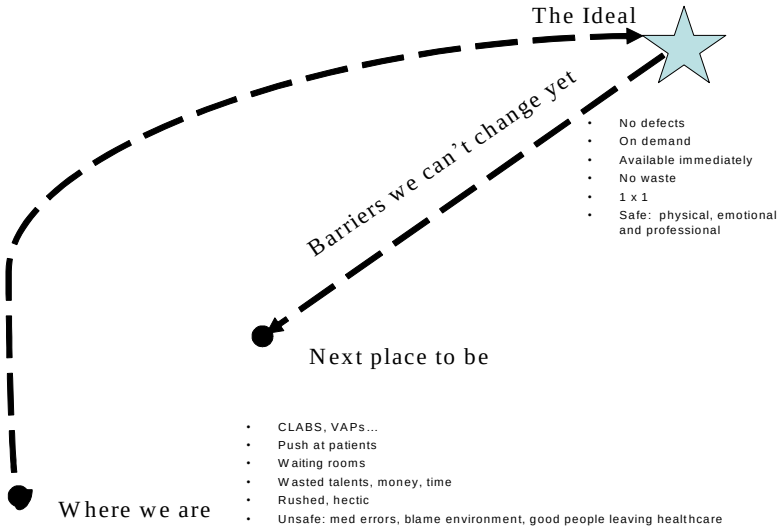


Figure 38: Healthcare Barriers Move Towards the Current Condition

By then defining the steps to go from our "where we are" or current condition to the "next place to be or target condition, we have created the tension toward the ideal but a manageable progressive step forward in a realistic target condition.

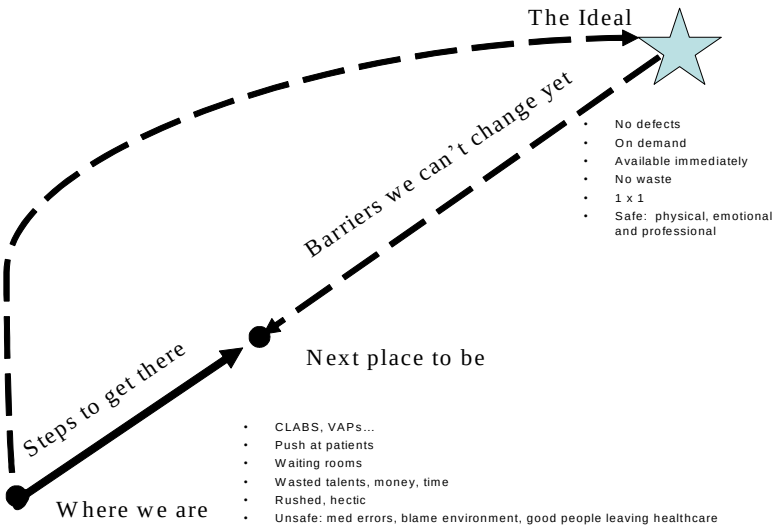


Figure 39: Closing the Gap Between the Current and the Target Conditions

The target condition in time 1 (t_1) becomes the current condition in time 2 (t_2). This the iterative process continues with constant progress towards the ideal, if the hypothesis is correct. If the hypothesis is incorrect, the feedback is provided and a reassessment can be done and a new experiment is designed. This is consistent with the Plan-Do-Check-Act improvement model from the Institute for Healthcare Improvement (IHI).

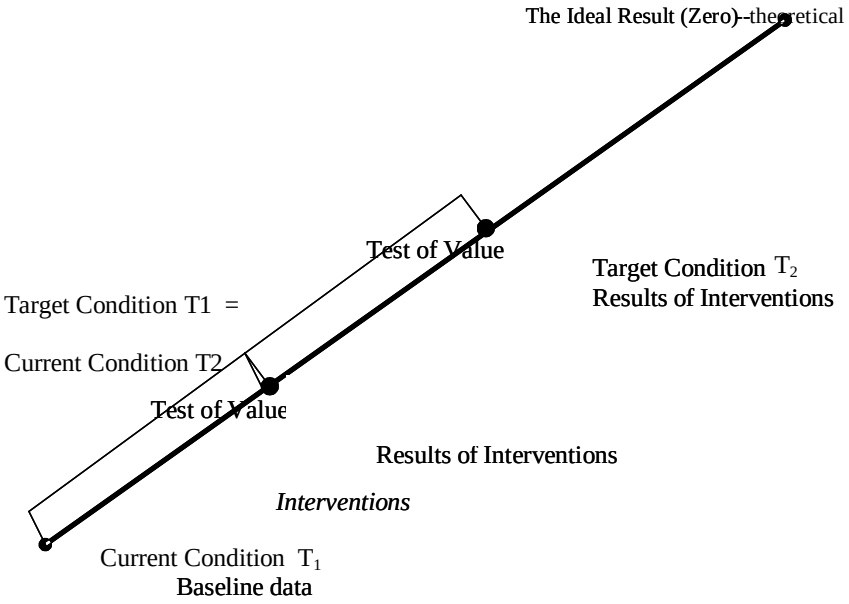


Figure 40: Climbing the Mountain towards the Ideal

Healthcare has been very interested in benchmarking. The definition of benchmarking is meant to include comparing to the best and identifying what is the best. Frequently the concept becomes diluted to be comparing to others, who are often only mediocre. Toyota reportedly discourages external benchmarking but encourages internal benchmarking. But can organizations make major improvements in processes simply by exposure to best practices and to benchmarking?

The positive deviance approach criticizes benchmarking as implying a level of stupidity within the team that fails to discover the best practice. In addition, the implementation plans derived from a benchmarking study normally fail to address all the specific details that make real the changes within the organization. The need to adapt the best practices from within the team and to allow for a team self discovery makes the changes more long-lasting (Bertels and Sternin, 2003).

Where does benchmarking fit into our diagram of the current condition, target condition and the ideal? The answer is that it depends on the real metrics of the process being evaluated and how it compares to the benchmarking and best practices organizations results.

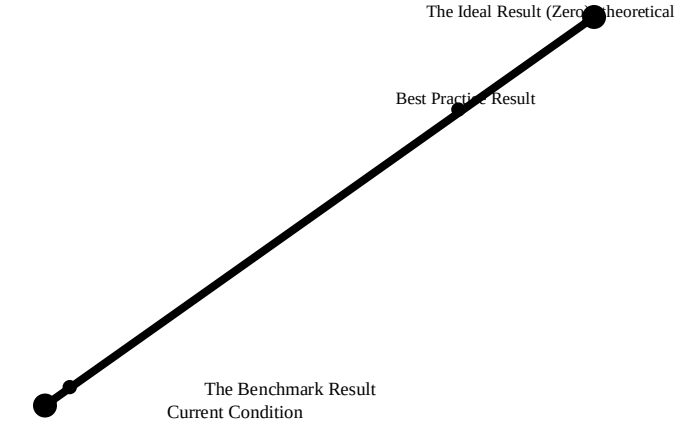


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Figure 41: Responding to the Benchmark when Close to Current Condition

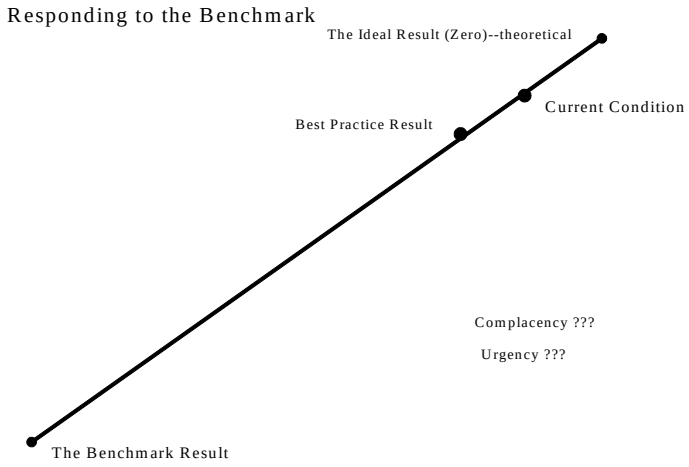


Figure 42: Responding to the Benchmark when Current Condition is Better

2.3.5.16 Designing Learning Organizations Creating learning organizations that are constantly adapting to changing environmental circumstances and patient needs is a goal towards achieving long-term patient service and safety. Hospitals are not currently learning from the

daily problems and errors that occur within their organizations in part because of the time pressures, unpredictability of workload, reliance on others for information and supplies and low status of front line workers (Tucker and Edmondson, 2003). In an article titled, "Diagnosing Diagnosis Errors: Lessons from a Multi-institutional Collaborative Project", the authors noted, "there needs to be a commitment to build learning organizations, in which feedback to earlier providers who may have failed to make a correct diagnosis becomes routine, so that institutions can learn from this aggregated feedback data"(Schiff et al., 2004). Part of the commitment includes setting the environment where learning can occur. Organizational learning occurs when individuals, groups and organizations gather and digest information, imagine and plan new actions, and implement change (Carroll, 1998). By gathering glitches, ideas and implementing rapid change, the front-line team can learn together and become a learning organization. The learning can occur when the staff are able to:

- Design immediate countermeasures and try them.
- Test in each use to create a learning system (the organization is constantly redesigning its processes towards the ideal). Never stop asking "how could we do this better?" And then do it.

2.3.5.17 Start Anywhere The interconnectedness of the departments and the change in the problem solving timing and philosophy is intended to lead to system-wide change. The implementation within one area in a multidisciplinary approach is likened to starting a fire. The intention is for the fire to spread into other areas and it is less necessary for the exact right spot to begin. The web of the entire system is dynamically connected and requiring constant redesign.

2.3.6 Contrast of Traditional versus Excellence Makeover Model

In summary, the table below provides an overview of the contrast of traditional versus the Excellence Makeover Model:

Table 15: Contrast of Traditional versus Excellence Makeover Model

	Traditional	Excellence Makeover Model
Who	Management and leadership; consultants; quality improvement staff—top-down approach Form task force which meets weekly or monthly	Front line workers with leaders supporting as learners and teachers—bottom-up approach
When	Retrospective—may take months; planned events	Real time-takes minutes, hours or the maximum days;
Why	Big issue as identified as by a sentinel event, data that identifies a trend or a significance of the problem	Small issue different than the expected outcome. Everyone becomes effective at doing and improving their work
What	Generic solutions-such as better teamwork, education, policies; install fixes or create programs Identify and focus on problems that have the biggest impact; in small day-to day problems, restore the system; work around small problems	Specific intervention based on the specific problem; everyone knows the principles and is designing and improving activities, customer-supplier connections and pathways. Small problems are the same as big problems—all symptoms of a poorly designed process; avoid symptomatic relief without fundamental problem resolution
How	Root cause analysis with binders of	Small "r" root cause analysis—

	Traditional	Excellence Makeover Model
	information; tell people to do their work differently; best-practices pre-determined and applied to the process	asking the 5 whys at the time of the occurrence; action cause analysis (reference—the way); lead process of scientific problem-solving; everyone learns by doing; best practice is an emergent property of the process.
Where	Conference or class room—remote from the problem site	On the shop floor in Toyota; at the point of care in healthcare
Accountability	Find out who did wrong	Find out what went wrong
Unit of analysis	Organizational unit, focusing on the outcome	One patient at a time and asking "What does the patient need?" and then "How does the system deliver against the need?"
Use of Data	To discover problems;	To understand the capability of the process
Learning	Individual learning from external resources	Organizational and individual learning in the context of the work place
Focus	Fragmented, parts focus	System, whole focus, part is connected to the whole

2.4 SUMMARY

The Agency for Healthcare Research and Quality (AHRQ), "Closing the Quality Gap" reports, "the complexity of health service delivery and organization may require alternative methods for

assessing what qualifies as evidence. Ultimately, however, more evaluative research in this area may be useful to those implementing quality improvement strategies by highlighting potential levers for change" (Center, 2004).

This research intends to primarily focus on other process improvement methodologies which can be implemented on-line, by the front –line staff The research is significant because of the numerous studies showing that the healthcare system is failing to provide the type of outcomes necessary and little applied research has been completed to document new models and results. The literature of successful process improvement models in healthcare is sparse. Most are project focused reports with specific teams or projects off-line. There is a need for a practical Excellence Makeover Model which could be research tested to learn about its applicability.

3.0 METHODOLOGY OF IMPLEMENTATION

3.1 INTRODUCTION

Why have system engineering concepts not already transformed the healthcare industry? According to the Institute of Medicine report, Building a Better Delivery System: A New Engineering/Health Care Partnership, the answer lies in the cultural, organizational, and policy-related barriers that have impeded the widespread use of systems-engineering tools [and information technology in health care] (Building a Better Delivery System: A New Engineering/Health Care Partnership, 2005). This research focuses on some of the cultural and organizational factors affecting implementation of the Model.

3.2 RESEARCH QUESTIONS/GOALS

The following research questions have guided the development of this research:

1. Prior to implementing the Excellence Makeover Model, what are the descriptive data about the focus area determined by the unit?
2. What were the theme areas from the glitch and idea analysis?
3. What type of changes can be implemented in rapid cycle process improvement?

4. What are the key factors influencing the effectiveness of real-time, on-line process redesign and problem-solving?
5. What are the short term results of the changes implemented in a unit implementing such a model?

3.3 RESEARCH APPROACH

3.3.1 Inclusion Criteria

Similar to other "makeover" shows, there needs to be an understanding of the objectives of the unit so an application has been designed to spur departmental thinking, creativity, focus and ownership. Originally, the departments were encouraged to be creative to convince the judges they are in need of a makeover, so the unit or team was asked to submit an application to identify their desire for an "Excellence Makeover". This created a "pull" from the department front-line rather than a "push" of change from the top-down. The premise is that behavior change occurs when there is readiness in humans or in organizations.

For the purposes of this research, interested units, departments, or hospitals were eligible for inclusion. The hospital who was selected had volunteered. However, any interested department would have been considered within the recruitment time period.

3.3.2 Scope of the Project

The research consisted of one case study of the facility for implementation of the Excellence Makeover Model. To determine the department and specific hospital, information about the opportunity was provided to the leaders of the facilities. A key aspect of the research is ownership of the improvement by the existing working team, so the response by the hospital will be important.

In order to answer the first research question, descriptive information was gathered and observational studies conducted to document the current condition. An understanding of the current quality improvement efforts was conducted to understand the current condition. Any specific quality improvement plans and historic data for the area of research were reviewed and summarized.

At least two planning sessions were to be conducted with the existing leadership. The sample agenda for these meetings is included in Appendix B. As part of the planning a schedule of events and teaching opportunities were to be defined. A sample of the schedule is provided in Appendix C and a similar schedule was developed and communicated to staff as appropriate. Appendix D provides a sample menu of module descriptions consistent with the logical background of the Excellence Makeover.

The Excellence Makeover Model was implemented and the experience will be documented through descriptive process steps. The exploratory aspect of the research focuses on how the Model is implemented and additional refinements to the Model after the experience.

The intact work team (viewed as a micro-system) was engaged to participate in the process improvement as an on-going focus to implement the Model. No individual participant information was identified in any way for this research. The focus of the research is to describe the implementation of the Model to evaluate the Model rather than the unit.

3.4 THE RESEARCH DESIGN

Since one aim of this research is to develop and implement a practical Model for ensuring quality for healthcare, the appropriate research design is action research. After consultation with the

University of Pittsburgh Office of Measurement and Evaluation of Teaching, this development and implementation design was determined to be the best approach for the research objectives. The purpose is to describe the developmental evolution and the most recent implementation with suggestions for additional refinements to the Excellence Makeover Model and additional research perspective. According to Carol Baker, former Director of the University of Pittsburgh Office of Measurement and Evaluation of Teaching, with this type of research, a hypothesis and research questions are not necessary because the description of the development and the implementation are the purpose of the research.

Action research is "an inquiry that is done by or with insiders to an organization or community, but never *to* or *on* them" (Herr and Anderson, 2005). Since the researcher intends to pursue practical action research, this method is the most appropriate for the researcher's interests.

By necessity the scope of the study will not allow for randomization of the interventional unit. Random selection cannot occur within the context of the current healthcare condition without changing the administrative structure of the hospital and disrupting care of the patients. In addition, the details of the intervention is necessarily determined by the team so highly specified operationalization of the intervention is not feasible for the type of research.

The research most closely aligns with traditional research including components of a case study. The case study methodology is appropriate because "case study evaluations are valuable where broad, complex questions have to be addressed in complex circumstances" (Keen and Packwood, 1995). A case study is appropriate because the research questions focus on the "how" and "why" of the implementation of model. According to Yin (2003), the technical definition of a case is the following:

1. a case study is an empirical inquiry that
    - investigates a contemporary phenomenon within its real-life context, especially when
    - the boundaries between phenomenon and context are not clearly evident
2. The case study inquiry
    - copes with the technically distinct situation in which there will be many more variables of interest than data points and as one result
    - relies on multiple sources of evidence ,with data needing to converge in a triangulating fashion and as another result
    - benefits from the prior development of theoretical propositions to guide data collection and analysis

In action research the team "'learns by doing' with a group of people identifying a problem, doing something to resolve it, see how successful they were, and if not satisfied, try again" (O'Brien, 1998). Action research is a methodology popular in education and social science because change needs to occur within the context of the social setting.

A characteristic of action research cycle is to intend, act, and review requiring mix of responsiveness and rigor (Dick, 2005). The responsiveness is essential to create the change but the rigor is important to recognize the impact of the change. Most conventional research designs provide for the rigor through standardization, objectivity and the use of numerical measures but the virtue of action research is its responsiveness (Dick, 2005). Since part of the assumptions of the research are that traditional quality and data management systems in healthcare have failed the customer and the employees, alternative approaches using a more emergent research design seem particularly appropriate and necessary to test the problem statement. There remains a limited understanding of the mechanisms of interventions to improve health care quality (Center, 2004). The AHRQ report, "Closing the Quality Gap" defines implementation research "as the scientific study of methods to promote the uptake of research findings for the purpose of improving quality of care" (Center, 2004). Implementation research is also called action research or quality improvement research.

The challenge in case studies and action research is to protect the generalizability or external validity. As Yin suggests, the mode of generalization for case studies is "analytic generalization" rather than "statistical generalization" in which a developed theory is used to compare to the empirical results of the study (Yin, 2003). Most of the objectives of this research proposal are not to question the type of healthcare interventions (i.e. theory) which lead to better outcomes in the areas of quality, safety, satisfaction or financial outcomes. The goal is to test the intervention of rapid cycle process improvement and problem solving on administrative processes such as patient flow, work design, problem solving and communication among the team members and between teams.

The researcher acted as a participant-observer in the action research component following a conceptual outline of how the Excellence Makeover Model can be applied in a specific context. This action research is an inquiry in the context of focused efforts to improve the quality of an organization and its performance. The purpose of this research is to provide a preliminary framework for others to follow to continue the research into a more traditional research design. Thus, providing several examples of the application of a theoretical Model is sufficient for this research. The cyclic nature of action research is diagramed below:

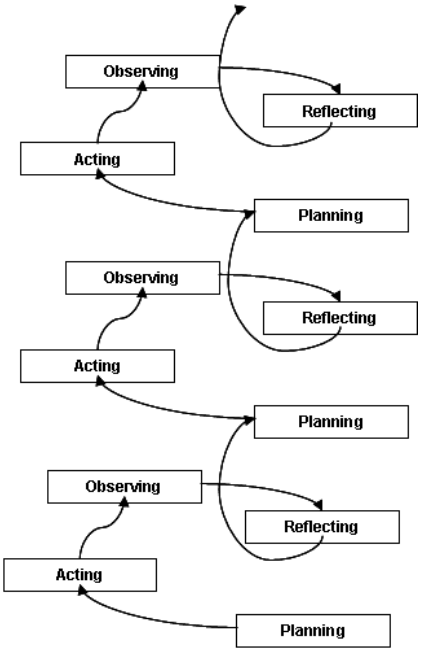


Figure 43: Action Research Cycle

The action research component will be conducted by the researcher with one intact work group. The Excellence Makeover Model implementation will be documented by the researcher and observations and learnings will be reported about the Model implementation. Embedded into the Excellence Makeover Model is the Plan-Do-Check Act in an expedited format. The small-scale changes of local Plan-Do-Study Act cycle can be more appropriate and informative than formal studies with experimental designs such as randomized trials or the ad hoc implementation of changes without reflection or evaluative measurement (Berwick, 1998). Artifacts of the interventions will be preserved and analyzed.

Just as complexity science speaks of 'messy problems", action research is described as a "a messy, somewhat unpredictable process and a key part of the inquiry is a recording of decisions made in the face of this messiness" (Herr and Anderson, 2005).

3.5 **ASSUMPTIONS**

An important assumption underlying this study is that much of healthcare delivery within a facility is currently ad-hoc, functionally siloed, managed via retrospective data in an off-line process initiated by management. Another assumption pertinent to this research is that effective change can occur at the front line worker level to successfully impact healthcare quality, safety, service and financial outcomes.

Another assumption is that the Toyota production system was designed to meet the needs of an automobile manufacturing company and certain rigid aspects are not applicable to healthcare and so must be adapted to meet the needs of patients, healthcare workers and healthcare organizations. By adapting the principles of the Toyota production system through the lens of systems thinking and complex adaptive systems thinking, the assumption is that the Excellence Makeover Model becomes more useful to healthcare.

An assumption is that errors can be prevented at the point of care through process management techniques such as the Toyota production system. Another assumption is that the staff will have enough time to improve their processes in real-time.

One assumption is the staff have a desire to change and improve the system in which they work. According to the AHRQ report, "Closing the Gap", barriers to change may stymie even the most laudable (and seemingly obvious) effort to correct a health care quality problem."(Center, 2004). Resistance to change efforts is common problems in organizational life and social science research.

There is an assumption that the small problems cascade to become errors. The attenuation of the sensitivity to problems will hypothetically reduce the system errors within

healthcare. The implied hypothesis is we have a high tolerance for the problems and have squelched the noise problems create which leads to error or system failures.

3.6 SCOPE AND LIMITATIONS

The intended scope of the study will be a department within one hospital. A description of the healthcare system, hospital and the department will be provided but will remain anonymous for confidentiality purposes.

3.7 ASSESSMENT OF THREATS

3.7.1 Construct Validity Threats

In qualitative research construct validity addresses whether the conclusions being drawn from the data are credible, defensible, warranted, and able to withstand alternative explanations (User-Friendly Handbook for Mixed Method Evaluations, 1997). There could be an unrecognized bias by the researcher as a participant observer in the process.

3.7.2 Internal Validity Threats

Threats to validity based on history, maturation or experimental mortality threats to internal validity are unlikely because of the short time period from the observations and the interventions and post tests. However, testing, possibly a John Henry effect and an experimental diffusion

threats may be expected because of the position of the experimenter, the participant-observer aspect of the action research and the nature of the experiment in bringing attention to the group's performance and the proximity of the one group to the general context of the health system and specific hospital. The threat of instrumentation is not expected since the instrumentation will not be the intervention. No threat of statistical regression is expected because this is not relevant to the design of the study. Differential selection could be a threat since the choice of the one group may be limited to a finite number of options and the selection may contain some level of confounding effect.

3.7.3 External Validity Threats

Generalizability or external validity is a concern with action research because of the "uncontrolled" nature of the experiments. The specific interventions will be determined from the repertoire of concepts from the process management techniques and generalizability will certainly be limited. Again analytic generalization is the goal of this research. The best test for generalizability will be replication which is recommended as an additional area of research after the completion of this initial test.

3.7.4 Limitations

The study has several limitations. The primary limitation is only one hospital will be studied which decreases the generalizability to other settings. There may be limits to the access to information or willingness of the intact group to participate. Clearly it would be useful to study a larger sample including a whole organization and/or additional departments. The researcher is

employed by the parent organization and the nature of her position may also be regarded as a limitation through it makes access to the hospital feasible.

3.8 **DEFINITION OF TERMS**

Activities

Activities constitute the work of each person within the organization. Any one person has activities to complete.

The rule in use for activities is that each activity should be highly specified as to content, sequence, timing, location and expected outcome. To simply this rule for the study, the concept will be summarized to "specify each activity".

Connections

All couplets of people are organized to be a customer and a supplier. Who makes the request? If the customer initiates the request, it is a pull system. If the supplier initiates the relationship then it is a push system. Pull systems lead to more efficient processes.

The rule in use for connections is that each connection should be highly specified and be binary with a request from a customer and then a response from a supplier. To simply this rule for the study, the concept will be summarized to "clearly connect each customer and supplier".

Errors

The definition of error adopted from cognitive psychology and used in the IOM report is "the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim" (Becher and Chassin, 2001)

Errors can also be defined as "execution of a task that is either unnecessary or incorrectly carried out and that could have been avoided with appropriate distribution of pre-existing information" (Tucker and Edmondson, 2003).

Glitches

The acronym Good-Little-Insights-That-Can-Help-Everyone-Succeed will be used for small issues that the staff, families or patients may highlight that might provide insight into the performance of the system currently. A GLITCH may be a problem or could be a positive insight of something that is working.

Front Line healthcare workers

Front–line refers to intact work group(s) closest to the patient or customer. This designation may be applied across many disciplines or departments. This includes front-line staff who add value directly to the patient experience. Front-line workers include nurses, physicians, therapists, housekeeping and others who directly connect with the patient and may cross many functions and departments.

Ideal

In the Toyota production system there is tension towards the ideal which is defined as (Spear and Bowen, 1999):

- Defect-free
- Available immediately when the customer needs it
- On demand
- Without waste (which creates the lowest cost available without cutting value)
- Safe: professionally, physically and emotionally
- One-by-one (eliminating batching and customizing the products to meet individual customer needs)

The concept of the ideal provides a "true north" that tensions the system to continuously improve and ask the question continuously "how can this be better?" Toyota has refined its production processes over the last 50 years or more in pursuit of this standard of the ideal.

Improvement

Improvement will be a change implemented with the intention of to better achieve the expected outcomes of the process.

Leadership

Leadership will be defined by the organization but is expected to include administrative and managerial positions within the organization.

Micro-system

A micro-system is defined by Batalden as "a small, organized patient care unit with a specific clinical purpose, set of patients, technologies and practitioners who work directly with these patients (Donaldson and Mohr, 2001).

On-line

On-line means "within the team that is performing the functions or tasks". This is contrasted by *off-line* problem solving which is completed by others outside the functional microsystem or as a separate problem solving microsystem specifically pulled together for the task of problem solving.

Pathways

A pathway is a series of interlinked persons who perform activities and who are connected to provide some value to the end customer.

The rule in use for pathways is that each pathway should be highly specified, predefined, simple, direct and without forks or loops. To simplify this rule for the study, the concept will be summarized to "Define and simplify each flow"

Problems

There are three levels of problems. The first level of problems is defined as circumstances that do not meet the patient's needs, or the inability of the worker(s) to be successful in doing his or her work to meet the objectives of the process. The second level of problems is when the work is not highly specified—meaning that the objectives, the work design of activities, connections or pathways and improvement are ambiguous. The third level of problems is when the need may be met (sometimes through heroic measures by the staff), the activities may be highly specified but there is still distance to the ideal. Problems may be very small and may or may not lead to errors.

Processes

Processes are series of actions or operations to achieve an end that occur within the system or microsystem. Processes include activities across connections and within pathways. Processes can be ill- or well-defined. Processes involve input and lead to an output.

Rapid cycle/Small Acts of Improvement

Rapid cycle process improvements are mini experiments designed by the staff with the participant observer researcher to test the ideas and "fix the glitches". The timing of the trial, sophistication of the planning and scale of the experiment may be highly variable depending on the circumstances.

Real-time

Real-time refers to within the course of work. This is contrasted with traditional retrospective analysis and feedback completed weeks, months, quarters or years after the work is complete to identify problems, trends or errors.

Redesign

Redesign means to modify or to revise in a way intended to better achieve the expected outcomes of the process.

System

The Toyota production system is called a system and the consistency between the definition of a system and the elements of the activities, connections and pathways is striking. To further elaborate, parts are similar to "activities", interconnections being "connections" and purpose being loosely similar to the "pathway" defined as "a series of connected activities and connections designed to provide a good or a service to an end customer".

Quality

As articulated earlier, quality has been defined by the U.S. Office of Technology Assessment as, "the degree to which the processes of care increases the probability of outcomes desired by the patient, and reduces the probability of undesired outcomes, given the state of medical knowledge (McLaughlin and Kalunzy, 2004). Furthermore, Donabedian distinguishes several aspects of quality care: 1) structural; 2) process; 3) outcome. For the purposes of this study, quality will be defined as "meeting the needs of the patient without defect".

3.9 DATA COLLECTION METHODS

Methods and data sources to be utilized within this case study approach include description of the local and the system contexts, participant-observer observations (using some ethnographic approaches), artifact/document analysis, photography and analysis of pre and post quantitative performance data.

The methods will be used in the following manner:

Table 16: Data Collection Sources

Local and organizational contexts	For the case study a descriptive narrative will be provided using multiple sources (such as the organizational chart, staff meeting minutes, informal leadership interviews, quality, safety and patient satisfaction reports, and other internal documents about the organization or the focus area), establishing the context and providing a timeline of the organization and its development leading to the Excellence Makeover. This will provide important contextual understanding including identifying historic, critical and formative events and event sequences. Informal interviews will be conducted with leaders and staff to understand the current condition.
Participant-Observer Observations and Personal	The researcher will provide learnings on the experience of the Excellence Makeover, as well as

Reflections	collect evaluations about the event. This will include the following metrics: • The number of participants and the professional discipline of the participants as a percentage • The number total glitches and ideas gathered • Active or passive resistance to change (collected in a journal approach) • Informal evaluations of the Intensive event
Artifacts/Document analysis	Considerable artifacts and documents are expected to be generated from the Excellence Makeover event. A listing and analysis of these results will be documented. • The schedule of teaching and level of participation • The volume and categorization of the glitches and ideas • Any process analysis • Any experiments or trials developed
Performance data	Pre and post data on process performance, patient satisfaction, financials and outcomes will be collected.

	• Any changes in the performance of specific target areas from the Excellence Makeover within the time period • Quick fixes of glitches or implementation of ideas • Challenges/barriers to implementation or sustainability

Table 17: Data Collection Methods

Research Questions	**Data collection methods**
1. Prior to implementing the Model, what are the descriptive data about the focus area determined by the unit?	Document analysis and participant-observer observations
2. What were the themes identified from the glitch and idea analysis?	Content analysis of available artifacts and documents
3. What type of changes can be implemented in rapid cycle process improvement?	Artifacts/Document analysis
4. What are the key factors	Participant-Observer Observations,

influencing the effectiveness of real-time, on-line process redesign and problem-solving?	Artifacts/Document analysis
5. What are the short term results of the changes implemented in a unit implementing such a model?	Performance data

For several metrics, the formulas or definitions will be dependent on the information available from the institution. For example, the definition of total number of patients who left without medical advice will be determined based on the operational definition of the institution—although comparisons will be made only after assessing the specific definition the institution uses and attempts to ensure appropriate comparisons can be made.

In addition to assessment of the Excellence Makeover Intensive, additional improvements to the Model will be described and justified based on the experience of the researcher.

3.10 **ACTION RESEARCH COMPONENT**

The Excellence Makeover Model will be able to dissect the complexity and have the internal experts within a system generate experiments to try improvements that lead to significant and measurable improvement for patients and employees and even better meet the needs of the

organization and society. The learnings from the Intensive and the post-Intensive experience for the six week period will be tracked.

3.11 SUMMARY OF THE RESEARCH PURPOSE

This research is expected to contribute to the understanding of the healthcare current condition and develop and refine a Model for implementation that is practical for healthcare workers to learn and implement. Additional research is suggested including additional units and measuring and understanding the longer-term sustainability and spread.

4.0 FINDINGS / RESULTS

4.1 DESCRIPTION OF THE IMPLEMENTATION

Each of the research questions will reviewed and discussed. This section addresses the first research question: Prior to implementing the Model, what are the descriptive data about the focus area determined by the unit?

After approval as exempt status for the University of Pittsburgh's Institutional Review Board (IRB) and the hospital's IRB, the implementation occurred within a 104-bed community hospital. The hospital is budgeted to have approximately 497 full-time equivalent employees. A Total Quality Management (TQM) approach was introduced to the hospital many years ago. TQM teams are usually formed and are authorized through the hospital's Quality Council. Monthly meetings are held where progress reports of "open" teams are reported. When a team's work is deemed completed, the team is formally closed. The Plan-Do-Check-Act (PDCA) model is used within the facility as its improvement model.

When approached about considering to participate in the research the senior leadership responded enthusiastically and a series of overview sessions were conducted to communicate among senior leaders, nurse manager and other ancillary and support managers.

The hospital determined a focus area of methicillan-resistant staphylococcus aureus (MRSA), known as a "superbug" because of this resistance to more commonly used antibiotics. The

hospital was partially motivated because of a major insurer's quality pay for performance program that could provide a financial incentive for reduction of the number of infections and colonizations of patients with healthcare-acquired MRSA infections, with performance improvement on other clinical metrics as well.

4.2 METHODOLOGY OF IMPLEMENTATION

After an introduction to the Excellence Makeover Model to the leadership, a presentation about the concepts of the Model was provided to a senior team, including all of the hospital nurse managers. After expressing an interest in proceeding with planning, a steering committee was formed and weekly coordinating meetings were conducted to plan the Excellence Makeover Intensive. The Intensive was scheduled for April 7-10, 2008.

The Intensive was conducted on a hospital-wide basis with everyone invited to participate, regardless of patient contact or role within the organization. The design of the Excellence Makeover was heavily influenced by the Steering Committee with active participation throughout the planning and the Intensive of senior leadership. The Steering Committee committed to these goals:

- 100% hand hygiene
- 100% admission and discharge swabbing
- Zero colonizations and infections

Over a three day (approximately a 72 hour experience) Intensive a total of 898 tickets were placed in a box to document participation and to provide an incentive system with participation, including a daily drawing and distribution of gift certificates. Although initially

staff were requested to include the role of the participant on the ticket, most tickets did not include this information, so analysis of the role of participation is not able to be accurately reported. All the nurse managers in the hospital participated in the daily activities and in fact participated in the various teaching events.

The dream room was a large conference center nearby the cafeteria which was acceptable to everyone and was left open 24-hours per day during the Intensive so anyone could enter, review and post glitches and ideas. At lunchtime sequential 30-minute learning sessions were provided and all staff across the hospital was encouraged to participate. The last day over 200 bright yellow t-shirts were distributed for those who participated and an estimated 85% of all hospital staff house wide (including housekeeping, dietary, pharmacy, laboratory and other departments) appeared to have worn the t-shirts the last day of the intensive.

The rapid cycle improvements were called "small acts of Improvement" and were documented on a modified A-3 diagram, a Toyota document consistent with a plan-do-check-act (PDCA) methodology. An informal connection with the Nursing Practice Council, a chief nursing officer sponsored, nursing leadership group generated additional opportunities to describe the Model. Each nursing practice council member was asked to select a glitch and to design and then implement a small act of improvement.

The session schedule was as following:

April 7, 2008

Day One

"Welcome to the Excellence Makeover" Kick-off 11:00AM-1:00PM

Description of the Session:

This is an introduction to the entire Excellence Makeover and concentrates on the Intensive (the first 3 days—24/7). After introductions we will review the schedule, the ground rules, and the focus on MRSA. Using the iceberg analogy this session will introduce the issues underneath the surface and why we are focusing on the small "good little insights that can help everyone succeed" (GLITCHES). The important role of the front line workers will be considered and the inverting of the iceberg so the point of care becomes the focus of change. This session will happen in the Dream Room—the Conference Center. Everyone is welcome to all sessions.

Results:

This session was conducted as planned and there were participants from senior leadership throughout the session. A total of 4 unique sessions were completed and the session ended at 1:45PM. A personal story about the healthcare errors, the Ground Rules, the Iceberg of Ignorance, the goals, the schedule of events and the tour of the process within the Dream room were shared.

Healthcare Reality Show 2:00PM-5:00PM

Description of the Session:

To understand the current condition, we will go and see. But how? This provides some training about how to observe and then will go to the floor and "walk in the shoes" of the patient and the staff. The insights of the Healthcare Reality Show will provide examples for the Excellence Makeover to address. Processes will be analyzed and mapped with glitches and ideas correlated.

Some important processes may include:

- *Hand Hygiene*
- *Environmental Cleaning processes*

- *Isolation procedures—identification, obtaining materials, following precautions…*
- *Admission and discharge swabbing procedures*
- *Food tray passing and pick-up*
- *Decontamination of Equipment*
- *Transport of patients, especially to ancillary services*
- *Communication about isolation precautions*

Results:

The nine participants included the senior leadership (3) and some of the nurse managers (2) and other managers (4). After some preliminary instruction about how to observe processes, the team was divided and went to observe. Because of conflicts in schedules, the report-out did not occur with the entire group but the information was shared as available.

One senior leader went to observe the discharge nasal swabbing process on one nursing unit. Figure 44 demonstrates the process which appears to have inconsistency, potential for waste, extra steps, searching for information and possible supplies. The inverted clouds represent glitches and/or problems and 12 glitches were observed or considered for this process.

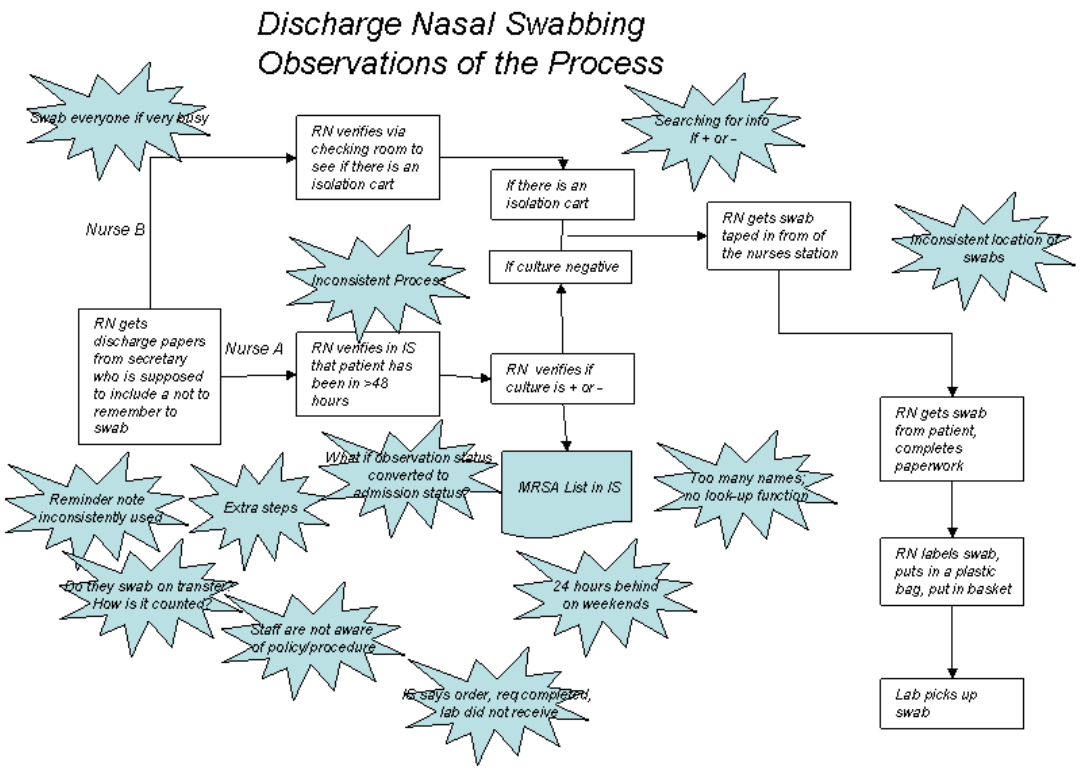


Figure 44: Observed Discharge Nasal Swabbing Process

Observations from the emergency department/transport team were conducted by a manager. Her observations were:

- Wheelchairs and beds were cleaned by the escorts which included two escorts, involved in 4 transfers and performing 7 different patient transports with none of the patients in isolation;
- One aide was observed performing hand hygiene before donning gloves and after donning gloves;
- One student was observed not performing hand hygiene;
- Two separate physicians were observed not performing hand hygiene will caring for three separate patients.

Another observer focused on isolation equipment and supplies and communication around identifying a patient as needing isolation and special precautions. She found 12 glitches associated with the communication although in general the process of procuring the isolation equipment and supplies did not appear to be a problem.

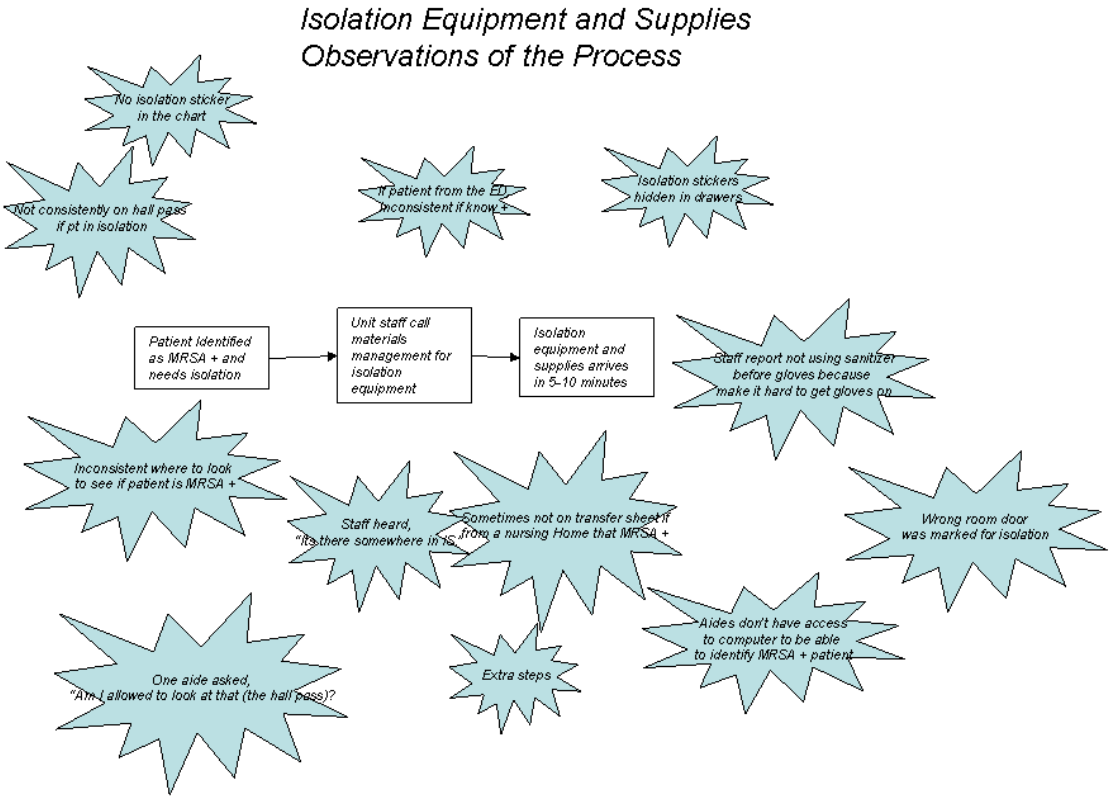


Figure 45: Observations of the Isolation Equipment and Supplies and Communication among Staff

Some observations about the identification of patients in the information system identified it is not clear who receives notification or even if the nurses enter the information in a comment field, it may not be viewable by other departments. The healthcare reality team suggested a more defined process to provide clearer communication house-wide.

The process for healthcare workers to prep the patient for isolation was reviewed and included the following steps:

(a) Perform hand hygiene before gowning and gloving

(b) Gown and glove as appropriate

(c) Take patient to the door

(d) Degown and deglove

(e) Perform hand hygiene

(f) Transport the patient

Some glitches include:

- Notifying the receiving department—some sending departments/staff do designate the information but others do not notify the receiving department they are receiving a MRSA positive patient requires use of contact precautions;
- One person was observed stripping the bed without gloves;
- If the secretary answers one question as "no" about isolation status during order entry in the information system, a wrong signal could be communicated to the receiving department.

One senior leader observed from the patient perspective and observed the proper use of gloves, hand sanitizers, informing the patient of the next steps, checking the ID bracelet, and reminding the patient to wash his hands while assisting them to the bathroom. There was some question about the process of cleaning of the bladder scanner in isolation rooms, which remained unresolved.

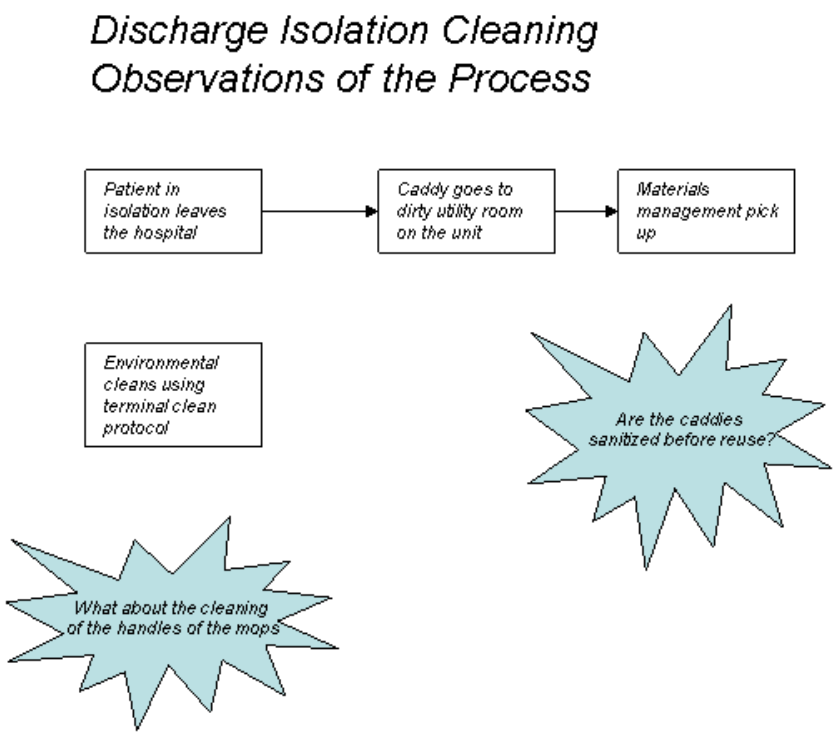


Figure 46: Discharge Isolation Cleaning Observations

The Germinators and the Web of the Patient Experience-HCHC

5:00-6:00PM (on the units)

Day Two April 8

4:00AM-5:00AM

8:00AM-9:00AM

Description of the Session:

This assigns roles to individuals and links them together through typical patient experiences. This exercise demonstrates the complexity of navigating the system and what happens when someone "drops the ball" or creates tension within the system. The back and forth that we introduce to patients will become apparent during the exercise. The team then can test some redesign models in real-time. Using special techniques to eliminate germs from our healthcare world. How the concepts of the Excellence Makeover have already resulted in

dramatic improvements in central line infections (CLABs), VAPs and MRSA transmissions at a sister hospital's CCU/MICU?

Results:

The infection control practitioner also actively participated in the teaching including coming in at 4:00AM to go unit by unit to connect with the night staff. Stand-up learning sessions, labeled Healthcare Hero Challenges were taught on the unit with the teaching of the Excellence Makeover concepts using the adult teaching methods of demonstrating the concepts through experiences, rather than through use of PowerPoint.

This session was a "show on the road" using a glo-germ product. The staff were invited to take a small amount of the glo-germ powder and wipe it on their hands. After seeing the black light florescent "glowing" of the germs, they were advised to wash their hands in their normal pattern and then reexamine their hands under the black light. Staff were surprised in some cases to see the missed hand hygiene opportunities as areas of their hands lit up after hand washing. The impact of the connection to others was reinforced using a ball of yarn which was passed from person to person with discussion of how if the hands are contaminated, the MRSA germ can be spread from person to person.

What's Wrong with This Picture ? 11:00AM-1:00PM

Description of the Session:

Sets up several scenarios for staff to see "what's wrong with this picture?" This is a fun yet insightful session where you get to participate in the experience of the patient live. This is an improve setting to experience different aspects of the patient with MRSA's experience and the healthcare professional who cares for them.

Results:

This lunch session was designed by the leadership and the staff. The session set up a typical hospital room, with a hospital bed, isolation cart, wheelchair and other supplies, in the Dream Room. Numerous infection prevention concepts were violated and a short skit was conducted with a debrief by the nurse managers with audience participation to identify what was right and wrong about the scenario in terms of infection prevention. A microscope and a laboratory reference book were set up on a side wall to show interested staff what MRSA looked like under the microscope.

Welcome to My Workaround World (HCHC) **(on the units)**

2:00PM-3:00PM

5:00PM-6:00PM

Day Three April 9 **4:00AM-5:00AM**

Description of the Session:

Each person in the organization comes to work to do work. Each piece of that work should be designed to add some value to the patient. But how much of our time is wasted or because of problems becomes full of workarounds rather than focused work? When we see problems about MRSA what can we do? How can we create some slack time to provide more patient "touch time" sometime soon? Does standardization mean everyone does it my way?

Results:

This session used the I Love Lucy "job switching" skit to show Ethel and Lucy having poorly designed work and being overwhelmed in trying to keep up with candy coming down a conveyor belt. In this scenario, under the threat of being fired, Lucy and Ethel hide problems in

their shirts and hats. The staff were showed the video which is less than 4 minutes and then a general question was asked, "How does this related to your job?" Seven participants noted that Ethel and Lucy did not wash their hands or wear gloves. There was discussion about the impact of poorly designed work and the need to expose problems rather than hide them.

The Makeover Medical Center Improv11:00AM-1:00PM

Description of the Session:

*Welcome to the **Makeover Medical Center** where many of the process design principles can be taught and tested. There are scenes where the teams need to redesign a hospital high quality, high customer satisfaction and good financials. The management team is enlightened and open to the workers ideas. Using the Beautiful Design Principles rapid cycle process improvements can be achieved.*

Results:

This session did not effectively introduce the Beautiful Design Principles because the steering committee designed an improv experience to further reinforce the opportunities for possible contamination of patients and staff. The improv was very entertaining and the staff seemed actively engaged.

The Incredible Journey toward the Ideal (HCHC) (on the units)

2:00PM-3:00PM

5:00PM-6:00PM

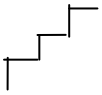
Day Four April 10

4:00AM-5:00AM

8:00AM-9:00AM

Description of the Session:

Where are you going? Do you have a sense of direction in the improvement work? Why not head toward the ideal? What is the ideal? How do you get there? What role should best



practices and benchmarking have in the journey? How do you use PDCA cycles towards somewhere? How do you judge all the brainstorming ideas and discard some? The goal is to create a constantly learning organization all seeking perpetual improvement. The goal is to make immediate changes and be "every day, little up".

Until you take the first step, it will be impossible to see the next step.

Results:

This exercise was taught on the units and included whoever was available at the time. When first arriving to some of the units, the staff were too busy to participate at times so the exercise would occur with available staff and then we would return to repeat for available staff. This meant for some sessions, the session would be repeated 2-4 times to access available staff. In one situation, the offer was made to one of the nursing assistants who participated about an hour before to teach the key messages to the nurses who were now available. She conducted the session smoothly and articulated most of the key messages without prompting. This same individual expressed technical MRSA questions after the session was over which also increased the level of understanding.

Celebration--The Launch of the Super Bug and the Bugettes11:00AM-1:00PM

Description of the Session:

A wildly popular musical group will entertain us on how we can eliminate MRSA.

Results:

This was the most popular session which included a multidisciplinary group including a physician, secretary, transcriptionist, a member of senior leadership and a director, who publicly performed karaoke parody songs about MRSA including:

- MRSA (instead of YMCA)—with appropriate hand motions
- Its an Outbreak (Instead of It's a Heartbreak)
- Stop in the Name of Health (rather than Stop in the Name of Love)

4.3 COLLECTED DATA

4.3.1 Glitch and Idea Analysis

These results are partial answer to the research question 2. What were the theme areas from the glitch and idea analysis?

Data were collected throughout the Intensive in an open participation format. All staff were invited and encouraged to add glitches and idea to the posters. Smaller versions of the posters were paced in each unit with a total of 30 glitch/idea 18"x 24" posters distributed. Staff was encouraged to periodically collect the accumulated glitches and ideas and bring them to the Dream room for placement on a larger glitch and idea poster. Some units, such as the laboratory appeared to participate more than other units.

The afternoon of the third day, available staff in the dream room were encouraged to organize the glitches and ideas into appropriate header cards. The participants were mainly the

nurse managers and the senior leadership who divided into two groups, one for glitches and the other for organizing the ideas. These glitches and ideas were subsequently graphed based on the participant's header topics.

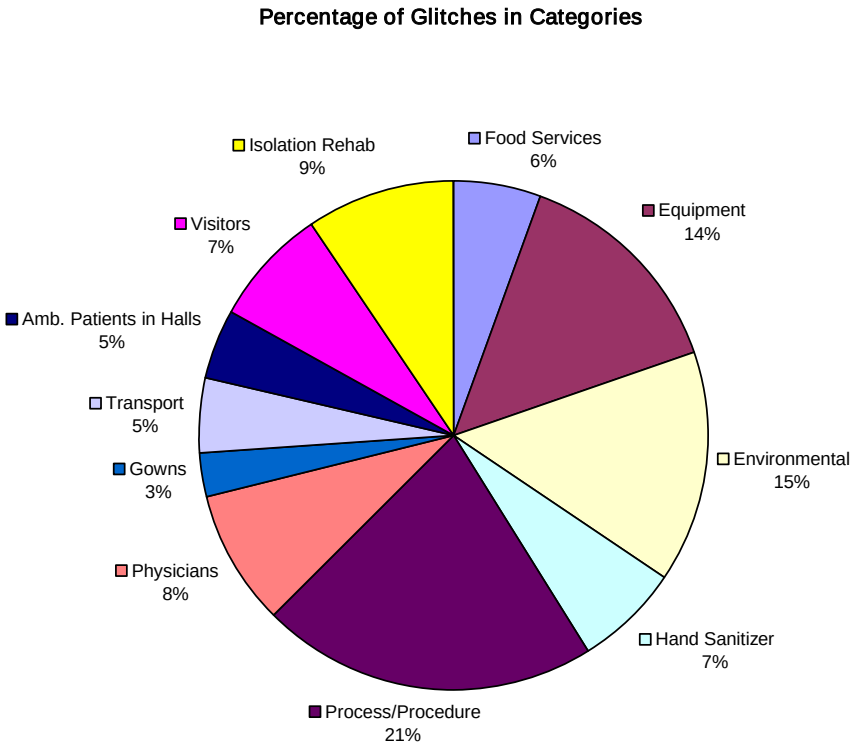


Figure 47: Percentage of Glitches per Header Category

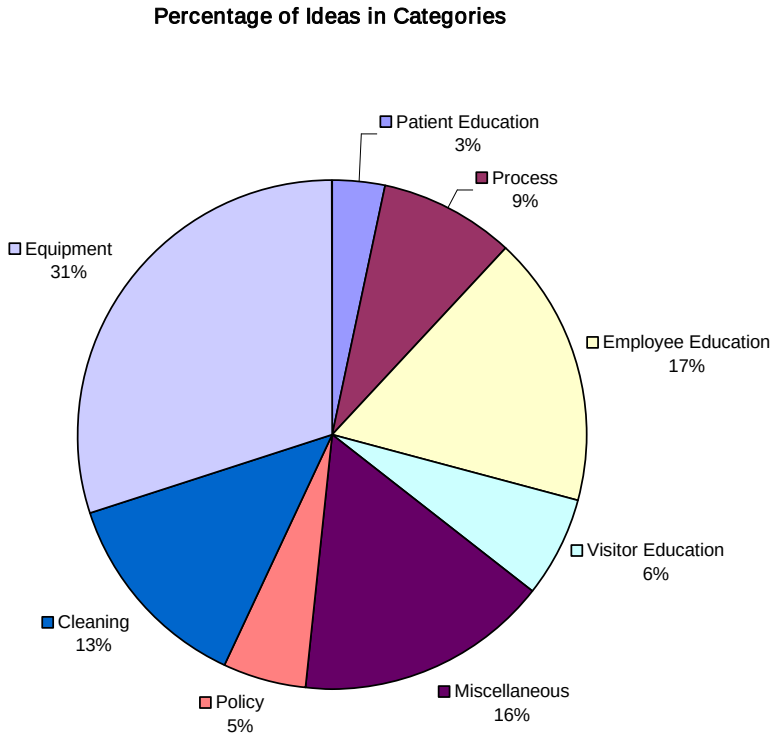


Figure 48: Percentage of Ideas per Header Category

A total of 118 glitches were collected and 92 ideas or a total of 210 combined glitches and ideas. Appendix E includes the total list of glitches and ideas generated from the staff. The glitches exceeded the ideas by greater than 54% within the first 24 hours which is consistent with the current condition focus within the first 24 hours of the Excellence Makeover Intensive. The second 24 hours the focus becomes more about the future or ideas the staff have about improving the situation and by the end of the Intensive there were only 22% more glitches than ideas.

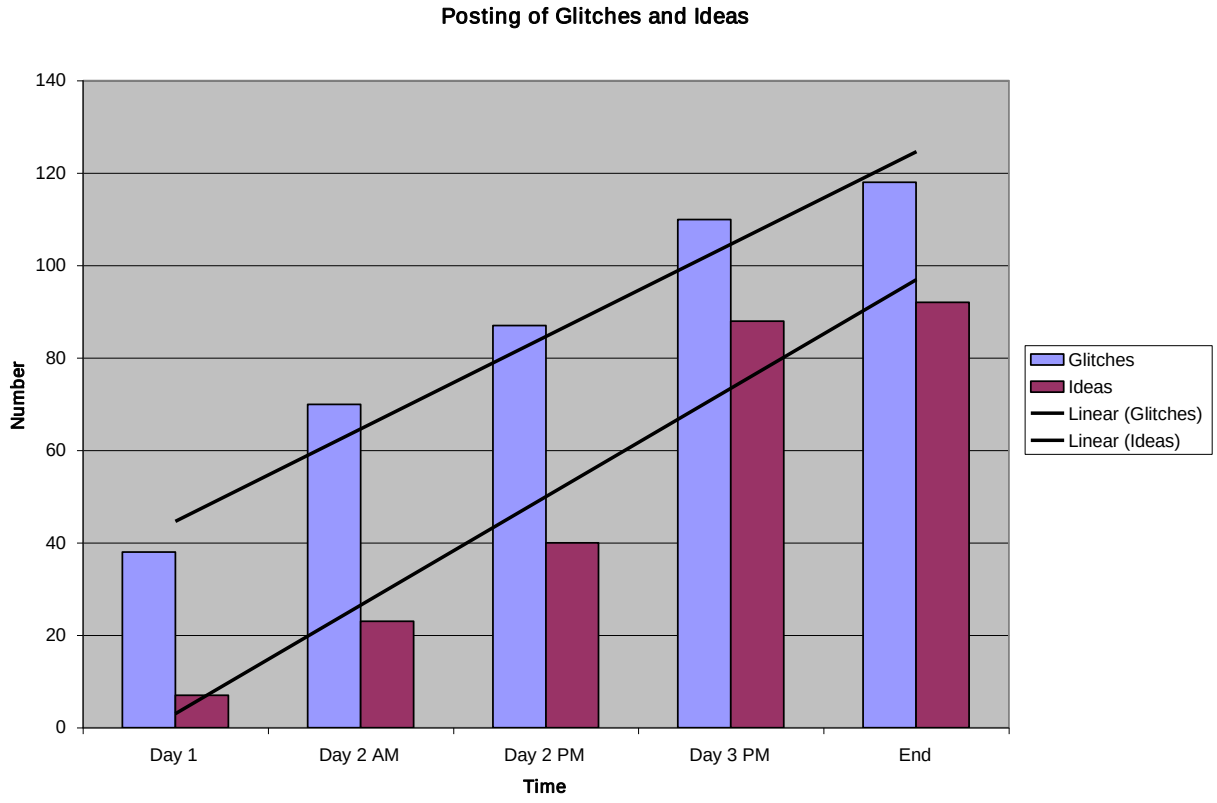


Figure 49: Volume of Glitches and Ideas

4.3.2 Changes Implemented

These results are partial answer to the research question 3. What type of changes can be implemented in rapid cycle process improvement? There were six "Small Acts of Improvement" forms placed on the Dream Room Small Acts of Improvement poster during the Intensive. A summary of each is provided:

Table 18: Small Acts of Improvement

Situation Background Information	Current Condition	Target Condition	Plan	Researcher Comment
Hand washing after each patient contact	The current set-up of our patient rooms and hallways on south and west force staff to wash hands in patient bathrooms After washing hands staff then touch the bathroom door handle to exit the room-recontaminating their hands Sinks outside of patient rooms are inconveniently located in medication room, clean and soiled utility room and kitchen.	One sink in each hallway on south and west would allow staff to wash hands without recontaminating before exiting patient room	Install one sink in each hallway on 2W and 2S over the next 2-3 months with an expected outcome of decreasing conversions.	Although a concern and uses the format of the form well, the plan does not allow for rapid implementation using the systems thinking concepts.
Dirty diapers in waste containers	Dirty diapers • Garbage not removed from rooms • Do not have containers • Cost of red bags	Purchase of red bags and appropriate biohazard container Samples Monday 4/14	VP, and housekeeping manager obtain sample	Supply issue
Everyone not wearing gowns	Gowns on door to wear when	Obtain larger gowns more		Useful glitch although not a

Situation Background Information	Current Condition	Target Condition	Plan	Researcher Comment
	going on: gowns are all one size; people are different sizes, large gowns are needed; smaller gowns don't fit; can't secure safely	people ill comply with goal 100% compliance		rapid cycle experiment
Not 100% checked patient to see if on MRSA list and swabbed prior to admission to floor	Secretary is supposed to check when putting in admission. Nurses forget to swab prior to admit.	Try by printing MRSA list at 3PM every day and post on clipboard so easier to read. TO be part of pre-admit check list.	Charted by nurse, charge nurse print; 1 week trial; check percentages of done correctly	Well-done
Not using protective gear	Staff doesn't wear gown when caring for pt-lack of time: 1. lack of time to put on when caring for pt. Aides are in a hurry; 2.Staff (nurses and NAs) have to go in to do a quick task without putting on a gown. 3. minister/clergy don't put on gear; 4. Poor time management; 5. Too many patients for nurse aides at a shift6. visitors not using gown	Encourage all staff to wear gloves, gown; increase staff both RNs and Aides- goal zero transmissions		Impractical to increase staff although education component could be implemented; no action plan designed by author

Situation Background Information	**Current Condition**	**Target Condition**	**Plan**	**Researcher Comment**
Discharge MRSA nasal swabbing not being done 100% in the ICU	Not tracking anywhere that we know if it is been done or not except for checking the IS; Patient may be (transferred) discharged on emergency basis to another facility and MRSA testing is not the highest priority	Hypothesis: if we have a (better) method to track whether MRSA nasal testing is done on discharge, we will obtain 100% compliance. Mark on discharge instruction sheet that MRSA testing has been done if pt is an inpatient > 48 hours; or Place on a special form/list of discharges and if testing has been done if pt >48 hours; or make an additional column in green admission book addressing MRSA testing i.e.>48 hours check if testing done	Check with ICU manager and infection control by May. Monthly data will show 100% compliance	Well-done thought process

Some specifics considerations and accomplishments of changes implemented for the MRSA prevention ideas considered:

- Consider 100% glove use in the ICU (like a sister hospital CCU)—under consideration by the ICU manager
- Ordered and implemented larger isolation gowns- not a rapid cycle improvement because of the ordering process
- Updated the assignment sheets with MRSA status
- Designed a "stop sign" to encourage hand hygiene for patient rooms
- Doing daily observations of isolation practices and hand hygiene
- Considered building in more nursing assistant ownership-- could they swab? Could they remind the nurses at discharge?
- Adding additional hand sanitizers at the entrance and in hallways
- Review the rehab isolation policies
- Forming four TQM teams

4.3.3 Evaluations of the Excellence Makeover Intensive

Evaluations were distributed at the last session of the Intensive and approximately 66 comments were provided (Appendix F). Some of the key themes from the evaluations appear to be reflected in some of the words used to describe the Excellence Makeover:

1) “fun”, “interesting”, “creative”, “upbeat”, “entertaining”, and “enjoyable” were used 21 times;

2) “Together”, “team”, “interactive” and “everyone” were mentioned 15 times.

3) "Learning", "informative" and "educational" were commented on 10 times.

Most of the comments were positive.

Some of the suggestions for the future included:

- Ask staff to be involved instead of just managers; Next time hopefully more staff will be involved so that the management staff can enjoy; More employee participation
- Having more departmentalized time with more time to discuss in smaller groups with small trials of ideas being implemented quickly.
- More involvement of physicians both in the makeover, as well as in the process day to day. MD's cannot feel exempt in the process.
- Isolation races to see who can get on the proper isolation PPE's needed for each type of isolation.

4.3.4 Key Factors

The fourth research question is: What are the key factors influencing the effectiveness of real-time, on-line process redesign and problem-solving?

The Excellence Makeover Model is intended to be a long-term cultural transformation of healthcare. Considerable adaptability of the concepts is incorporated into the design to allow the ownership by the organization to develop naturally rather than an outside program being presented to the organization. Cultural change or even major behavioral change usually does not occur within 3 days or even 6 weeks.

Appropriate factors to revaluate the implementation of the Excellence Makeover Model became self-evident during the Intensive. Factors from medical mishap literature resulting from communication failures include: time constraints, alignment of perceptions, priorities and goals,

hierarchal differences, concern with upward influence, role related ambiguity and conflicts of interpersonal power (Sutcliffe, Lewton and Rosethal, 2004). Several of the factors from this research appear to be validated by similarity to some of these factors.

Some of the key factors were:

4.3.4.1 Leadership Involvement The leadership expressed support throughout the experience and actively participated in most activities. In the MRSA Excellence Makeover, the participation of senior leadership throughout the planning, the Intensive and in the follow-up was evident. Senior leadership participated in the presentation of each of the lunchtime sessions—at times in very creative ways such as dressing up in a bug costume or singing parody songs with dance motions as well.

4.3.4.2 Process Focus and Understanding The observations did lead to some process changes but the primary focus of the Excellence Makeover seemed to be about creating social awareness. Although there was some attention to a process focus, the Intensive was not able to introduce many of the Toyota production system concepts specifically. Several articles were made available and as a few people expressed an interest, they were provided some additional information but there did not appear an eagerness to embrace the process concepts available. Likewise, although the idea of glitches and ideas seemed to resonate within the group, the use of the small acts of improvement method of documenting and planning the experiments did not appear to be embraced. On follow-up the managers did not see a need to document the experiments but anecdotally relayed the staff were informally talking and for example were redesigning the placement of discharge swabs to achieve higher compliance towards the goal of 100% discharge swabbing.

4.3.4.3 Time Constraints Staff was challenged to participate through sessions designed to be short to accommodate time limitations. Nevertheless, limited time availability makes the process of learning a challenge. The time constraints impact implementation although attempts to take the education experience to the units and providing lunchtime sessions were efforts to incorporate the experience within the available time.

4.3.4.4 Engagement, Participation and Ownership There was a high level of participation with about 900 contacts over a three day period for a hospital staff of approximately 500 employees. There was an estimated participation level of about 85% in the wearing of the t-shirts at the celebration. So engagement and participation were present but ownership will need to develop over time. The levels of cumulative participation increased over the three days with the most participants on the last day at the Celebration event. From the first day of 116 lunchtime participants, there was a 51% improvement in the levels of participation from the Day 1 lunch session to the Day 4 lunch session.

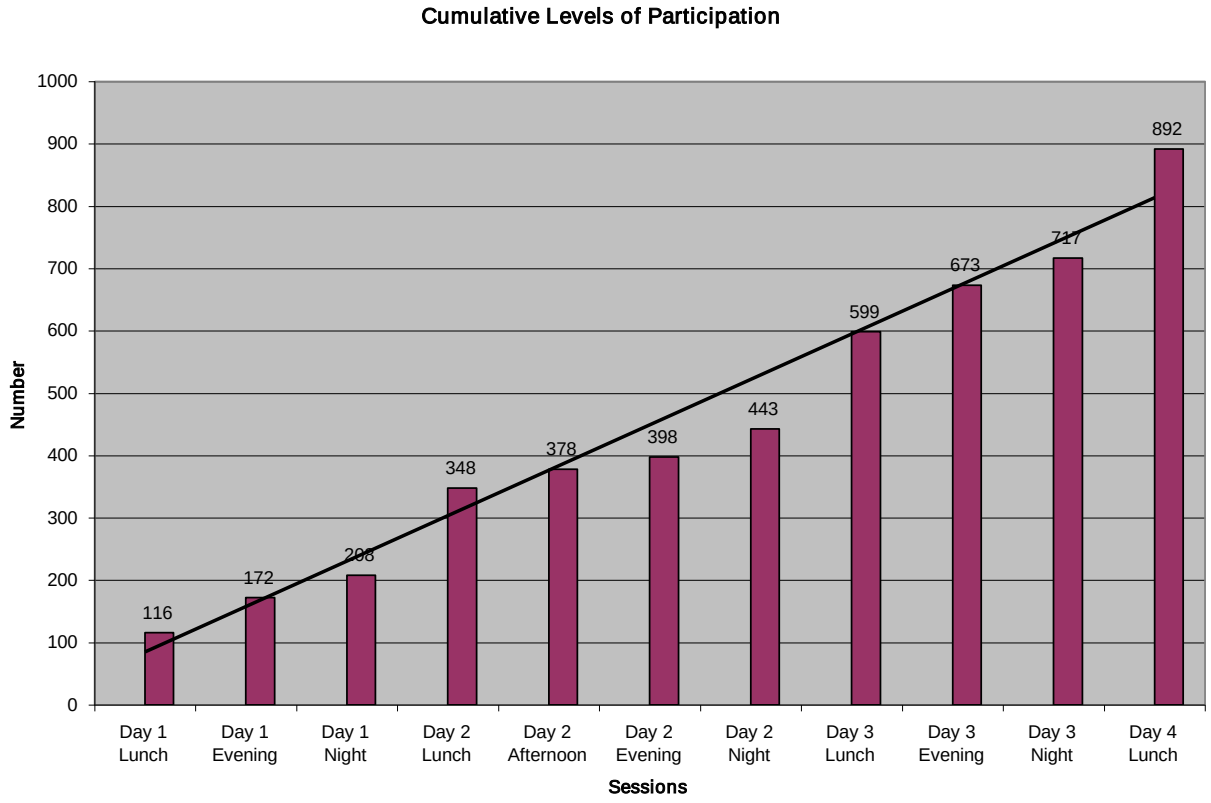


Figure 50: Cumulative Levels of Participation

4.3.4.5 Design of the Interaction One factor which has not been considered in much of the literature is the ability to create a fun and even entertaining method of teaching intact work teams. The evaluations appeared to have a theme of appreciating the design of the Excellence Makeover Intensive experience. In reviewing the evaluations, there were several themes which emerged from the comments, the words “fun”, “interesting”, “creative”, “upbeat”, “entertaining”, and “enjoyable” were used 21 times indicating a positive, entertaining experience. The theme of enhancing team work with words such as “together”, “team”, “interactive” and “everyone” were mentioned multiple times. The concepts educational and learning were apparent with words such as “learning”, “informative” and “educational”.

4.3.5 Post Intensive Experience

4.3.5.1 Follow-up Plan The fifth question focused on the short term results of the changes implemented in a unit implementing such a model?

A week after the Intensive another Lunch and Learn session, an invited physician with an expertise in positive deviance and MRSA prevention encouraged the participants about their Excellence Makeover and reinforced the concept of using the front-line staff expertise in addressing complex problems such as MRSA.

About a month after the Intensive, on May 6, 2008 a follow-up meeting of the steering committee was held. Anecdotal discussion at the meeting suggested although there was great enthusiasm after the Intensive and on-going interest, there were observations of staff and physicians not following the hand hygiene and the isolation precaution guidelines. One nurse manager reported she was now doing daily observations and follow-up one–on-one with staff observed violating the guidelines.

A summary of the follow-up plan was developed which included:

1) Established specific goals and a specific date to accomplish the goals of 100% hand hygiene, isolation precautions, swabbing and decontamination by December 31, 2008 at 9:00AM;

2) Communicating on the electronic medical system the ideas and glitches as a follow up for all employees. It was also suggested communicating "Here is what we have done so far--here are some smaller challenges for which we need your ideas.";

3) Design a serious scenario to emphasize to staff the serious nature and have another lunch and learn within the next month. (This session was held on June 17 [post the research period]. An

actress articulated how a hospital acquired MRSA infection impacted her life and was reportedly also well-received);

4) Create 4 TQM teams so fits with the hospital's existing improvement efforts and model--1) Hand Hygiene 2) The Swab Squad 3) Isolation 4) Decontamination. The Manager responsible for quality agreed to coordinate;

5) Have monthly newsletter progress reports to the staff using the frequently asked questions (FAQ format)--emphasize the goals, the ideas used and have challenges on additional glitches;

6) Have the MRSA Monday shirt wearing house wide the first Monday of each month;

7) meet with the Steering Committee at least monthly;

8) distribute the Small Acts of Improvement posters and the MRSA Goals posters through the managers;

9) Make a picture collage for the dining room of the pictures--show the DVD (we were not specific as to when or who);

10) Investigate opportunities to "take the show on the road";

11) Encourage leadership by Nurse Practice Council who have a meeting the following week;

12) Continue to address individual's issues--pastoral care, physicians, nursing assistants as necessary--try to make positive "caught in the act of doing it right".

4.3.5.2 Performance Data related to the Focus Area The graph below provides the total MRSA colonizations and infections for the time period October 2007 through the study period of 6 weeks post Intensive.

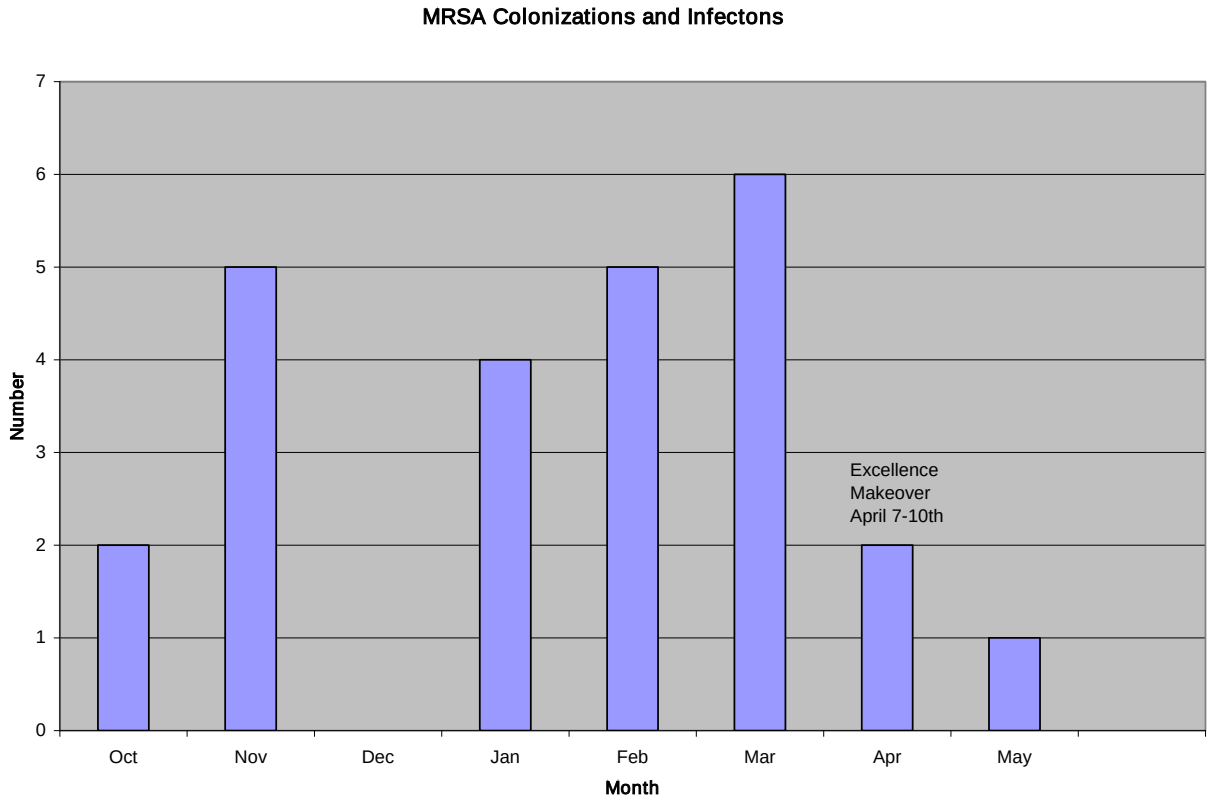


Figure 51: MRSA Colonizations and Infections

A decrease in the number of colonizations and infections appears to have occurred following the intervention. However, interpretation of such data, especially with small baseline numbers, may be misleading, and results do not necessary indicate long-term impact or stability.

5.0 CONCLUSION

5.1 DISCUSSIONS OF FINDINGS

5.1.1 Introduction

Without question, healthcare quality, safety and service issues are receiving considerable attention from the consumers, media and health care policy makers. Many have tried top-down approaches such as regulatory or accreditation bodies specifying healthcare organization activities and reporting requirements.

Although these approaches remain important in providing the proper impetus for change, they have largely failed to create the systematic change to prevent quality, patient safety and service problems and arguably have increased the overburden for healthcare administrators and front line professionals. Although much research and critical thinking has been applied to the effectiveness of top-down approaches, there is more limited experience with effective of "bottom-up" approaches.

These concepts are not mutually exclusive and both top-down and bottom-up approaches are necessary in concert to achieve the transformation of the healthcare experience. The Excellence Makeover Model is based on a more "bottom-up" approach by involving the front-line workers in the evaluation and the redesign of their work and this research is intended to

investigate this one method of achieving outcomes with a front-line first approach. This dissertation describes the theoretical development and a recent implementation of a practical Model, called an Excellence Makeover, of real-time redesign and problem solving for frontline healthcare professionals.

This study implemented the Model in one hospital over a three-day Intensive period and followed the participants for a six week period following the Intensive. This section assesses the effective and ineffective aspects of the implementation (Section 5.1.2), critiques how the logic of the Model was demonstrated during the Makeover (Section 5.1.3) and makes recommendations about refinements to the Excellence Makeover model based on specific challenges and key learnings from the implementation (Section 5.1.4).

5.1.2 General Assessment of Effective and Ineffective Aspects of the Implementation

5.1.2.1 Multidisciplinary and Broad Participation The implementation of the Excellence Makeover Model was broad, involving the entire small community hospital's workforce, a strategy which appeared to be effective. During the course of the Intensive organizational hierarchy seemed less apparent given the multidisciplinary participation of staff at all levels contributing and interacting collectively with the collecting of anonymous glitches and ideas. At the final educational session the participants included a physician, secretary, transcriptionist, director and vice president all performing the parody songs. The multidisciplinary nature of this implementation was consistent with my expectations.

Other implementations have had a much smaller, more narrowly defined group of individuals which can provide more contact time at the educational sessions and more coaching

around the concepts of the Excellence Makeover Model but which also limits the exposure to the Model's concepts.

5.1.2.2 Goal-Orientation Over a three day Intensive experience, the organization experienced the use of the Model with educational activities for all staff across the hospital with specific goals discussed throughout the Intensive and the placement and distribution of posters describing the goals in the Dream Room and each unit.

As referenced in Figure 7: Toyota XY Diagram, the establishment and agreement of the goals seemed clear and non-controversial, but the agreement on the method of improvement or "the way we do things" was modified during the course of the Intensive and was not completed at the end of the study period.

5.1.2.3 Leadership Participation The organization's leadership, including the chief executive officer, chief nursing officer, vice president of operations and all unit managers, was enthusiastic and participated fully throughout the planning and the implementation of the Intensive. The chief nursing officer participated in the karaoke-like parody band and the vice president of operations donned a "bug" costume, designed by the director of human resources. The infection preventionist came in for the 4:00AM sessions and actively engaged the front line staff. This level of openness and encouragement by the leadership was considered key to the involvement and support by the front line staff.

5.1.2.4 Focus of the Implementation The scope focused on the behavior and process changes associated with a challenging problem of the "superbug" of MRSA. The clinical nature of the focus led many participants to share their personal interest in patient safety issues. There were many questions about the microbiology of this pathogen and some of the policies in place for isolation practices. The choice of a focus area considered to be important to the participants with

an obvious patient impact seemed to lead to more engagement. Many projects using Toyota concepts appear to focus on efficiency rather than clinical issues, a bias that may discourage participation.

5.1.2.5 Penetration of the Design Principles The large scope, broad participation and short-time frame for the implementation may have diluted the ability to teach several of the Excellence Makeover Model concepts. Unfortunately, little penetration of the formal Toyota production system concepts occurred within the Intensive mainly because of lack of apparent interest by the leadership in these concepts. The original design included a one-hour teaching session about the Beautiful Design Principles, but the leadership group did not include these concepts in their development of the educational sessions.

I tried repeatedly to introduce the concepts and encourage consideration for the sessions involving the design principles. However, as part of the Excellence Makeover design the desired sessions emerge from the group dynamic consistent with the complex adaptive systems understanding. Perhaps, as the Buddist proverb states, "when the students are ready, the teacher appears" and potentially the teacher appeared but the students were not yet ready.

The concepts are learned by doing and the experience of the team is incomplete after 3 days, or even within a 6-week follow-up time period. The challenge of integration of the manufacturing concepts into the fabric of thinking for healthcare workers is not particularly surprising. In fact many have found the adaptation to be difficult both in the linear and the non-linear healthcare environment.

However, a recommendation I would continue to make for future implementations would be some introduction of the TPS concepts in a formal educational program. Over time I would

expect these concepts would be reintroduced to the participants of the study at appropriate times to engage the staff in improvements in a more structured way.

5.1.2.6 Identification of Operational Failures During the Intensive, the staff had the opportunity to contribute their "good little insights" and ideas into the broad topic of eliminating MRSA. Over 210 combined glitches and ideas were generated by over 900 contacts with front-line, management and leadership staff. The header categories for glitches (from the affinity diagram determined through an interactive process by the participants Figure 47: Percentage of Glitches per Header Category) seem consistent with the previous work of Tucker (Tucker, Edmondson and Spear, 2001).

Tucker's, "Front Line Staff Perspectives on Opportunities for Improving the Safety and Efficiency of Hospital Work Systems" identifies 1,732 operational failures from 20 hospitals with the operational failures based on observations by leaders and discussions with front-line workers. The research on general patient safety issues faced by front line workers suggests the most ten most frequent types of failures involved equipment/supply (18%), facility (18%), communication/documentation (16%), staffing/staff development (16%), medication (12%), process/policy (6%), response time (4%), security (4%), infection control (3%), task management (2%) and other (2%) (Tucker, Edmondson and Spear, 2001).

Within the Intensive which specifically focused on MRSA and gathered the insights directly through voluntary participation of front-line workers, the header categories (also determined by the participants unaware of the Tucker research) were percentage of glitches of process/procedure (21%), environmental (15%), equipment (14%), isolation rehab (9%), physicians (8%), hand sanitizer 7%), visitors (7%), food services (6%), ambulating patients in halls (5%), transport (5%), and gowns (3%). Even though the two research studies gathered the

data using different methodologies, the similarity of the categories and the pattern of results provides an interesting focus for future research.

5.1.2.7 Ambiguity, Defects and Waste Identification As expected, the observations of the work environment during the implementation of the Excellence Makeover Model demonstrated significant time constraints for improvement work, ambiguity of work processes, waste, and very limited learning about the connection between the design of the work processes and the results. The ambiguity and workarounds were well-documented within the process observations such as in Figure 44. For example, with over twelve process problems identified in a short observation, the team did not eliminate these wastes in the redesign experience.

Continuing to experience these design flaws allows for prediction of the variation in the results of the process. This process will not perform with the desired 100% accuracy with the ambiguity described. The awareness of the ambiguity apparently only resulted in a cognitive awareness but did not result in immediate process or behavioral changes that were formally documented. However, in the post Intensive time period, there does appear to be an encouraging improvement. Obviously additional time and reinforcement would be necessary to achieve additional improvement and sustain any results in colonizations and infections.

As Tucker notes, work system or operational failures account for much of the waste in hospitals and the observations and the analysis of the glitches demonstrate waste of staff time, materials and opportunity to make improvements to prevent MRSA infections (Tucker, Edmondson and Spear, 2001; Tucker and Spear, 2006; Tucker, 2006). Although in this implementation there was verbal recognition of the waste, there was not an attempt to actively eliminate it. This is surprising since the hospital has limited resources and operates within a tight budget.

5.1.2.8 Changing the Group Dynamics The gathering of the glitches usually changes the dynamics within the group. Past experience suggests this is especially so when the team has been more dysfunctional with negative attitudes, cynicism and significant operational problems. The teams seem to experience a cathartic effect after purging previously unrecognized and unacknowledged issues through the establishment of a "no blame" environment and requesting the engagement of front-line staff. This specific implementation did not appear to have a high initial state of frustration so there was a less noticeable improvement of relationships among the team members.

5.1.2.9 Rapid Cycle Experiments The ability of the team to implement changes formally within the three-day Intensive failed to mature within the Intensive or the follow-up six-week time period. Subsequent anecdotal examples were provided to describe increased sensitivity and various front-line driven changes to achieve results closer to the goal. The question remains of how these changes become hardwired into the organization's "way of doing things" or whether the changes were primarily the result of Hawthorne effect. The nurse manager's descriptions continue to provide evidence of on-going improvement, although documentation of the improvement remains sparse.

5.1.2.10 Participants Evaluations of the Intensive The evaluations of the Intensive were almost overwhelmingly positive which was gratifying but also did not indicate a level of critical thinking among the staff about the experience. Perhaps additional evaluation techniques should be considered to evaluate more fully the effectiveness of the Excellence Makeover Model. Using Kirkpatrick's levels of evaluation, most of the feedback was Level I (Reactions) or Level II (Learning) rather than the higher levels of evaluation including Level III (Transfer—Behavioral Change) or Level IV (Results) (Winfrey, 1999). Anecdotal behavioral changes were

reported and early results were promising, but the evaluation method of requesting feedback at the end of the 72 –hour Intensive did not elicit these effectively.

5.1.3 Critique of the Demonstration of the Logic of the Excellence Makeover Model

In Chapter 2, the logic of the Excellence Makeover Model was introduced and now will be discussed as to the extent of noticeable demonstration in this implementation.

Table 19 Excellence Makeover Model Demonstration for Implementation with Critique

Logic Item	Demonstration within the implementation	Researcher critique/comment
Finding Slack Time and Creating Touch Time	The Intensive was a specific 'set-aside' time for the implementation and most leaders participated in most public activities during the intensive	Future implementations would hope to achieve true healthcare professional time savings which should be achievable by eliminating the waste within the processes
Documenting the Current Condition Hairball	The volume of glitches gathered and process observations were conducted to document the current condition	Only limited observation times were conducted and although during the Intensive the observation session is intended to be more educational about the process of observation, it is still unclear the participating staff would consider this a change in the way they understand their problems,
Listening to the System	The engagement of the staff as part of the listening system was apparent.	In part, this step is intended to be more real-time and listening as the small process breakdowns occur, rather than listening to the perception of the process breakdowns.
Refocusing the Role of Leadership, the Management Philosophy and Adopting a Systems Approach	The leadership were visibly available to staff and some unit managers, vice presidents and other staff were involved in the improv and the parody songs/dances.	Although the leadership demonstrated participation, a subtle top-down message persisted during the Intensive. This was apparent with some of the smaller group or individual interactions. A longer – term coaching and reorientation would be necessary to achieve a try systems approach and leadership moving to a support versus a command and control perspective.

	Logic Item	Demonstration within the implementation	Researcher critique/comment
	Changing When and How Problems are Solved	Ideas were generated by any interested staff and participation was good indicating "how" problems were solved was modified. However, the "when" problems are solved did not appear to be modified	Although limited formal rapid cycle experiments occurred, considerable focus on problem solving and education about the problem-solving methodology was conducted.
	Focusing on the Point Of Care—the Point of the Value Exchange Asking "What Does the Patient Need and How Does the System Respond to that Need?"	Educational sessions were conducted on the floors closer to the point of care than most other educational programs	The actual participation by a front line professional, such as a nursing assistant, at the point of care did not occur and would be pursued in future activities extending beyond the post implementation study period
	Focusing on the Process and Creating Adaptability	There were only a few instances of blame and no interventions were necessary during the implementation.	The balance between standardization and adaptability was not important to this implementation during the study period.
	Refining Problem Solving Levels	Most problems are still Level One problem solving during the Intensive but a gradual understanding became more apparent post-Intensive.	Since based on Anita Tucker's research Level II problem solving is quite rare in healthcare, it is not surprising the transition to Level II problem solving did not occur during the study period. Additional reinforcement and demonstration would be necessary to further explore Level II problem solving abilities.
	Taking an Constructionist-based Approach to Problem-Solving	Almost all of the glitches were negative although there were about 27 questions embedded into the glitches	This is an interest area of additional consideration. Could the questions be converted into a positive deviance like discovery process?
	Understanding Normal State, Dysfunctional Normal State, Contingencies and the Creative State	No demonstrated	May be more appropriate for other more process-oriented problems than the chosen issue for a focus area of MRSA. This has particularly been useful part of the Model when dealing with chaotic or extremely complex work such as patient flow or nurses' work flow.

Logic Item	Demonstration within the implementation	Researcher critique/comment
Conducting Very Rapid Cycle Experiments	Only six experimental designs	Although emphasized, perhaps a specific educational program on the power of rapid cycle experiments could be conducted
Using Data	Data was visible to all in the Dream room and was a surprise to several who were not aware of their individual unit performance or the hospital-wide performance	Use of more real-time feedback was recommended and eventually daily feedback to the units. This more frequent access to data may also spur more improvement interest and implementation of the ideas.
Creating Tension Towards the Ideal	Session was taught and appeared to be well-received. No additional understanding was demonstrated.	Would need additional reinforcement over time and demonstration of the concepts. Although the concept was taught using an exercise rubber band, may have still been too abstract for full understanding.
Designing a Learning Organization	The participants reported individual learning and through discussions reported team and organizational learning.	A longer-term outcome but some early organizational learning occurred during the Intensive.
Start Anywhere	Although the hospital started with MRSA several attempts were made during the Intensive to point out the applicability of the concepts to other problems as well.	Time would be essential to see deeper understanding in other problem focus areas.

5.2 RECOMMENDATIONS FOR FURTHER DEVELOPMENT OF THE EXCELLENCE MAKEOVER MODEL

This research was intended to focus on the development, the implementation and the refinement of a model of various system thinking methodologies. Key learnings from this implementation will be discussed and recommendations offered for additional enhancement of the Excellence Makeover Model. The application of these industrial concepts and potential

healthcare adaptations are still in early development and so the maturity of the Model is in its infancy phase with considerable additional work necessary to further refine and formalize the Excellence Makeover Model. An iterative learning process has occurred over a seven year timeframe that has led to a fuller understanding of these concepts.

Given the experience of this implementation, four primary challenges remain: 1) the small acts of improvement; 2) sustainability through organizational learning; 3) customer focus; 4) problem-orientation. I will discuss each of these challenges and some potential countermeasures to overcome them practice.

5.2.1.1 Small Acts of Improvement

Small scale improvements are believed to be important to achieve the involvement of front-line workers in making necessary changes in part because front-line workers can influence small changes more effectively than large-scale changes that are usually designed and implemented through leadership initiatives. Steve Spear indicates four basic organizational capabilities leading to operational excellence using the Toyota methods:

1) Work is designed as a series of on-going experiments that immediately reveal problems;

2) Problems are addressed immediately through rapid experimentation;

3) Solutions are disseminated adaptively through collaborative experimentation;

4) People at all levels of the organization are taught to be experimentalists (Spear, 2005).

Previous implementations did not experience the first challenge of incorporating the small acts of improvements. Usually this aspect of the Model begins at the end of the second or the beginning of the third day and was previously called, “fixing the glitches”. Typically about 5-10 quick fixes were immediately trialed in the time period 48-72 hours into the Intensive. For

this Intensive, this aspect was renamed, “Small Acts of Improvement” and a simplified single page A3 diagram was introduced. A3 diagrams are evidenced to be an effective tool used within Toyota for problem-solving (Sobek and Jimmerson, 2003)

The format of the plan included:

- Background info (What is the problem?)
- Current Condition (How does it work now?)
- Target Condition (What should we try? How should it work?)
- Action Plan (including who, what , by when, How will we know it worked?).

This is a standard form from Toyota that was slightly modified and had the specific ‘bug logo’ the organization was using for the Excellence Makeover.

Within the organization, the incumbent process improvement methodology was reportedly the Plan-Do-Check-Act method although the understanding and use of the method was not apparent at the front-line worker level. Unfortunately, the participation in the design of formalized experiments did not occur of a significant level within the implementation. The use of the formal document was introduced during the Intensive to record the small acts of improvement. Only six forms were completed during the Intensive. Several of these experiments did not satisfy the criteria of being under the direct influence of the front-line worker.

There were numerous attempts to teach the concept of rapid cycle process improvement as a semi-formal “experiment” or small act of improvement. During the Intensive there were at least five unique incidents of coaching about very small scale, rapid cycle, real-time redesign but the group did not appear to formally incorporate this method into their daily practices, as expected.

5.2.1.2 Sustainability through Organizational Learning To create a learning organization, group learning needs to occur and TPS suggests learning by doing is most effective. A learning organization is one that is '…skilled at creating, acquiring, and transferring knowledge and at modifying its behavior to reflect new knowledge and insights'" ("Patient Safety Toolkit," 2002). The relationship between safety and organizational learning is defined as: "safety has been described as the final result of a process of organizational learning that involves all elements of an organization working collectively towards this end (Carroll and Edmondson, 2002). In the case of the Excellence Makeover, the organization learns by sharing its implicit knowledge.

The group collectively needs to understand an explicit goal, and work actively to achieve it by trying various methods, reflecting on the effectiveness of these methods and then incorporating these learnings into the next cycle of improvement. Applying this framework, some organizational learning related to the rapid experiments within the Intensive was apparent, even though the form provided was not used.

Obviously, a three day Intensive cannot create cultural change just as exercising physically for three days does not lead to a permanent improvement in an individual's physical fitness. No process improvement can be completed within such a brief time frame. However, the performance data does indicate the potential for an effective beginning using the Excellence Makeover Model. The sustainability of change is a long-term commitment by leadership with repeated activities to encourage front-line ownership over a longer time period. On reflection, in the various pilots, the sustainability of the Excellence Makeover Model does seem challenged in what might be called a "schizophrenic environment" with mixed messages for front line workers. However, previous Excellence Makeover experiences suggest the initial changes initiated and refined by the front-line teams usually do sustain. Therefore the challenge of sustainability is to

continuing the improvement cycles to develop more depth of understanding of the comprehensive Excellence Makeover Model.

The initial three-day Intensive is intended to be a 'kick-off" event rather than an end in itself. Communication about the Excellence Makeover Model should emphasize this is a necessary improvement to the Model. Attempts to emphasize the long-term commitment to the Model have not been successful to date. In fact, the CEO and leadership team were made aware of this challenge with previous implementations and expressed their commitment would be different and would sustain. A further refinement might be to have a formal commitment document with specific follow-up steps and pre-scheduling of these steps before the Intensive begins.

Change within organizations is not expected to be straight linear path and can have many knots, bends, reverses, and off-track moments. Consequentially, perseverance is a key element to successfully implementing the Excellence Makeover Model or any other significant cultural change. Since Toyota has shaped its culture using these concepts for almost 60 years, healthcare organizations will likely see similar results if they effectively apply these methods relentlessly over time.

5.2.1.3 Customer Focus A critique of this implementation is that it failed to actively involve the patient or the customer. This is a design flaw in this implementation of the Excellence Makeover Model that deserves serious attention. Although obviously patients are impacted by the MRSA colonizations and infections, they were not actively recruited to participate in the Intensive. In previous implementations, some teams have informally or formally discussed the activities and engaged the patients or families in identifying glitches or ideas. In one case, a rapid experiment

was conducted where patients were asked five service questions about their experience to better assess patient satisfaction in real-time.

In other implementations family members visited the Dream Room and were encouraged to put glitches or ideas on the Post-it™ notes and families and patients were interviewed informally or encouraged to provide their ideas from their rooms. No such activities occurred within this implementation, except for some informal dialogue with patients and families in waiting areas. Hospital volunteers did participate, however. The Toyota Way emphasizes the importance of starting with the customer needs and designing around those needs. This is an important aspect of the Model that was not fully executed within this Makeover.

5.2.1.4 Problem-Orientation The problem-oriented focus is another area of possible reconsideration within the Excellence Makeover Model. Healthcare is ripe with problems and the Toyota production system used within the Toyota culture does address problems continuously. However, the focus on problems may detract from the effectiveness of the Model.

Toyota also focuses typically on three aspects: purpose, process and people. These three organizing principles could be more positively focused—connecting to the ultimate healthcare purpose, perfecting processes and providing for the full passion of the people.

I am intrigued with some of the community building thought leaders such Jack Ricchiuto and Peter Block who suggest we need to change our conversations to change our sense of community (Ricchiuto, 2008). They suggest:

- Instead of focusing on problems or "What's wrong?" questions, a refocusing on "dream space" or conversations about possibilities;
- Rather than blame or "Who is to blame?" have conversations about engagement;

- Instead of trying to reach consensus or "What we can all agree on," instead focus on small acts or conversations about projects; and
- Decrease the focus on deficiencies, or "What are we lacking," and increase the focus on gifts or conversations about assets.

Since the healthcare community is so motivated by caring using a more positive approach is more culturally consistent and would likely increase engagement and sustainability. Clearly some of the Excellence Makeover language is adaptable to this more positive focus through use of the "good little insights", Dream Room and Small Acts of Improvement.

5.3 LIMITATIONS AND RECOMMENDATIONS FOR ADDITIONAL RESEARCH

There are several significant limitations to the study reported.

One of the most obvious limitations is the inability to generalize from the results of this study. This study is not intended to be experimental research, meeting the robust criteria of a controlled study. Rather, it is intended to be an exploratory, descriptive study of one implementation. The experience of one hospital in the implementation of the Excellence Makeover Model may not reflect experience with the Excellence Makeover Model either positively or negatively in other environments or time periods. However, each implementation can provide an opportunity for reflection and modifications to the Model based on the researcher's deep understanding of the one environment and the change processes and analysis of the outcomes.

Another significant limitation is that the researcher as the primary participant-observer may have favored success of the Excellence Makeover Model. The researcher had to play this role because of the maturity of the Model. However, future studies should include the use of inter-rater reliability testing and independence of the evaluation component of the Excellence Makeover Model including the analysis of the relevant factors. An objective observer may have additional insights that the participant-observer researcher may not be able to recognize.

Some additional research studies could be conducted applying the systems thinking concepts. Some of these ideas specific to the Excellence Makeover Model would include:

- Replication in other units. Since generalizability or external validity is a concern, replication in other units is recommended and further study and Excellence Makeover Model refinement is recommended, possibly under the guidance of another facilitator.
- Prospective study with a control or comparison group. One recommendation would be to conduct the research with a control group unit for data comparison. Although this may be attractive from a pure research perspective, interpretation of results may still be difficult because the appropriateness of the match and operationalizing of the Model would not be fully controllable.
- Longitudinal study. The time frame for the research's evaluation included only a short-term perspective of six weeks. A longitudinal study where the concepts were introduced during the Excellence Makeover Intensive but additional follow-up of the concepts were provided and studied would be recommended. Perhaps a longitudinal study without additional teaching would provide insight into the performance metrics affected.

- Additional research questions, such as:
    1. Can the concepts of the Excellence Makeover Model be taught more effectively to healthcare workers to build organizational capacity to perform real-time problem solving and system design?
    2. What are the factors leading to on-going sustainability of the concepts of the Model?
    3. Is the depth (number of participants) or the breadth (focus area) of implementation a key factor to a successful implementation?
    4. Are the glitches identified accurate and are the ideas provided by the staff relevant to the process and outcome performance related to the focus area? Are they able to be validated through retrospective analysis of the incidence of infections?
    5. Are there specific characteristics of the organization which may lead to a more successful results, such as the for profit or not for profit status, previous experience with TPS or other quality improvement methodologies, market position/penetration of managed care, financial situation at the time of the implementation, pay for performance (P4P) motivations, regulatory results or specific leadership and staff characteristics.

These areas of additional research could contribute to the understanding of the use of TPS concepts and other system thinking concepts in healthcare.

5.4 **IMPLICATIONS**

Top down, traditional approaches for healthcare quality have generally including leadership initiatives, with changes being primarily designed in a conference room or remote from the point of care, usually being passed down to the front line healthcare workers. Prioritization occurs based on regulatory and accreditation measures or reports that indicate there is a need to achieve a process improvement. The total quality management and continuous improvement model the hospital may employ would be driven by the experts in the methodology and involve selective team participation.

Some hospitals using the Toyota production system focus on the tools and achieve results, primarily in the area of efficiency. But after the kaizen event, the process frequently regresses back to the previous state in part because the front-line professionals do not understand the underlying design principles employed.

In contrast, the Excellence Makeover focuses on a bottom-up approach involving the front line workers and asking their expertise to drive the change. The solutions are also determined by the front-line workers with education and coaching about the design principles, in contrast to the tools, of used by Toyota or the other improvement methodologies. The relationship between the front-line and the leadership is inverted so more attention and "listening" occurs to the experience at the point of care.

There are several potential advantages to this Excellence Makeover Model:

1) It deals with smaller problems (labeled "good little insights" or glitches);
2) Hypothetically, if small problems are corrected more quickly resulting in a decrease in the incidence of more serious errors, less harm to patients and improved quality of care would result sooner;
3) It engages the healthcare professionals in their work redesign, measurement and improvement;
4) Local solutions may be more effective in addressing the processes at the root cause of problems and avoiding the classic criticism of "blame and train" tradition which has focused on personal accountability rather than system design;
5) System design done outside of the local microsystem may not be sustained if the front-line workers are not engaged early in the process.
6) Previous experience with the Excellence Makeover Model suggests front line healthcare professionals can implement principle-based changes relatively quickly and effectively.

Some of the disadvantages of this bottom-up approach include:

1) The staff are challenged with time constraints which impact their ability to make improvements and learn the design principles;
2) Front line workers are inexperienced with incorporation of an improvement cycle into their work;
3) This approach still requires significant leadership time and attention to be successful;

4) The process is messy and may require more time investment in the short term than the command and control style of change;
5) The appropriate methods are still in development, especially in applying the industrial models of improvement to healthcare while we have considerable experience in the top-down methods.
6) There need to be a filtering process for handling a wealth of information relevant to quality which can lead to information overload and frozen decision-making to achieve the desired change.

Based on the implementation described in this dissertation, the Excellence Makeover Intensive appears to be effective in achieving widespread participation, in introducing some of the system thinking concepts and in providing a diagnostic framework for identifying the deep systems, i.e., from the perspective of the front-line employees, issues in terms of glitches and ideas. Considerable understanding of current processes was achieved within a very short timeframe through use of a team to observe work processes related to MRSA prevention. This implementation demonstrates that the front-line team could effectively determine what is working or not working in the current condition in real-time, and did contribute ideas to improve the patient experience in the area of MRSA prevention.

There was introduction of system thinking and design principles using ideas from various systems engineering methodologies in a worker-friendly way, although the apparent understanding of the Toyota production systems design principles was limited. There were some early attempts to redesign processes in real-time using rapid cycle mini-experiments. Subjective evaluations of the Excellence Makeover Model were very positive and focused on enjoyment, teamwork and learning primarily. The early performance results indicating decreased

colonizations and infections were promising but conclusions about results are premature at this time.

There were several challenges for the implementation. The first challenge is the Excellence Makeover Model appears to be less effective in generating rapid cycle improvements using a PDCA model based on this implementation. Second, sustainability is a known concern for kaizen events and sustainability of a hospital-wide initiative of three day duration seems improbable. I would suggest sustainability of specific changes might be enhanced by using this front-line healthcare professional focused Model, rather than an expert-based or a complicated approach (as described by Zimmerman) to implementation of the Toyota production system. Further trials applying the Excellence Makeover Model are recommended to address these challenges.

After the implementation of the Excellence Makeover Model for this institution I discovered the similar work of Keith Turnbull, a retired executive from Alcoa, who described the implementation of the Toyota production system using the Four Rules in Use, i.e., pathways, connections, activities, and improvement—all with built-in tests as articulated by Spear, in Alcoa's smelting plants (Turnbull, 2003).

Turnbull contends that there are three essentials: customer first, quality first and people first. His understanding and use of the concepts seem consistent with the essence of the Excellence Makeover Model. The Intensive alone does not change the underlying system (system kaizen) since the Intensive is not designed to be a standalone activity. System change, in contrast to process kaizen, requires persistent follow-through. This implementation did not demonstrate the customer first concept directly. Perhaps some of the future focus of the Excellence Makeover could reconsider the application of these concepts.

Complex adaptive systems concepts, e.g. allowing opportunity for emergence, self-organization, adaptability, distributed control and embeddedness, provides unique features for the Excellence Makeover Model. I am convinced these concepts are helpful to the Toyota and other industrial models in applying these improvement methodologies to healthcare.

The concepts of positive deviance could further enhance the front-line healthcare professionals' interest in participating and making changes. This is a recommendation for future consideration and development.

There is a need for innovative models for improving healthcare quality, patient safety and the general patient experience while also improving the front-line healthcare worker experience. If the Excellence Makeover Model were able to demonstrate the three aspects of the Figure 4: The Toyota Outcomes Triangle—high quality, low cost and short lead time, the impact for pay for performance (P4P) programs could be positive in addition to achieving better outcomes for patients.

I would strongly encourage further development of various mixes of these methodologies to define a more effective healthcare specific methodology. Through on-going research using a hybrid of concepts we should be able to refine a unique application of these system methodologies for healthcare.

6.0 REFERENCES

APPENDIX A

EXCELLENCE MAKEOVER OWNERS MANUAL

Excellence Makeover℠

Hospital Design

West Penn Allegheny Health System

Owner's Manual

WEST PENN ALLEGHENY HEALTH SYSTEM

www.wpahs.org

Distinguished by Excellence

Notes

Excellence Makeover
Hospital Design
West Penn Allegheny Health System

Frequently Asked Questions:

What is an Excellence Makeover: Hospital Design?

WPAHS is eager to transform the patient experience in providing excellence in every aspect at the point of care. We seek to live the words, "The patient is the focus of everything we do." To accomplish this goal we desire everything we do to make our patient's and our staff's lives better.

To accomplish this we want to:

- see things through the patient's eyes
- find a better way of doing things
- look at the whole picture
- give front line staff the time and the tools to settle the problems
- take small steps as well as big leaps

An Excellence Makeover is an intense redesign team activity to create an amazing care experience involving both the patients' and the staffs' experience. We want to work very hard, generate many innovative ideas, learn together, redesign care experiences, build relationships and have fun.

How are units chosen for an Excellence Makeover?

Any department, program unit, or hospital within WPAHS can apply. We encourage teams to be creative in their application to convince us they truly want a makeover. We have had creative videos (including song parodies, skits, staff interviews and team cheers) and a board game as applications. We want the teams to use the application process as an opportunity to focus themselves and understand what they would like to change. So Excellence Makeovers are won!!!

What happens at an Excellence Makeover?

After a kick-off event, which establishes ground rules and focuses everyone on the purpose, we first focus on the current patient experience by walking in the shoes of the patients and the staff through observation. We call this the Healthcare Reality Show. We map out the current processes and ask the front line workers to gather their good-little-insights-that-can-help-everyone-succeed (GLITCHES). The glitches, ideas, waste, barriers, and data are collected in a designated "Dream Room" on the unit.

Interspersed with the identification and solving of real problems are quick Healthcare Hero Challenges — teaching exercises for front line staff (usually done in the Dream Room on the unit). Our Excellence Makeover Thinkers (EMTs) sessions are for those interested in a more in-depth educational experience and are usually held in the Patient Care Innovation Center. We connect the theory with the opportunity for immediate application of the concepts with real-world scenarios in the unit. Excellence Makeover schedules outlining the sessions being offered and their locations should be available.

After we understand what is working and not working, we start to generate ideas, develop a vision for the amazing patient experience and we start fixing the glitches. Since glitches can be good or bad, we try to hardware (or "fix ") the good little insights of what is working; for the insights about things that don't work well we truly redesign the process. We do this using simple system design principles from various methodologies. We have the EMTs available to support the changes but the department/unit staff will be primarily responsible for coming up with the new ideas, designing mini experiments to try new ideas and ultimately will determine what ideas to keep or discard. We determine metrics to know if the idea led to an improvement.

As we transition through the Excellence Makeover experience, we begin to focus more on the future and how we sustain some of the ideas, the new way of thinking and the momentum. The initial "reveal" occurs to celebrate the changes made thus far and reenergize the team on their future changes and direction. We know the intense experience ends but we hope the skills, perspectives and approaches never end! We want to develop team understanding and enough Excellence Makeover Thinkers' expertise so they can continue to redesign.

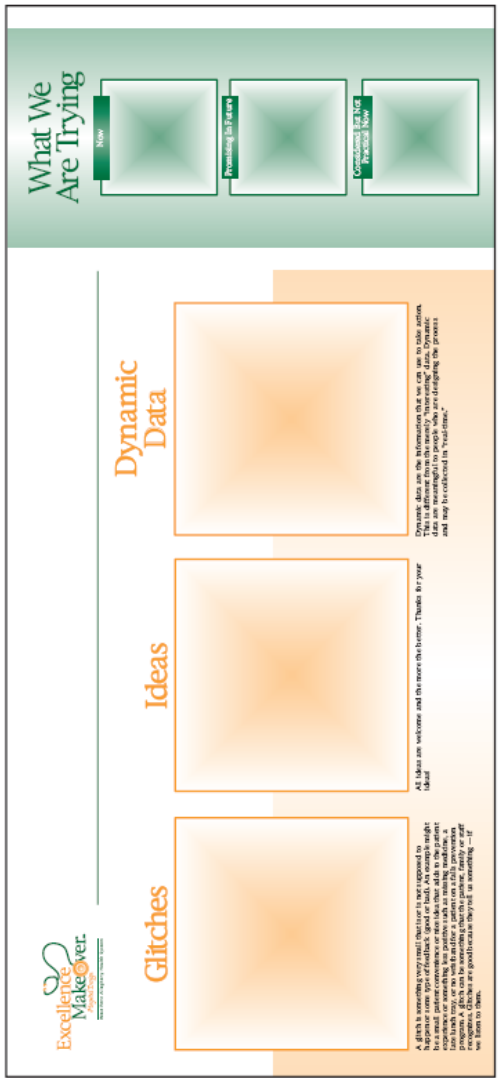
What are the Excellence Makeover ground rules?

- No blame
- Have fun and generate high energy
- Creativity before capital
- Never say "because that's the way things are done here"
- Design mini experiments
- Open systems — involving everyone with open communication about problems and solutions
- Keep going no matter what

Who is welcome to attend an Excellence Makeover?

Everyone. We need the perspectives of many different people so we can have the best insights and ideas possible. We suggest that you stay for at least one hour so you can understand the makeover process and contribute your thoughts. Anyone is welcome to

Notes



come to any of the Healthcare Hero Challenges and the Excellence Makeover Thinker sessions. You do not need to attend all sessions or pre-register for the sessions at this point. Obviously the more sessions you attend, the deeper understanding you will gain. The more you contribute or sessions you attend, the more likely you will win a gift in the daily Excellence Makeover drawing.

What methodologies are taught and used?

We are seeking what works for the real world of health care. So the specific methodology is less important than the wisdom from within the team. However, we want to use any ideas from others that we can, so some of the process redesign principles draw from the models and fields of:

- Complexity science, chaos theory, complex adaptive systems theory and systems thinking
- Toyota Production System/Lean — the Perfecting Patient Care System concepts from PRHI
- Six Sigma
- Theory of Constraints (TOC)
- Malcolm Baldrige framework
- Industrial/Management/Systems Engineering
- Clinical Microsystems
- National Health Service (NHS) Modernization Agency in the UK
- Crew Resource Management
- Institute of Healthcare Improvement (IHI)

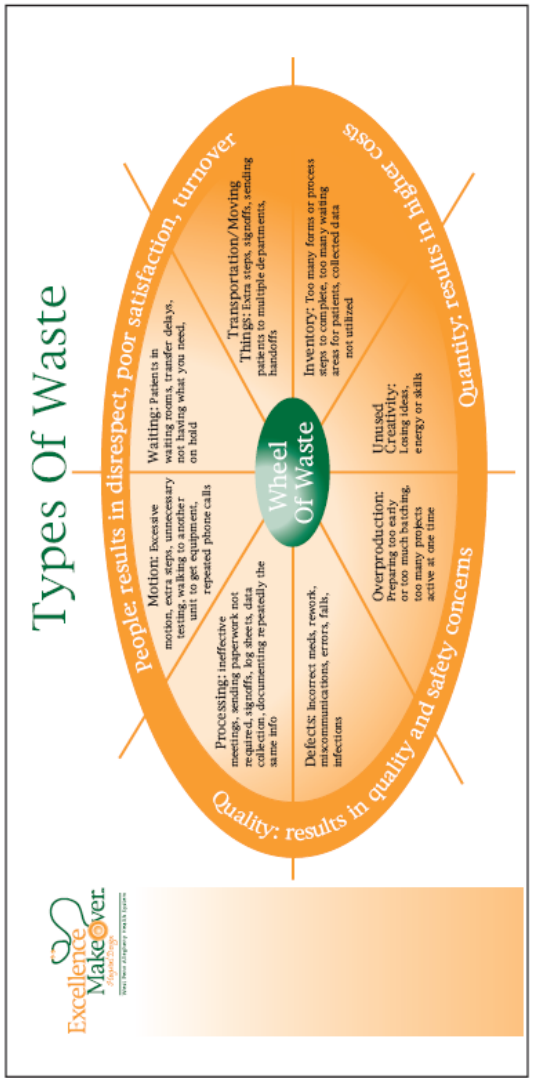
What should be accomplished in an Excellence Makeover?

The Excellence Makeover seeks to apply new methods of improvement through system redesign and rapid-cycle improvements. In aligning the patients' and health care professionals' needs, these methods have been shown to:

- Improve the quality, service and safety for patients
- Make processes more efficient and less chaotic for patients and health care professionals
- Reduce the overall cost of care
- Create a positive environment and culture for health care professionals
- Achieve excellence in the delivery of health care

Contrast of Traditional versus Excellence Makeover Hospital Design Model

	Traditional	Excellence Makeover Model
Who	Management and leadership; consultants; quality improvement staff — top down approach. Form task force which meets weekly or monthly.	Front line workers with leaders supporting as learners and teachers — bottom-up approach.
When	Retrospective — may take months; planned events.	Real time-takes minutes, hours or the maximum days.
Why	Big issue as identified as by a sentinel event, data that identifies a trend or a significance of the problem.	Small issue different than the expected outcome. Everyone becomes effective at doing and improving their work.
What	Generic solutions — such as better teamwork, education, policies; install fixes or create programs.	Specific intervention based on the specific problem; everyone knows the principles and is designing and improving activities, customer-supplier connections and pathways.
	Identify and focus on problems that have the biggest impact; in small day-to-day problems, restore the system; work around small problems.	Small problems are the same as big problems — all symptoms of a poorly designed process; avoid symptomatic relief without fundamental problem resolution.
How	Root cause analysis with binders of information; tell people to do their work differently; best-practices pre-determined and applied to the process.	Small "r" root cause analysis — asking the 5 whys at the time of the occurrence; action cause analysis (reference — the way); lead process of scientific problem-solving; everyone learns by doing; best practice is an emergent property of the process.



Excellence Makeover
Hospital Design
West Penn Allegheny Health System

Dream Room

Excellence Makeover
Hospital Design
West Penn Allegheny Health System

Patient Care Innovation Center

	Traditional	Excellence Makeover Model
Where	Conference or class room — remote from the problem site.	On the shop floor in Toyota; at the point of care in health care.
Accountability	Find out who did something wrong.	Find out what went wrong.
Unit of Analysis	Organizational unit, focusing on the outcome.	One patient at a time and asking "What does the patient need?" and then "How does the system deliver against the need?"
Use of Data	To discover problems.	To understand the capability of the process.
Learning	Individual learning from external resources.	Organizational and individual learning in the context of the work place.
Focus	Fragmented, parts focus.	System, whole focus, part is connected to the whole.

Excellence Makeover
Hospital Design
West Penn Allegheny Health System

Excellence Makeover: Hospital Beautiful Design Principles

The patient is the focus of everything we do. Everything we do will make our patients' and our staff's lives better.

Why beautiful? Because something that works well is beautiful.
What is the opposite of beautiful? Ugly systems.

> *To my mind, there must be, at the bottom of it all, not an equation, but an utterly simple idea. And to me, that idea, when we finally discover it, will be so compelling, so inevitable that we will say to one another, 'Oh, how beautiful. How could it have been otherwise?'"*
>
> — John Archibald Wheeler

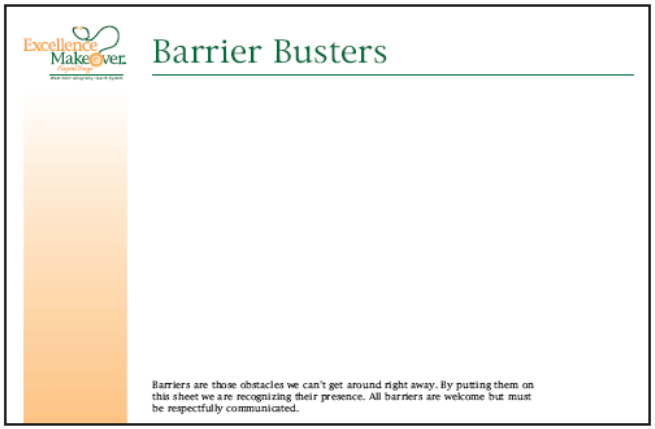
The Beautiful Design Principles[1]

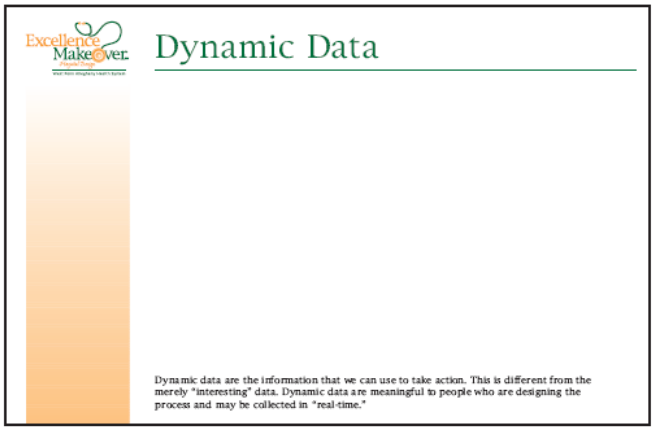
Start with "what does the patient need or what is the purpose?"

1. Define and simplify every pathway and streamline flow.
2. Clearly connect customers and suppliers.
3. Specify every activity.
4. Improve with each glitch to move closer to the ideal.

These Beautiful Design principles can be simple ideas that provide guidance or direction.

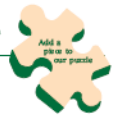
[1] Adapted from Spear, Steven and H. Kent Bowen. "Decoding the DNA of the Toyota Production System." Harvard Business Review (1999): 97-105.





G-L-I-T-C-H-E-S (Good Little Insights That Can Help Everyone Succeed)

Gathering



A glitch is something very small that is or is not supposed to happen or some type of feedback (good or bad). An example might be a small patient convenience or nice idea that adds to the patient experience or something less positive such as missing medicine, a late lunch tray, or no wristband for a patient on a falls prevention program. A glitch can be something that the patient, family or staff recognizes. Glitches are good because they tell us something — if we listen to them.

Idea Center

All ideas are welcome and the more the better. Thanks for your ideas!

UnCommon Sense Process Design Principles

(Nuggets of Wisdom from the Front Lines of Healthcare – an attempt to understand what really works)

Purpose

- Always start from the patient's perspective. What does the patient need? Destroy functional barriers (also called silos) and design around the patient's processes and needs.
- Stand on the floor and ask, "What is the purpose of this process (or step, work…)?" Although that sounds ridiculously basic, it can provide good insight to the system. For example, the purpose of emergency department triage is to actually triage patients into the appropriate path. To achieve this purpose, documents were designed called a triage note. Too many times the focus changes from the purpose to the document completion — completely losing the purpose. Another example is the admission work by the nurse. What is the purpose? The nurse understands the patient's needs and can design the care to meet those needs. What has it become? What is the purpose of our accreditation or regulatory requirements? You get the point.
- Observe to understand the hairball. Allow the "mess" to be understood and embrace the uncertainty. Don't try to control the mess — just try to help it learn what works within its context using simple rules or design principles of how it can be more effective. The real world can seem totally controlled or in utter chaos one minute and simply beautiful the next.

Figure 1. The Hairball

- Signs of unstable processes:
  - Hoarding behavior
  - High stat versus routine volume/frequent expedites
  - Lots of workarounds, "quick fixes" or just-in-case stuff
  - Blame of departments, individuals or management
  - Lots of inventory or queues
  - Highly variable defects, process times and "ways it works"
  - Crisis or reactive modes of management — fighting fires constantly
  - Expanding the buffer time for the process (i.e. calling for a patient one hour ahead when you need them in 10 minutes, scheduling 45 minutes for a 5 minute piece of work)

Pathways/Flow

- Start with simplifying pathways/flow — it will take a lot of the mess away. Then connections, then activities. Understand the glitches in pathways, flow, connections and activities. Constantly redesign.
- Look at the whole system — local optima ≠ global optima. Do not think that 100 percent utilization of individual areas is consistent with efficiency. This is old thinking where you set capacity at the average fluctuation in demand. This leads to lots of energy (money) shuffling the queue with a high risk of getting it wrong[2] (utilization should be set at 80 percent of the variation in demand).
- Manage today's demand today — aggressively manage queues so they never get out of hand. Some of the ways of managing queues might be to have trigger points and flex in staff or develop contingencies for the variable demand (i.e. expand capacity to meet the demand on a temporary basis). Establish performance agreements between ends of handoffs and manage the handoff in real-time. If greater than agreed upon delay or volume occurs, respond to understand.
- Simplify processes and eliminate waste (waste is anything that does not add value to the customer). The more steps the more waste, the more complexity, the more errors, and the more delays. Waste hides quality problems; remove waste and expose quality problems. Simultaneously decrease the number of steps and improve the quality of each step. Eliminate waste everywhere.
- Avoid multitasking when there is a need to transfer something between people. Multitasking is not the same as "using wasted time" which can be sequencing your own work to avoid waste — this is good. Multitasking will delay work. Advances are not passed forward but delays are (the student syndrome).

Picture a process of 3 steps: A, B, C
Single tasking—30 minutes each but all of A is done before B is started, and all of B is done before C is started until finished.

[2] NHS Capacity and Demand presentation

Ground Rules

- No blame
- Have fun and generate high energy
- Creativity before capital
- Never say "because that's the way things are done here"
- Design mini experiments
- Open systems — involving everyone with open communication about glitches and solutions
- Keep going no matter what

The Beautiful Systems Design Principles

1. Define and simplify every pathway and streamline flow
2. Clearly connect customers and suppliers
3. Specify every activity
4. Improve with each glitch to move closer to the ideal

Adapted from the Rules in Use in "Decoding the DNA of the Toyota Production System" by Steve Spear and H. Kent Bowen, HBR, 1999

Sample Posters

Multitasking — divide up the total time into 10 minutes of A, then 10 minutes with B, then 10 minutes with C…until finished.

A	B	C	A	B	C	A	B	C

Analysis

	Total time in the process before complete			
Single tasking	0-30	30-60	60-90	Gained nothing from starting C early because finished at the same time but disadvantaged A by 233%, and B by 166%
Multitasking	0-70	10-80	20-90	

- Segment but do not carve out. Carve outs are using resources for one group of patients which disadvantages another group of patients. Segmenting is separating the whole processes of care for one group but not at the expense of another group. For "long processes" create cells or small units that can absorb flexed demand and capacity — can be called teams. Consider a modern cafeteria with multiple points of being served versus a long line cafeteria where you can't move faster than the person in front of you. Expediting patients is a carve out — think of a traffic problem. If you are on a highway with an on-ramp where the cars come on the on-ramp in front of you sitting in traffic behind the on-ramp. Consider this versus an HOV lane that is a separate lane that actually speeds up the arrival of both types of cars. The health-care example is patients in the ED who are in the waiting room but never move forward in line because of ambulance patients also streaming in. This is called starvation in queuing theory. We need to understand this and create alternatives to accommodate these patients.

- Once a decision is made to move a patient, do it. Sooner is better than later. If a patient is discharged, transferred or admitted, move them to the next step in an orderly but steady way. Delaying can create later havoc for interdependent processes.

- Avoid "evil flexibility" but increase agility. Flexibility is when shared resources need to be able to accomplish more. Agility is when resources can come to expand capacity in a graceful way. Think of flexibility as one cashier trying to handle two lines simultaneously but agility as opening another lane when the line is > than 3 customers long. Pre-determined pathways will expose problems but you need to have the resources to respond to the problems or you frustrate the customers.

- Avoid shared resources—use designated resources. Truly dedicate versus allocate. Example is the rapid response team—what a designated group to respond-not 10 percent of their time to be allocated to this function. Do not allocate.

- Understand the relationship between capacity and demand. Accept that variation is inevitable but try to decrease variation of demand and capacity. There are techniques for both. First, understanding why the capacity is varying (this alone leads to queues). Second, set the average capacity at 80 percent of the variation in demand. Third, ask why is the demand varying? Fourth, reduce the variation in demand. Fifth, evaluate whether good or wasted capacity. Could the excess capacity help in further problem solving or creative endeavors? Smoothing demand = reducing variation leads to smooth capacity. We can smooth demand by preventing batching and tidal waves — admission pattern-elective/emergency, referral patterns, discharge time/day, reporting.

- Beware of linear thinking in understanding processes. The reality is closer to causal loops with reinforcing and balancing loops which are interconnected.

- Beware of the whiplash effect (also called the bullwhip) effect. This is typically when a variation gets amplified as it moves through the system. This happens, as others tend to compensate to meeting their customer need. This is similar to the just in case, I order more but the variation leads to:

- Expose barriers—don't ignore them. As you get some of the big rocks out, lower the water and expose new problems, solve those, and lower the water again. Do for 50 years and you might be as good as Toyota.

- Avoid death spiral thinking:

As is recognized in systems thinking, failure to invest in key capacity areas can lead to death spiral thinking. In the casual loop described above, the failure to have enough phlebotomists negatively impacted the lab turnaround time, which increased the average time to make clinical decisions, which led to a higher average LOS, which decreased the hospital profit which led to less hiring which made the number of phlebotomists less which then makes the circle occur more aggressively in a death spiral.

- Search for high leverage opportunities where small changes can provide big impact (this is called the butterfly effect).

- Communicate with humbleness, gentleness and respect but persevere with patience. Teach and bring everyone who is willing along the journey.

Beautiful systems are:
Coherent
Compact
Connected

Resuscitating the system

'Saving lives requires a system. The problem is not that our health care system is broken and we need to fix it. The problem is we've never had a system. And complexity requires systems — industrial engineering techniques, project management, continuous improvement, all of the stuff that's done in every other industry in this country.'

Mayo Clinic President and CEO Denis Cortese, Fast Company, April 2004

- Use the collective intelligence of the front line workers—get their understanding of what works and their ideas about what is not working and their solutions. Try mini experiments to see if something works. Do it quickly. Embrace ambiguity and allow solutions to emerge when they are ready. That is how the organization will learn — which is different from an individual learning and requires more time, patience and perseverance. Expect to be exhausted — problem solving is the most exhausting work.

- All data is not good — lots of data can have some very bad consequences:

  1. Cost of collecting — especially if not used (test all logbooks to see if they can be eliminated or simplified) and is called waste.
  2. Gotcha data — any retrospective data brought to a meeting to show someone how bad they are is dangerous. Real time data is better than retrospective data. Real-time data managed on a daily basis is better than weekly, hourly basis is better than daily…
  3. Data showing variation (+ or -) should have a statistical process control or p-value to know if it is statistically significant variation — otherwise you will create more problems by tampering or adjusting to the data too much
  4. Pretty or ugly with make-up data — pretty data is fancy graphs and such — eliminate it. It distorts your thinking unless you know the scale is managed and the visual effect makes sense. Ugly data tends to come with some "make-up" to make it pretty ("plans are in place").

Valuable data are useful to the people at the front line to know whether something is working or not working.

- Avoid "just in case" information or supplies especially. Just in case tells you the system has problems. You may need just in case stuff but you should design it in and know what it is telling you and try to design it out as soon as possible.

- Forget trying to find silver bullets, magic, experts or best practices which will take away all the chaos because they will not. You need to learn to cope with the real world but provide the sense of direction towards the ideal.

Connections

- Each couplet is a customer and a supplier within the process. Clear signals need to occur between customers and suppliers.

- Develop pull versus push flow with no batching (one piece flow). The customer should initiate the relationship, and then the supplier should respond. Push systems overwhelm the customer and fail to meet the need. Push will lead to overproduction, waste and decrease the efficiency of the whole system.

- Decrease batching — get as close to one piece or continuous flow as possible. Eliminating all batching is not possible but it is a sense of direction.

- Avoid stashes of patients (called WIP in manufacturing) between processes. Design how many patients should be between processes or in waiting rooms and then what the contingencies will become.

- Connections can be a "store" — one of everything so it is available immediately (ex. McDonalds's model). The taking of something from the store acts as a signal to replace it. A first in first out (FIFO) allows for customization (example Wendy's or Subway).

Activities

- Adding an additional form/checklist is not solving a problem unless the person using the form designed it.

- Understand the role of standardization — it is to solidify the best practice as determined by the staff but it cannot be rigid or the system gets paralyzed.

- Have each person understand his or her work and be able to specify it in a way that meets the customer's need. Understand the impact of cycle times for each person in the process to meet the next person's need and the development of bottlenecks.

- Think of an individual's work in terms of waste, fluctuating (unexpected) work, periodic work and cyclic work. To develop a rhythm or flow in a process, the cyclic work would not be interrupted. To change, start with eliminating waste. Hunting, sorting and motion can all be waste. Then look at each fluctuating work as a good little insight (GLITCH) and see if it can be converted to cyclic work or be directed to another individual who is responsible specifically for fluctuating work. Ignored cyclic and periodic work will likely become fluctuating work. Although patient care can seem always having a lot of fluctuating work (i.e. call bells), it is possible failure to check in on the patient to anticipate needs such as taking to the bathroom, may actually become fluctuating work. Design buffers at the end of cyclic work to anticipate fluctuating work and manage the buffer.

- Beware of log sheets to track data. Try to have one single source of data (not five as is frequently seen) and wasting the person's time by rewriting already available information.

- Design activities around what the patient needs — not what the department needs.

Improvement

- Design every process!! Have high performance standards and design processes to accomplish them as close to 100 percent of the time as possible. Design a "functional normal state" (outcomes in quality, service and financial that are desired). Do not tolerate a dysfunctional normal state. Establish then an abnormal state and contingencies for the abnormal state (if xx happens, we will try yyy). Everyone should understand the contingencies and trust the people in the system to analyze the situation and implement the contingencies. If contingencies fail, try the creative state. Only allow undesirable situations (i.e. condition red, long lines…) if all contingencies and creative states have failed but do an after the action review quickly afterwards and refine your contingencies or redesign the process.

- Never pass defects forward — find out why you have defects and correct them at the place they occur.

- Design virtual and on cords — Avoid workarounds and solve problems in close to time and space to the problem — avoid quick fixes or the path of least resistance, which relieve the system's pain so it does not need to deal with its problems. Keep problems where they belong. Chaos is many unsolved problems — the current condition hairball — dissect into pathways, connections, and activities and then redesign in that order. Sensitize the organization to very small problems called GLITCHES (good little insights that can help every one succeed).

- Keep tension towards the ideal (defect free, one x one, on demand, available immediately without waste, safe emotionally, professionally and physically for the staff and the patient) but never lower the ideal. This will force the organization to grow towards the ideal.

- Really, really, really go to a just no blame environment. "You can take the most carefully selected, arduously trained, highly motivated individual, drop him into a bad system, and in 90 days he looks like the system. Bad systems defeat good people." A healthy culture is one that embraces openness, empowerment, accountability, reward and ownership. No blame does not mean no accountability — but a just culture that looks for why things happened openly and then addresses the individual issues privately and with full justice. Accountability is easier if the process is designed and has performance expectations.

- Avoid taking problems to meetings, but take the meeting to the problem as soon as possible. Shop floor-on-line problem solving is good; leaders absorbed into meetings are bad. No response or delayed response to small problems creates workarounds (which is waste), quality issues and poor morale. Small problems aggregate or cascade into huge problems. Look at improving work by focusing on this order eliminating waste, learning and understanding fluctuating work (unpredictable work), then periodic work and finally cyclic work. If cyclic work gets ignored, it will become fluctuating work to get your attention.

[3] The Baptist Leadership Institute about Creating a Passion for Excellence e-mail received 4/4/06.

APPENDIX B

SAMPLE PLANNING AGENDA

Agenda for Central Sterile Planning Meeting for the Excellence Makeover

June 28, 2007

a. Scope of the Excellence Makeover:

b. Schedule

    i. Dates: July 9-12

    ii. Review of Excellence Makeover schedule

        1. *Teaching assignments*

    iii. Additional Planning Sessions

    iv. Staff Intro and Input Sessions:

c. Approvals

d. Creative ideas:

e. Communications Plan—Internal Marketing-

f. Incentive System Development-

g. Sustainability Model Development-

h. Food Coordination-

i. Room Coordination-

j. T-Shirts-

APPENDIX C

SAMPLE EXCELLENCE MAKEOVER SCHEDULE

Excellence Makeover
Hospital Design
West Penn Allegheny Health System

Excellence Makeover Intensive

Central Sterile

July 9-July 12

	Day 1 Monday July 9	Day 2 Tuesday July 10	Day 3 Wednesday July 11	Day 4 Thursday July 12
6:30 am - 7:00am		Glitch gathering	Idea Generation	Healthcare Hero Challenge: Bad Batches Group picture (wear the Excellence Makeover shirts!!)
7:00-8:00am				Fix the Glitches
8:00 – 9:00 am				Drawing for prizes Healthcare Hero Challenge: Climbing to the Peak
9:00 – 10:00 am				Fix the Glitches
10:00 – 11:00 am		Healthcare Hero Challenge: Making Toast		
11:00-12:00		Glitch gathering		
12:00-1:00		Healthcare Hero Challenge: The Iceberg of Ignorance	Healthcare Hero Challenge: Bad Batches	12:00 Noon Celebration !!!!!!! "Launch"
1:00-2:00		Glitch gathering	Idea Generation	
2:00-3:00				
3:00-4:00		Drawing for prizes	Drawing for prizes Group Picture (wear the Excellence Makeover shirts!!)	
4:00-5:00PM	4:00 PM Kick-off Event "Welcome to the Excellence Makeover"	Idea Generation	Fix the Glitches	
5:00 – 6:00 pm	Healthcare Reality Show Intro	5:30 Healthcare Hero Challenge: The Web of the Patient Experience	5:30 Healthcare Hero Challenge: Detangling the Current Condition Hairball	
6:00-10:00PM	"Come Walk in Our Shoes" Understanding	Idea Generation	Fix the Glitches	

APPENDIX D

EXCELLENCE MAKEOVER TEACHING MODULE DESCRIPTIONS

C.1 DAY ONE (THE FIRST 18-24 HOURS OR SO)

C.1.1 Integral Modules

Healthcare Reality Show- EMT but on the floor 4 hours observation experience

To understand the current condition, we will go and see. But how? This provides some training about how to observe and then will go to the floor and "walk in the shoes" of the patient and the staff. The insights of the Healthcare Reality Show will provide examples for the Excellence Makeover to address. Processes will be analyzed and mapped with glitches and ideas correlated.

The Web of the Patient Experience-HCHC

This assigns roles to individuals and links them together through three typical patient experiences. This exercise demonstrates the complexity of navigating the system and what happens when someone "drops the ball" or creates tension within the system. The back and forth that we introduce to patients will become apparent during the exercise. The team then can test some redesign models in real-time.

Don't Be a Cheese Head - HCHC

Using a foam cheese head, we will learn about James Reason's Swiss Cheese Model and the alignment of the holes leading to significant events within the system. This introduces the "hairball concept" of the current condition and how we can start to fill in the holes of the Swiss Cheese to make our care more safe. The role of the glitches will be discussed.

The Iceberg of Ignorance- HCHC

Using the iceberg analogy this session will introduce the issues underneath the surface and why we are focusing on the small "good little insights that can help everyone succeed" (GLITCHES). The important role of the front line workers will be considered and the inverting of the iceberg so the point of care becomes the focus of change.

C.1.2 Elective Modules

Designing for Vivian EMT one hour

This session will include an introduction to Vivian and her healthcare experience through being a proud and challenging professor to being a dependent patient. In this interactive session the participants will try to understand Vivian's needs, perspective and experience. As Vivian goes through her cancer treatment she tells us what she feels. Warning: this may be tear jerking but

can help us understand from the patient experience. Remember the patient is the focus of everything we do.

Making Toast -- (EMT) one hour session/ Waste Watchers (HCHC)

This session shows a familiar process—making toast—and shows the current condition through observation, which has embedded waste. Each waste is identified and discussed and then the process is redesigned. There is a decrease in time wasted and total time to complete the process. It teaches the concepts of kaizen—small changes. The customer needs are met with the redesigned process.

Bowling for Barriers-HCHC although on-going

Obviously the healthcare world cannot be changed in a few days. It will take years of effort to redesign the entire patient experience and there are many barriers. However, can we identify 10 barriers and "get a strike" by removing 10 barriers within our Excellence Makeover. First we need everyone to define the barriers—respectfully as always.

The Germinators-HCHC/ Get Real about Germ-ination (EMT 1 hour)

Using special techniques to eliminate germs from our healthcare world. How the concepts of the Excellence Makeover have already resulted in dramatic improvements in central line infections (CLABs), VAPs and MRSA transmissions at 's CCU/MICU.

C.2 DAY TWO (19-48 HOURS)

C.2.1 Integral Modules

Beautiful System Design Principles for an Excellence Makeover (EMT version 1 hour session then application for at least 2 hours) / Detangling the Current Condition Hairball (HCHC version)

This session introduces the difference between simple, complicated and complex decisions and suggests that healthcare needs solutions for complex adaptive systems. We will talk about designing an autonomic nervous system for an organization and provide specific examples of how this can occur. Signs of unstable processes will be presented. Systems thinking ideas of dealing with the current condition hairball through dissecting it into pathways/flow, connections and activities plus using every glitch to move closer to the ideal. This session will teach easy to understand "beautiful system design principles" to design truly beautiful systems.

Taking the Deep Dive through the Blue Ocean Strategy—Visioning the Amazing Care Experience EMT 1.5 hours / Creating the Amazing Care Experience HCHC

What would an amazing care experience look like? This brainstorming session encourages the participants to build on each other's ideas and take a deep dive into unexplored territories of the patient experience. The ideas will be collected and if possible tried within the Excellence Makeover time. All ideas are welcome—the more risky the better! How could the hospital redefine health care like Cirque Du Soleil redefined the circus? .

C.2.2 Elective Modules

The Dice Game- HCHC

This game uses dice and a multiple people process to show the impact of variation on a process. The goal is to average 3.5 but there is only a slim chance of achieving the goal based on the variation. How can the process be redesigned so we know it will meet our patient's needs?

Dynamic Data Divas- EMTs one hour

The dynamic data divas come to provide wisdom about the use of data and the misuse of data. In their experience horrible decisions can be made if the data is not properly understood. Join them in considering topics such as the data death spiral (also known as death by data –i.e. Poisson), statistically significance, statistical process control, tampering and the difference between pretty data, ugly data with makeup and beautiful data.

Poke Yoke Polka and the Jidoka Jig- HCHC

The Poke Yoke Polka introduces the ideas of the human factors engineering and how you can "fool proof" processes, supplies or equipment. Common healthcare and non-healthcare examples will be provided and discussion will center on the design principles beneath the surface. Jidoka means "intelligent machines" where a machine has the ability to detect a problem and stop which builds quality in. This is contrasted with the retrospective quality inspections.

It's All Greek to Me EMT 1 hour

This is an introduction into the six sigma thinking and model. The ability to understand variation and practical applications of the six sigma method will be presented. One sigma, three sigma and six sigma—what is the difference and what does it mean to our patients? DMAIC process will be outlined. At the end of the session, you will be able to "speak the Greek" in having an introduction to six sigma.

Six Hats Thinking–HCHC

This exercise uses 6 different color hats to evaluate new ideas. Everyone wears each hat in sequence to get an overall perspective about the idea. This exercise provides a memorable

experience for the participants and teaches what the different colors mean but how you need all the hats.

Avoiding Healthcare Traffic Jams EMT

(in development)

We all get agitated when we hit a real traffic jam. For many, they would rather travel further and longer, just to avoid stopping and just sitting at the traffic jam. Why do traffic jams happen in healthcare? How can we manage demand and capacity and eliminate stashes of patients (healthcare's traffic jam). Decrease delays and huge waiting rooms through establishing continuous flow, segmenting and establishing work cells, just to name a few pathway or flow ideas from the Beautiful Design Principle on Pathway/Flow.

Filling in the White Space EMT

(in development)

Between two of anything---letters, numbers, paragraphs, people, departments or organizations---is "white space". White space seems blank or void but in many situations, the white space is the most important part. This session digs deeper into the Beautiful Design Principle on Connections. This session will address designing handoffs so they work well. A practical example using tangled lines between the OR and an ICU will be presented and how it was solved. The concepts of stores, FIFO queues and push versus pull systems will also be introduced through an exercise.

Welcome to My Workaround World (HCHC) / It's About Time!! (EMT)

(in development)

Each person in the organization comes to work to do work. Each piece of that work should be designed to add some value to the patient. But how much of our time is wasted or because of problems becomes full of workarounds rather than focused work? How can one person's activities be designed using the Beautiful Design Principle on Activities? How do you analyze work and modify work? How can we create some slack time to provide more patient "touch time" sometime soon? Does standardization mean everyone does it my way?

Welcome to Patient Paradise! HCHC 15-30 minutes

In a board game format the patients' travel through the system to different tests and procedures. Lose a turn or experience a delay and you have non-valued added patient experience. Get quickly though the patient experience maze and you have the most value added experience. The game focuses us on the patient perspective. Through the rolling of the dice the value versus non-valued added aspects of the patient experience are taught. Patients win when they are in Patient Paradise! Designed by the Penn State Industrial and Management Engineering students in Spring 2006

Makeover Medical Center EMT 2.5-3 hours

Welcome to the Makeover Medical Center where many of the process design principles can be taught and tested. There are 4 three-minute runs where the teams need to redesign a hospital high quality, high customer satisfaction and good financials. The management team is enlightened and open to the workers ideas. Using the Beautiful Design Principles rapid cycle process improvements can be achieved.

The Tower of Teamwork HCHC 20 minutes

Using 9 people through a process with everyone contributing, a tower product is designed and quality is assured. How does it work with a "push" system versus a "pull system? How can you build quality in? What is the role of quality inspection? How do can you connect the 9 people and what are the results? Designed by the Penn State Industrial and Management Engineering students in Spring 2006

Bad Batches HCHC 15 minutes

Using simple Post-it Notes we can see the impact of batching and the through put effect for a 5 person, 10-product process. As we introduce new ways of designing the process we can see the immediate effect. Other examples of the advantages and disadvantages of batches will be provided.

Test Track: Accelerating Patient Flow HCHC 15 minutes

Introduces the concepts of continuous flow though a 3 person simulation with low variability and high variability cards. The participants experience how high variability influences flow and then convert to a low variability system to demonstrate continuous flow. Designed by the Penn State Industrial and Management Engineering students in Spring 2006

Jenga Waste Game HCHC 15 minutes

This exercise uses the popular Jenga game to help small teams learn the 7 types of waste: defects, overproduction, over processing, excess motion, transportation, waiting, and inventory. It also introduces several examples of kaizen and provides some healthcare case studies. Designed by the Penn State Industrial and Management Engineering students in Spring 2006

C.3 DAY THREE (48+ HOURS)

C.3.1 Integral Modules

Pulling the Cord (HCHC) /CareAction System (EMT 1 hour)

In some manufacturing environments they have an "Andon cord" which can be pulled and literally shut down the line. How does that work and what is the logic behind "pulling the cord". How can healthcare develop virtual Andon cords and how would they work? Are there practical examples and results of those examples? The difference between traditional problem solving and the CareAction method of problem solving will be presented.

Hospital Re-Design on a Dime- 1 hour session for EMTs

Hospitals are cash strapped. However, most improvements can start with simple ideas and items such as cardboard, Sharpie pens and Duct tape. The idea of starting with mini experiments, which can be designed quickly and tested, and then constantly redesigned. What do you need to get started in improvement?

The Incredible Journey toward the Ideal- the EMT (1 hour) Inching towards the Ideal (HCHC)

Where are you going? Do you have a sense of direction in the improvement work? Why not head toward the ideal? What is the ideal? How do you get there? What role should best practices and benchmarking have in the journey? How do you use PDCA cycles towards somewhere? How do you judge all the brainstorming ideas and discard some? The goal is to create a constantly learning organization all seeking perpetual improvement. The goal is to make immediate changes and be "every day, little up".

Until you take the first step, it will be impossible to see the next step.

C.3.2 Elective Modules

Rocks, Pebbles, Sand-HCHC

What are our big rocks and how often do we get to them? Are we letting the irritating pebbles use up our time so we cannot get to the big rocks. This exercise will ask the participant to "fit the rocks" and see how it can be done.

Controlling Crazy Chaos - EMT 2 hour session

Some days it just seems so chaotic with constant firefighting and crisis interventions. Where do you start to redesign in a chaotic environment. Some of the concepts of the theory of constraints (TOC) will be introduced through practical exercises and deep thinking using real world examples. The participants will be encouraged to embrace rather than fight uncertainty but have common sense design principles in mind to help "make sense" of the chaos around you. Local optima global optima. What is the goal? Dealing with multitasking, bottlenecks and buffer management will be introduced.

The Healthcare Challenger - EMT/Leadership session 1 hour towards the end of the Excellence Makeover

This is a more serious session looking at parallels between NASA and the healthcare industry. This uses NASA's post Columbia and Challenger debrief to challenge ourselves to develop an organization committed to high quality and patient safety. Some of the issues will be changing culture, reducing complexity and enhancing the flow of information, improve the clarity, strengthen and presence of signals that challenge assumptions for ill-structured problems to avoid normalizing deviance. What are the O-rings and foam pieces in healthcare? How do we accomplish organizational and individual accountability?

The Making of an Excellence Makeover-EMT/Leadership session 1 hour towards the end of the Excellence Makeover

How did the Excellence Makeover come to be and when should you use the Excellence Makeover? What is the serious logic beneath the fun user interface (FUI) (similar to the "graphic user interface-GUI)? What is the embedded outline of an Excellence Makeover and some of the concepts and science under the surface? You will be able to contribute to the future direction of the Excellence Makeovers.

Choreographed Care - EMT

(in development)

Rather than functional silos or disconnected departments, how could care be coordinated from the patient's perspective? How could you establish a "normal state" that is healthy from a quality, service and financial perspective and then develop abnormal states with real-time contingencies, creative states and after action reviews (AARs). Real world examples will be provided where this has been accomplished. Utilization versus throughput perspective.

Sharpening the Saw

Change and problem solving can be exhausting so how do you refresh yourself and "sharpen the saw"? What action do you take when you get dull? Do you put your dull blade down and stop or do you take time to sharpen it so you can even be more effective. This session is designed to refresh the participants as they consider how they might be able to sharpen their own saws.

The Merry-Go-Round of Systems

Systems have typical patterns that occur over and over. We do not live in a linear world but a very dynamic one so we need to think in terms of casual loops as introduced by Peter Senge in "The Fifth Discipline". Some system archetypes concepts such as "shifting the burden", "fixes that backfire", "death spirals", "success to the successful", "limits to success" and "escalation" will be introduced and the group challenged to provide additional examples of these and what

they mean. We will discuss the path of least resistance concept and how we can use it in system redesign.

Running on 7 Cylinders

We all know organizations are strong in one area, such customer focus, but weak in other areas such as human resources. How do high performing organizations become truly high performing in multiple categories? This session is an introduction to the Malcolm Baldrige framework and its 7 criteria categories: leadership, strategic planning, customer focus, human resources, information, analysis and knowledge, process management and results.

SPECIAL

The Game of Hospital Land HCHC

Our very own Anne Marie Harris, RN has designed a game to describe some of the problems within the emergency department. Start as a patient coming into the emergency department and take your turn as a patient through the system. Overcome common obstacles and give us ideas on how to fix these problems so our patients have a streamlined experience and end up with a ☺ in the appropriate unit.

APPENDIX D

PILOT WITHIN AN AMBULATORY CARE CENTER (ACC)

In this example, we implemented rapid cycle process improvement, on the shop floor using general principles of the Toyota production system. Formal observations were not conducted but informal observations were completed.

The leadership was frustrated by delays in the registration process for patients having surgery that morning. A delay in registration had a cascading effect for the entire operating room (OR) schedule which created patient, family, physician and staff delays. As the Director of Patient Access lamented the problems in her department she exclaimed, "meetings, you want to know about meetings. I have been to plenty of meetings about this problem." Her frustration was evident and clearly indicated another approach could be appreciated. Instead of describing the problem we went to see the problem at 4:30AM a few days later. This is consistent with the concept of *genchi genbutsu* which means the actual place, actual part. The principle is to go and see through direct observation (Liker and Meier, 2006). In observing the process the patients arrived at a reception desk in the main lobby where they were directed to the 11th floor. After 5:00AM a receptionist was present who greeted the patient. She placed the pre-prepared chart in

a wire file rack which acted as a signal to the registration clerk and the patient was asked to have a seat in the waiting room. When the registration clerk was available, he would pick up the chart and call the patient's name. The patient would go into a private room where a series of questions were asked, with updates made on preprinted registration forms (printed the night before). Apparently the registration clerk would go into each patient's account and print the form (a form of batching) the day before. Before any patient arrivals, he would again go into each account to convert the patient's account to an active/or arrived status (although he was not aware which patients would arrive and which would not. He did not have access to the computer when he say the patient and recorded the changes onto the paper and then in the afternoon would again reenter the computer account to make the corrections. In the meantime, the patient would be able to proceed to surgery (although the information in the computer system was not accurate when accessed until the corrections were made and he had to enter the account three times instead of once). We timed the cycle time (the time necessary to complete the task) varied from 3 minutes-5 minutes, depending on various patient factors. However, if there was some type of error the cycle time would increase up to 300% to about 10 minutes. At 5:30AM two registration clerks would be performing this task so they had the capacity for about 3 patients each 15 minutes if error free (6 per 15 minutes total). However, with errors the total capacity would decrease 50% to 3 per 15 minutes. We later discovered about 15% of the patients had errors which increased the cycle time. Clearly eliminating possible errors before the day of surgery would help the timeliness of getting patients through the process.

In talking with the receptionist however, she said, "You will see all 4 of these elevator doors open and us get flooded with patients at 5:30AM. It is like a bus pulled up and let everyone off." Very shortly we were able to observe this phenomenon. On inquiry to the

manager, we discovered 21 patients had been told to arrive at 5:30AM for 8:00AM surgeries. (They usually start at 7:00 except one day per week which happened to be the day we were visiting.) Although the patients were arriving 2.5 hours early for surgery, they were still having delays, thus their request for some help. They were considering asking patients to arrive 3 hours early so they could prepare them on time.

Within a day we determined that this batching of patients created a surge which could not be handled by the capacity. The solution, designed by the staff was to stagger the patients so 5 patients would arrive every 15 minutes. Phone calls were made prior to some patient's arrival to also decrease the error rate. This simple solution solved the delay in registration the very next day and has been fairly well sustained. It meant some patients did not have to come in as early and then wait to be seen. In addition, the registration clerks were moved to a location where they had access to computers so two steps of accessing the account were eliminated (eliminating overprocessing waste).

Pleased that we had a relatively easy solution to this problem we arrived the next day anxious for the staff to be appreciative of the elimination of delays in registration. Although all agreed that that problem had been eliminated, the downstream nursing area was upset because the registration was "too efficient". So we observed the flow from the registration to the nursing unit. It appeared that after a patient was registered they were told to go down the hallway to the nursing area—a push rather than a pull system. The nursing unit being the customer of the supplier (registration) was not determining the patient would arrive so they would be overwhelmed with the flow of patients in a fairly uncontrolled manner. A push system is defined as no defined agreement between the customer and supplier as to the quantify of work to be supplied and when (Liker and Meier, 2006). Since there were two suppliers (registration clerks)

to the nursing (one charge nurse until 5:30 when 2 clinical nurses arrived) and they could provide about 5 patients every 15 minutes but the nurse could only handle about 1.5 patients in each 15 minutes (the cycle time for an uncomplicated patient was about 10 minutes). Another simple change of converting the system into a pull system. They still had at least 6 patients ready before the nurses even arrived (another waste called overproduction). So the nurses walked into a situation of feeling they needed to rush patients which can lead to error and patient and staff dissatisfaction. By slowing the patients through a pull system the charge nurse was able to pleasantly greet the patients by name because she had called to have them arrive in the nursing area.

The statistics demonstrated close to 100% of the patients to surgery on time for the next three days. But it was also obvious that the unit was overstaffed so the nurses' cycle times appeared to dramatically slow down. Because of a lack of management support, no further improvement work was completed after a few weeks. Gradually the department regressed to close to the old way of thinking after additional management turnover of the managers who understood the concepts.

Some additional improvements on this unit:

We sorted the patients into the order of their scheduled surgery time. Before, a first come, first served process was informally in place. So if an 8:00 patient showed up before an 6:45AM patient, the 8:00 would be ready and sent to the OR holding area-only to use a bed and wait. Although this is intuitive, we were never able to convince the ACC to use a schedule which ordered the patients in this order. Instead, because of habit, they used a schedule which was organized by OR room. So to find the 7:00 cases, the charge nurse needed to browse through about 5-7 pages of the schedule and could easily make a mistake.

The nursing assistant noted her first task in the morning was to rearrange the rooms so the furniture was in its proper place. We set up a "picture perfect room" and took pictures and instead instructed the evening housekeeping to properly prepare the rooms after cleaning (principle of not passing defects).

The patients were given patient belonging bags which took extra time to prepare the morning of surgery-instead we prepared them the say before so they were already available.

There was no customer/supplier defined process between the OR holding unit, the transporters and the ACC. So up to 5 transporters would arrive (although only 3 elevators where used to transport the patients) at any time to take any patients.

The charge nurse role was to assign rooms and nurses which were not done in any sequence except availability. Chaos described the charge nurse area and the function was fragmented and required a lot of multi-tasking. We organized room use so there was a sequential order—6:45 AM patients in room 1100-1102, 7:00 in 1102-1107 (obviously adjusting with gender), 7:15 in room 1108… This decreased the complexity of work for the housekeeper who went from in an ordered pattern instead of jumping between different rooms. This also helped transport know where they should take patients and helped act as a visual control to the charge nurse. By ordering the charts on a desk, nurse assignments were no longer necessary because the nurse could take the next chart. To adjust the order of the patients, the charts would be reordered. Charts for patients who were ready to be taken to the OR were placed in a designated area rather than left various places.

Approximately a year or more later, a new manager was in place. After about a two hour observation period, and after 15 minutes of instruction to the new manager, the unit sent from 54% of patients to surgery on time to 89% in one day.

OBSERVATIONS FROM A GI UNIT

In this example, no changes were implemented by the observer but recommendations were made. Observations were informal and application of concepts is purely theoretical. A GI unit had a small space with a total of 8 bays to both prepare and recover patients. In addition there were 3 exam areas to do procedures such as colonoscopies, EDGs or other scope procedures. The patients were scheduled about every 30 minutes plus the unit needed to accommodate procedures for inpatients who needed a GI procedure (such as a GI bleed). The staff complained that they could not accommodate as many patients as the demand required. The work steps were to get some pre-procedure information (a cycle time of about 15 minutes) seemed expected although there was variation because of nursing styles and patient issues (5 minutes to 20 minutes). Patients arrived, were registered, changed clothes into a gown and then were sent back to the GI unit bay area. The actual procedure took about 18-23 minutes of physician time, plus some additional room turnover time and procedure room nurse time. The physician would want the next patient immediately and yell at the staff if the next patient was not available. In addition to not being respectful, this created an expediency by the staff. Patients post-procedure would need to be "recovered' which would take about 30 minutes but for some patients or physician anesthesia styles closer to 45 minutes. The physician would then need to see the patient and discharge them. Sometime in the process the physician would need to dictate the procedure note. The management was looking at increasing the time between patients up to 45 minutes instead of 30 minutes because of frequent delays, inability to accommodate the inpatients and staff overtime.

From a process perspective, several solutions were suggested:

Segment the bay area into “three production lines”. For each production line only allow one prep bay to be used per exam room and one recovery bay. To provide for patient variation or unusual circumstances, this would allow for 2 buffer bays to be used as needed.

Don’t send patients to the bay area until there is an open slot. This is avoiding the push system which leads to overproduction (waste).

Use one-piece flow (also called continuous flow) so the prep nurse is assisting preparation of patient A2 while the MD is doing the procedure on patient A1. When A1 moves to recover, A2 moves to the procedure room, and A3 moves to the prep bay.

Since the physician cycle time is < 30 minutes, he can dictate and then discharge a patient before starting the next patient.

The sequence was:

Exam, exam, exam, exam, exam, exam, exam, recover, recover, recover, exam, exam, exam…dictate, dictate, dictate, dictate, dictate…

The revised sequence was:

Exam, dictate, Exam, dictate, recover, exam, dictate, recover, exam, dictate, recover, exam, dictate, recover

PILOT WITHIN THE EMERGENCY DEPARTMENT

In this example, a cross-disciplinary team was convened and spend about one week together in rapid cycle process improvement using many ideas from the team. The results have been sustained for greater than seven months with daily problem meetings to develop contingency plans.

A community hospital with a problem of patient throughput leading to patient delays in the emergency department. The solution has been for the ED to go on condition red, essentially closing the emergency department for the ambulances. Patients would continue to walk in if they needed care but they could expect to wait a significant time to be seen.

For several years ED taskforces met every other week to talk about the issues. Numerous action plans and designs of best practices were planned but not fully implemented. The environment digressed into a blame environment with fingers pointing in many directions: towards the ED for too frequently requesting condition red, to administration for not providing funds for electronic tracking software systems, to nursing for refusing to accept patients from the ED because of compromise of the nurse: patient ratios.

After several months of trying to facilitate the team to focus on the real issues, the team seemed unable to focus on the solutions but obsessed with restating the problem and assigning blame to individuals or departments repeatedly.

The graph below documents the potential lost review due to condition red/diversions.

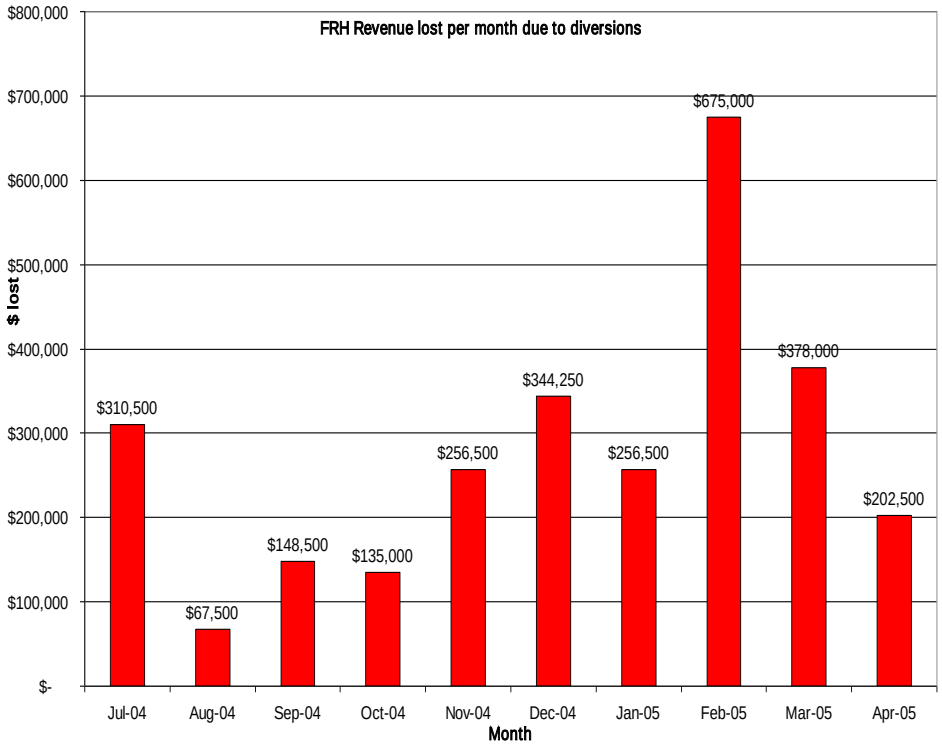


Figure 52: Graph of Potential Lost Revenue

Finally, we determined that we would focus on the problem in an intense week effort called a kaizen blitz in TPS. We allowed the group to be open and included all levels within the organization including administration, nurse managers, support functions, and the patient flow coordinator. Observations were completed with several of these functions including the patient

flow coordinator, a case manager and some understanding of the nursing roles in patient flow. The understanding developed showed fragmented approaches to the flow of patients with isolated islands of people and inaccurate information flow between them about the status of the emergency department, discharges or bed availability.

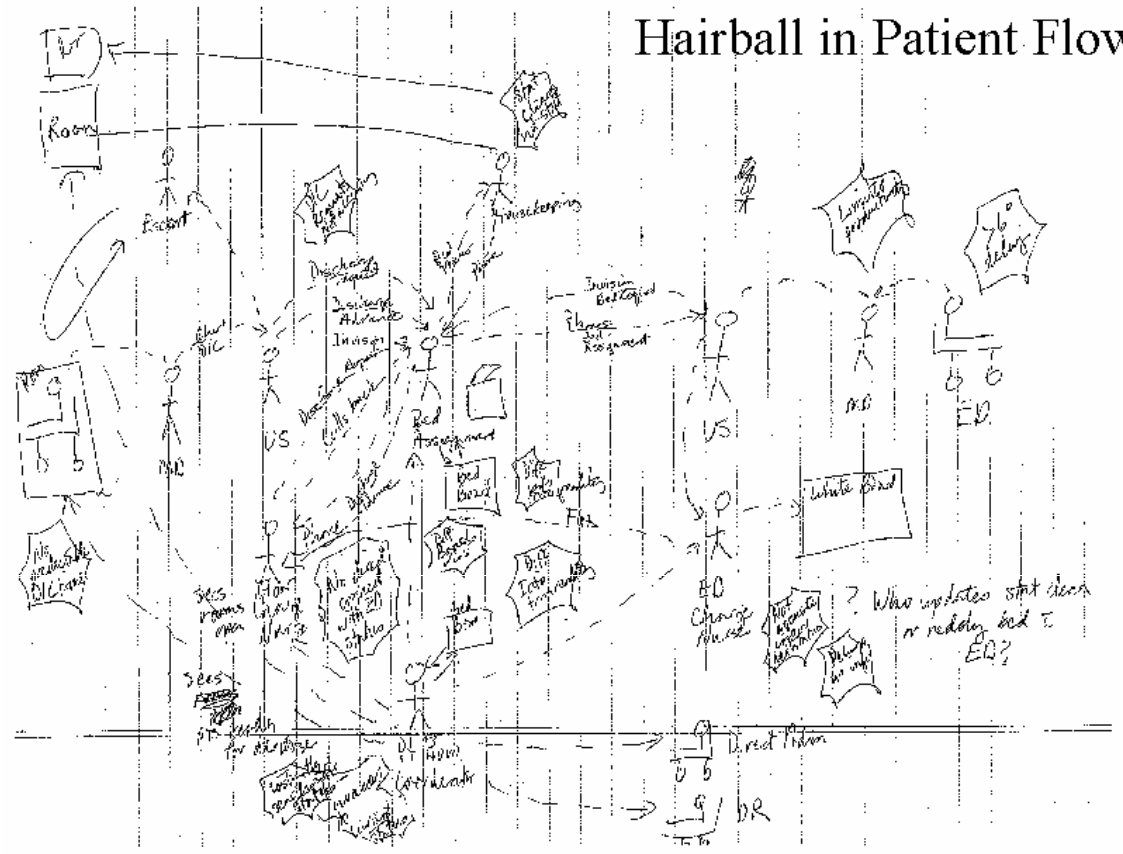


Figure 53: Hairball of Patient Flow

One June 13th we started with the Excellence team week of intense process redesign. At 11:00 each day we met to discuss what we wanted to try as experiments for the day. We divided into 4 teams: ED, Bed assignment/Patient Flow Coordination, Medical/Surgical and ICU/Telemetry (a known bottleneck). We established ground rules the first day including:

- No blaming anyone for anything
- Keep improving no matter what
- If it is not working, analyze why—if it is a bad idea—stop! If it needs more time to be tested, tweak but keep trying. If it is working, keep refining it.
- Update the log daily
- Be Open to Change - Stay Positive
- Speak Out if You Disagree
- See Waste as Opportunity - No Blame
- Treat Others as You Want to be Treated
    - One Person - One Vote
- Ask the "Silly" Questions, Challenge "Givens"
- Creativity Before Capital
- Understand the Principles then JUST DO IT

What was the initial condition? The condition red was seen as an intractable problem which is chronic to the current condition of healthcare. Essentially every hospital faces the same problems, these problems have existed for years, and there is little chance of change. The team summarized the previous condition as:

- No standardization
- Silos which were independent of each other
- No accountability/responsibility
- No one understanding the "whole picture"
- Blame of everyone

Not including any ED revenue or expense, the additional inpatient from ED admissions revenue was $1.4 million for the first 6 months of FY 2006 ($2.8 million annualized). The total contribution margin was $832,000 for 6 months (if we looked at all of the increase in ED I/P visits being related to not being on condition red [not totally an unacceptable assumption since the I/P volume is down across all the other system hospitals]). If you look at budget variance in

hours per KVI expense of $325,240, you have a net benefit for 6 months of $506,849 (or over a $1,000,000 annualized). Some might argue that some of the extra volume was not related to the condition red you are still looking at a positive net benefit of >$600,000 annualized. The total cost of the work was $1,156 for food and t-shirts.

Other indicators such as the ED patient satisfaction scores increased from 80.8 in June 2005 to 86.0 in December 2005, elopements were down >than 50% and the initial post event experience was 8 months without condition red.

Over 2 years later the results of this work have been sustained, even through significant leadership changes including the CEO, the ED manager, and other director and vice president transitions.

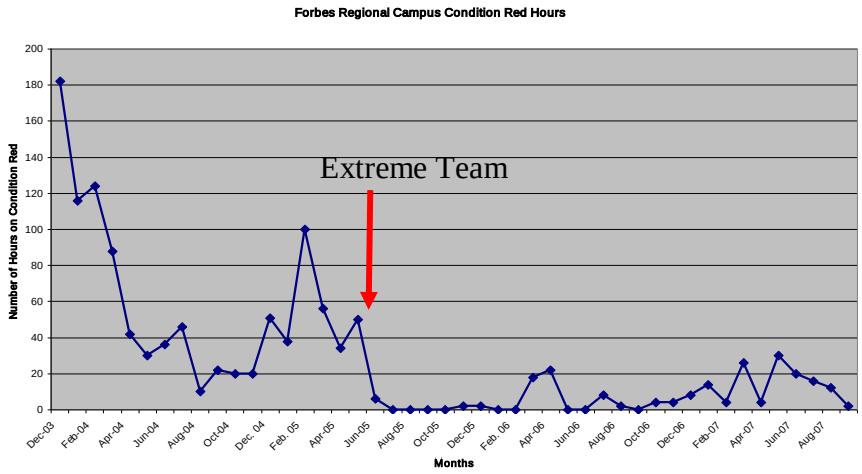


Figure 54: Condition Red Line Graph

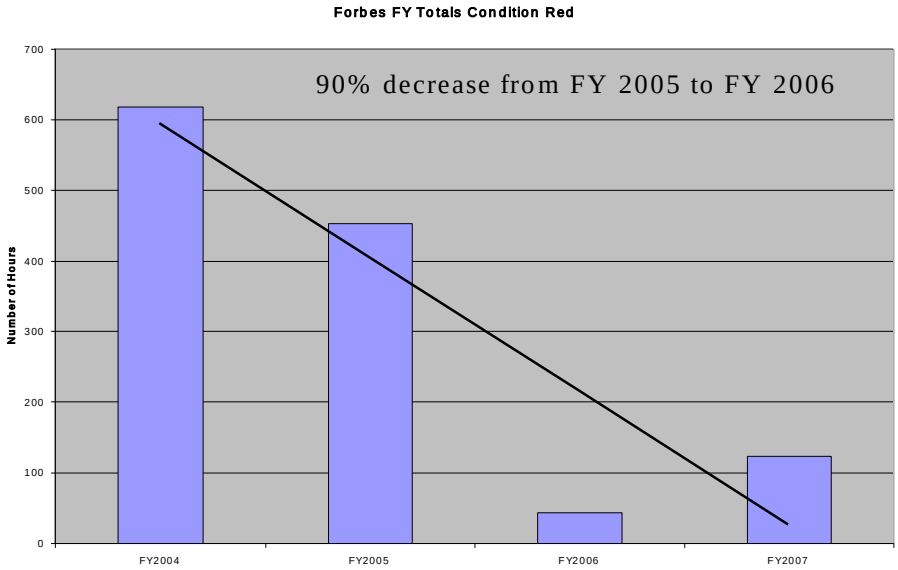


Figure 55: Condition Red Fiscal Year Analysis

PILOT IN CARDIAC LABORATORY UNIT (CLU)

The CLU had an Excellence Makeover Intensive October 1-4 and Oct 8th 2007. Prior to the Makeover, the research spent time observing the unit and had the following findings:

D.1 OBSERVATIONS IN THE CLU 6:00AM TO 4:00PM ON MAY 8, 2007

D.1.1 Patient Experience

- The staff were prompt in meeting patients' needs. Many times the staff seemed synchronized when a patient returned or needed an IV started…
- Patients were proactively offered a sandwich and beverages after the procedure and personal preferences were courteously handled.

D.1.2 Patient Volume/Demand Analysis

- On 5/8 thirteen patients scheduled during the day with 2 add-ons (one of which was never seen in the CLU because went straight to the cath lab); eight of the 13 patients were cath lab patients, plus the 2 add-ons were both cath lab patients. 5 of the patients were thus EP patients. Three patients came via ambulance. On 5/9 13 patients were scheduled with 0 EP patients.

- It appears 6 patients were told to come at 6:00AM when there were three staff available (2RN, 1 NA), plus there was one patient via ambulance when the staff arrived (at 5:50AM—the ambulance had left another hospital at 4:30AM according to the EMTs-this patient was cancelled because of an elevated INR which was drawn at the other hospital—unnecessary trip for the patient). So a total of 7 patients needed some service at 6:00AM from 3 staff.

- At 6:00AM the staff walk into the 5th floor waiting room and ask, "anyone for the cath lab?" Three patients stood up. Their families were told to "wait here and then come back in 10 minutes" (although where their family member had gone was not clear). All three patients were walked to together to the nurses' station where they waited for the staff to determine which room they should go to. The gown, slippers and plastic bag were on the bed waiting.

- The staff report since the CCU has moved to the 5th floor the waiting room has been more crowded and it has been a less comfortable location for the CLU families. Discussions about organ harvesting are occurring in the waiting room or the hallway and are obviously upsetting to families.

- The staff reported this was a slow and unusual day and the volume can expand to 22 patients—when they have to start IVs in the waiting room.

D.1.3 Scheduling Issues

- The CLU was given a "schedule" but there were not times for several patients. One the 5/9/07 schedule 3 patients in the same room were scheduled for 10:00AM per physician preference. Each physician and physician office has different patterns of when they tell the patient to arrive to CLU

- It is not clear which patients are going to the cath lab or to EP to an outsider. The staff know because they know the physician groups but the patients are mixed together and treated similarly. The medical records requirements are less for the EP patients.

- The cath lab ran 4 rooms with 1-4 patients scheduled in a cath room. The staff estimated time in cath to be about 30 minutes for a cath only with a total time of about 60 minutes. With intervention the total time was closer to 90-120 minutes.

- Suburban patients "fall through the cracks". The patients may arrive without knowledge by CLU that the patient is to have a cath. Sometimes the family is there before the patient and the staff have to call around to see what has been scheduled.

- CLU has a Patient Log form (in addition to the Cath "schedule") which is handwritten and includes the patient medical record number, patient name, DOB, Account Number, Physician, Origin, Procedure and Testing. It is prepared the day before. Many of these pieces of information are also entered into the G-Med system which ahs a form similar to the Patient Log Form

- There were 3 transplant patients on 5/8 and one on 5/9. These patients come weekly or biweekly for heart biopsies. They sign their consent downstairs but other patients sign their consent downstairs after the physician has explained the procedure.

- They routinely ask the patients to be there about 2 hours prior to the anticipated schedule but since there is not a real schedule, the patients have waits much longer than 2 hours. During that time several steps occur including. Patients had very long waiting times without a lot of activity.
  - Registration (estimated time 5 minutes)
  - Changing clothes (estimated time 5 minutes)
  - Nursing assessment (estimated 20-30 minutes)
  - NP assessment (not observed but estimated 20-30 minutes)
  - Informed consent (5-10 minutes)
  - Labs, x-rays… (some labs need a 60 minute turnaround time)
  - Transport to the cath or EP lab

D.1.4 Facilities Capacity Analysis

- Unit has 19 beds—room 7 is used as a storage room; They have 10 rooms on a linear format, which meshes into the 5A side. The staff are separate but the CLU staff have to travel to the ice machine to get ice for patients. One room has been held out (07) for storage. Staff report occasionally they have to use the room because of the volume or ask patients to go into the bathroom.

- The unit is called the cardiac lab unit (CLU) but also preps patients for the EP lab—this seems confusing to patients

- The actual cath lab and the EP lab are located on the 4th floor while the CLU is on the 5th floor.

- The Pyxis machine is centrally located in a small room; the fax machine is also located in that room. Staff report the Pyxis is slightly inconvenient when a patient is vomiting and needs an emesis basis or something small but is otherwise helpful.

- Any patient can go to any room.

- There are 3 EP rooms and 3 MDs. Time for EP procedures is 2-4 hours

D.1.5 Staffing Capacity Analysis

- There were 9 staff there (not including physicians or management) to prep these patients (4 RNs, 1 NA, 1 monitor tech, 1 secretary, 1 housekeeper, 1 NP); there is another monitor tech position being considered; another monitor tech who was off for the day and a 3-11 housekeeping positions. There are 6 total nurses (one PT at 20-24 hours per week).

- It took between 20-30 minutes for the nurse to complete her work—starting IVs, completing various forms.

- The EKG technician went from bed to bed to complete EKGs

- There is not clear delineation of who does what. Sometimes the nursing assistant does vital signs, other times the nurse did it or asked someone else to do it. The NP completed the H&P before the nurse did it in one situation. Sometimes the monitor tech started IVs but did not for others.

- The secretary works on completing yesterday, running that day and then prepping for the future patients—especially prepping the charts.

- Charge nurse rotates among the staff—the charge nurse function is not clearly defined according to the staff. The secretary related she is asked to problem solve placement issues sometimes when she would like the charge nurse to coordinate the next step.

- The staff said they have been challenged to change but are now starting to accept the changes. They mentioned that there have been some very good changes, but event those have been difficult to adjust to because there were a lot of changes occurring.

- There was a competition for the chart several times—in one situation the NP was waiting for the nurse to complete her work; in another situation, the nurse did the history from memory because the physician had the chart

- The nurses looked at the white board and were able to determine the priorities and the next thing to accomplish. The white board had a lot of codes that the staff knew.

- The staff liked the sharing of staff between 8A and CLU when necessary when there was a manager of both. They were disappointed that the practice stopped when he left.

- Cath lab does not take patients until 8:00 but many times starts at 9:00AM, unless a physician has a special schedule. The EP lab starts at 7:30.

D.1.6 Patient Flow

- The monitor tech or NA usually transport the patients to and from the cath lab and the EP lab (return only)

- EP patients need 2 IVs started-just in case. The EP staff came to get their first patient (because there was a delay in the CLU staff getting them done according to the staff). The EP staff were thorough in providing a follow-up appointment and discharge instructions but did not complete the discharge instructions form so some of the information the nurse was going to tell the patient was inconsistent with the information already provided to the patient/family.

- The cath lab or EP lab call for a patient. The word "SEND" is written on the white board. The cath lab or EP lab expect the patient within 20 minutes of calling for the patient. The EP lab started to call at 7:30AM.

- When the patient is done, they call again. The secretary writes on the white board. A CLU employee goes to get the patient. Three times the person returned because the patient was not really ready to be transported back up yet. The CLU staff reported this is a common occurrence and they do not usually have a delay in arriving from the time the lab calls.

- When a staff member sees it, they get a stretcher from 07 and transfer the patient to the stretcher. They were usually offered the opportunity to void first but the standard documentation appeared to be "the patient voided and was transferred" regardless of whether the patient had actually voided.

- CLU is given room numbers but the rooms are not ready. CLU calls the 8 floors charge nurse to tell them of the possible admissions, and calls again when a patient has gone down to have the procedure. The goal is to have the patients go directly to the floor instead of back to CLU to wait. That happened for most patients on the day of observation but the staff said that is highly unusual and may have been because of my presence.

- The transplant patients are handled slightly differently. After their procedure they may need magnesium. They also wait to see the social worker, the cardiologist, have an echo… All these consults or procedures are paged after they return—staff report they can also wait for hours until everyone comes to see them.

- Post procedure, the nurse does an assessment every 30 minutes and based on the orders writes a time what the patient can be OOB on the white board.

- A "big problem" is getting beds for patients. The staff report they are miserable because of the overtime. They stated "you never know when you will be able go home". They call the charge nurse on the 8th floor to coordinate bed placement—they report waiting for hours for beds. This creates overtime with staff just waiting for patients to move out of the unit (can be 11:30-12:00 at night). They sense there are stalling tactics by the floors because several of them have worked on the floors. An example of a stalling tactic is to assign a patient to a dirty bed instead of a ready bed. Beds are assigned at 1:00 but the patient does not move until 9:00PM creating overtime for CLU staff. The staff report the cleaning of a dirty bed on the floors take "hours".

- Discharges take 12-15 minutes of nurses time

- When patients return, the nurse starts the data flow sheet. They assess the patient and then check the patient every 30 minutes. They mark the times on the white board for the checks and the OOB times

D.1.7 Documentation Issues

- Staff said that the EP is not as big of a problem for CLU as the cath lab—staffing/scheduling is a problem there. Patients are told to come in 2 hours before their procedure. When patients asked when they were scheduled, CLU staff told them that the CLU staff were not sure but the physician would be around to tell them.

- One patient was to go directly to the cath lab. When asked if one of the CLU staff or one of the cath lab staff would complete the assessment, the staff said that usually the work of the CLU was not completed until after the patient had had the cath. The nurse said she did not think that was right because many of the questions were important to know before the patient had the procedure and asking them after the procedure was just to make it look like they had done it prior to the procedure. The actual patient was sent directly to the cath lab and then directly to an assigned bed.

- Addressograph cards are generated the night before the patient arrives—registration information may not be updated

- Physician offices contact the cath lab but an Advanced scheduling request is usually faxed to the CLU. The staff try to "figure out" what is going to happen in the cath lab and the EP lab. They receive different notices from different physician offices, which they save. They don't receive the next days' schedule until the afternoon the day prior (although the have received a ASR and some clinical information which are date filed). The "final schedule" is received at 8:00AM the day of the procedure but is not relied upon for prepping patients. The staff have a general understanding of physician patterns but if a different physician is performing the procedure, the timing are different.

- The CLU staff make up labels for the monitors and take them to 5A so the monitor techs there know which patient's rhythm they are watching.

- There was one wrong first name on an armband, which was destroyed and corrected—this had to be tubed up or someone had to go to the first floor to get it. Staff report errors on the registration information.

- The white board has an elaborate signal system including arrival times, nurse who is caring for the patient, required tests, consults, procure, completed nurses work, when a patient is to be sent, or when ready to return, dirty room

- There was a peak of 5 dirty rooms at a time (11:50AM). There is a designated housekeeper (this used to be shared but is not designed—some staff were not aware of the change). The dirty beds did not create a bottleneck.

- The NP does not need to do H&Ps on the transplant patients, the EP patients or for physicians who have already completed an H&P. She also writes orders for the patients. The day of observation there were about 5 patients who *potentially* needed H&Ps.

- Transplant patients have been asked all the information again and the information rewritten even though very little has changed. (The manager recognized this and they were going to try to copy the information and keep it in alphabetic order in a binder to decrease the duplication)

- Even though the patient had just gone through registration, the nurse asked who to contact as next of kin and their phone number for the Initial Nursing Assessment; this information is rewritten on the intra unit transfer sheet (3 sources of information)

- There are 5 places to consider the patients medications. Medications had to be handwritten onto the form—many of the medication lists were long.

    - Medications of ASA, Plavix, Coumadin and Lovenox are on the medication Precath Checklist;
    - Full med list is to be recorded on the Medication History, Reconciliation, Physician Admission and Home Medication Orders,

- Meds are to be ordered on the Physician order sheet (although the Medication History, Reconciliation, Physician Admission and Home Medication Orders also includes an opportunity for the physician to check "order now")
- H&P
- The cath sheath removal again asks about anticoagulants

- There are 3 sources for laboratory results (plus the computer)
  - The secretary takes lab results, hole punches them and places them on the chart
    - she also writes them on "green sheet" (not a permanent part of the chart) so labs that are missing can be obtained; Secretary copies the orders from the physician for tests on to the green sheet and highlights other missing pieces
    - lab tests are also recorded in the Precath Checklist, the H&P and then are also on the chart.

- At discharge, the staff tear off the yellow copies and dispose of them—they compile the other parts and send them to medical records

- IVs are recorded possibly 6 different locations (not including the order sheet)

  - Precath Checklist
  - H&P (twice-front and back),
  - Continuous IV Infusion Medication Administration Record
  - Data flow sheet (post procedure)
  - Inter Unit report

- Height and weight are recorded 3 times
  - Precath Checklist
  - Medication History, Reconciliation, Physician Admission and Home Medication Orders
  - H&P

- Verification of the ID band is present is on 5 forms

- The Precath Checklist has a nameplate imprint but then the staff handwrite the name, MR#, DOB at the top of the form

- Allergies are to be recorded on 8 forms (including the allergy arm band)—documentation of allergy bands are recorded 3 times;

    - On the H&P they ask seafood/shellfish/iodine and the staff added metals;
    - On the Initial Nursing Assessment it prompts to ask about medications, food, vaccines, serum, anesthesia, adhesive tape, latex and document on the Medication Reconciliation form—in addition to the Initial Nursing Assessment
    - The nurse is also to place an allergy sticker on the patient's chart and enter allergies into Invision –an 9th source of information).

  What if it changes?

- The date needs to be recorded at least 55 times; the time is recorded at least 48 times

- The Chart requires 21 CLU nurse signatures plus 21 times to write her initials (does not include the cath lab or other nursing signatures)

- The procedure is handwritten/documented at least 9 times.

- "Transfer from" or origin is recorded 6 times

- A discharge includes some information on 6 separate forms (not including the EP lab documentation)

- The physician name has to be recorded 6 places by hand

- Chief complaint or diagnosis is recorded 5 times

- EKGs are recorded 3 times, CXR twice, echoes 3 times

- including the intra unit report; stress test is on H&P and the Intra unit Report Sheet
- Plus a copy of the EKG or the CXR or echo report should be on the chart

- Vitals are recorded on 5 forms and double written in 2 cases—same vitals but different locations
  - H&P
  - pre-procedure anesthesia evaluation
  - data flow sheet (2 separate locations),
  - expected in the G-Med system
  - the intra unit report sheet

D.1.8 Observations of the communication between various departments and the CLU Secretary

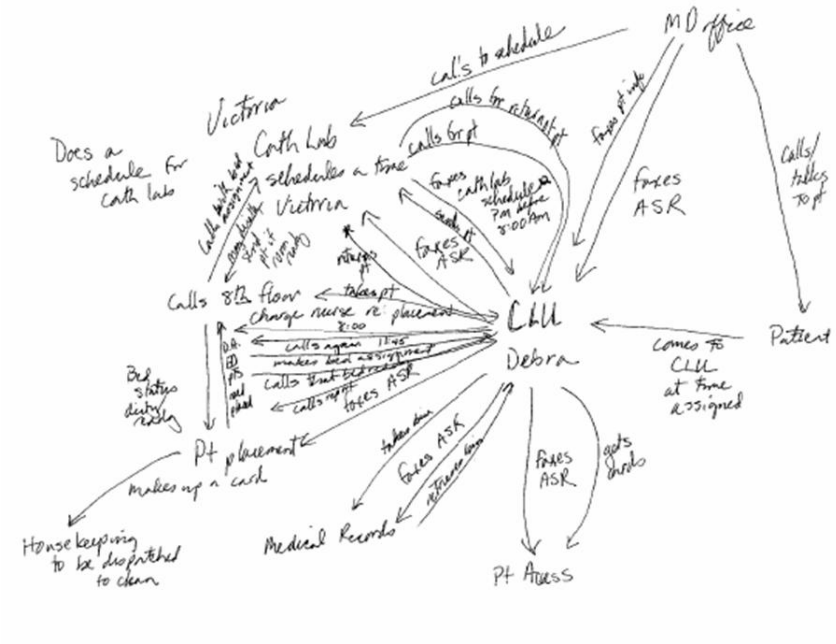


Figure 56: Hairball in CLU

D.1.9 Major wastes

- Over production by getting patients ready before they are needed—cause by lack of information about when the physician will be available. Have patients ready—just in case. Hurry up and wait experience for the patient
- Motion—staff are not geographically assigned so they can have patients spread out over the entire unit
- Defects
    - Incorrect schedule
    - Information not up to date
- Batching of patients when only have limited resources to accommodate patients
- Waiting—lots of waiting time for patients (could eliminate about 13 hours per day of patient waiting time for caths without changing the physician schedule)
- Transport-up and down the elevators with patients when could arrive at the cath lab directly.
- Overprocessing—
Figure 57

    information and could lead to inaccurate information if updated
    - At least 20 phone calls per day between the charge nurse on 8 and CLU trying to get patients placed. (if 5 patients assigned to 8th floors)
        - 8:20
        - 11:45
        - Each patient when sent
        - Each patient when assigned a bed
        - Each patient when bed is ready
        - At least one phone call per patient for report (sometimes several)

D.2 IDEAS

- Aggressively decrease the documentation burden. The nurses' work seems like it could be decreased to 10-15 minutes per patient (consistent with SPU)

- Stagger the patient arrival times and connect more tightly to the actual anticipated cath or EP pull

- See if the extra log sheet should be eliminated through use of schedules in Gmed (G care2).

- Do not use the previous registration—have patient bring up their addressograph card the day of the procedure.

- Pull specific patients from the waiting room when staff are available to provide service to them.

- Don't bring in more than 3 patients at 6:00AM; bring in 3 patients every 30 minutes. Each staff member takes a patient.

- A couple of staff members suggested the CLU housekeeper go to help the floor housekeeping staff to get the job completed. The CLU housekeeper could be dual assigned to the 8ths as a prn.

- Someone must always be available to take report when a call is made. Going to lunch or on a break is not a sufficient response.

- Establish a clear customer supplier relationship between the cath lab and the CLU—the cath lab pulls. Some information about the schedule are not provided to the CLU. Can a schedule be developed?

- Specify each person's role—there could be duplication or mistakes with every patient being having a different person/process of prepping.

- Could some of the data collection occur via the phone prior to the CLU.

- Staff stated they need more garbage cans at the bedside

- Could try taking first cases directly to the cath lab—this could eliminate patient waits, extra staff (free up capacity to be used for additional patients), decrease overtime…

- Eliminate the inter unit report form—it isn't used between the cath lab and the CLU, why the CLU and the floor? Do not need a verbal and a paper report. Either one is sufficient.

- The 8th floor should consider prompt patient placement—30 minutes from the time of the patient complete. Ideally the patient would go from the cath lab or EP to the 8th floor.

- Do not assign beds which are not ready. Have a 30-minute turnaround for housekeeping and dispense CLU housekeeper as needed. Define an acceptable beyond scheduled shift parameter. Call the MHO 1 hour before the timeframe so patient can be moved. (i.e. shift ends at 7:00PM, parameter up to 9:00PM, call MHO at 8:00PM).

- Have a consistent charge nurse and a defined role for that person.

- Have EP or cath complete discharge instructions as appropriate—the CLU nurse reviews with patient.

- Eliminate the stretcher transfer if possible.

- Design when the cath lab should call for a patient to return—patient is indeed ready for transport.

- Documentation must be completed prior to the cath.

- Arrange that transplant patients skip registration and greatly simplify documentation requirements for them. They should be ready in 15 minutes—allow 60 minutes max

- Patients without blood tests come in after patients with blood tests.

- Eliminate batches of patients coming in (for example 3 patients scheduled at 10:00 for the same room in the cath lab (10:00AM) for a 1:00 procedure with 2 of these patients not needing any lab work. The design will mean two of the patients will have at least a 3-4 hour wait with no work being completed.

- To increase continuity for patients have one nurse take 2 cath lab rooms and 1 EP room. The other nurse takes the other rooms and the other one floats. Once a nurse has seen a patient, that nurse should recover and discharge the patient.

- The unit is considering a triage room where IV supplies can be readily available, vitals could be done, monitors applied and then the patient escorted to a room. Another alternative would be to have the Monitor tech/NA move between patients in a sequential way. Staff are uncertain about this idea because it sounds like an assembly line.

- The constrained resource in CLU would be the nurse who has to feed 3 rooms in a redesigned process.

D.3 RESULTS AFTER THE EXCELLENCE MAKEOVER INTENSIVE

Staff participated in the Excellence Makeover initially very well. However, over the days, the staff became increasingly resistant to the suggestions of the researcher and the management.

They argued the changes were making the patient experience too much like an assembly line. After gathering the glitches and understanding the current condition, two goals were established of 1) having a predictable sequence of work so less missed aspects could occur and the staff work would be less rushed and chaotic; 2) having the first cases prioritized as needing completed first. Teaching of concepts were conducted and attended by most staff on the eight types of waste and the Iceberg of Ignorance but other sessions were not well-attended and thus were not conducted. Over 100 people from the hospital participated in the Intensive with about fifteen physicians throughout the Intensive.

Although staff actively argued there was no possibility of achieving the goals, they were willing to continue trying changes around the goals. Some negative leaders within the group refused to participate initially but ultimately did come up with ideas and were willing to try their own ideas. The less negative expressing staff continued to refine changes in process using the triage room and the prioritization of patients. They have sustained these changes since October 4th through present.

D.3.1 Some of the trials and changes implemented:

Pharmacy management came up for a huddle and committed to putting Vancomycin in the Pyxis machine

New stretcher system was implemented which decreased patient transfers and housekeeping functions

A triage room was defined and the staff adjust the responsibilities for first cases and sequence the patients so the four available staff are all accommodating patients initially

First cases are identified by red marker use on the magnet used for tracking patient location

Calling of patients the night before to complete some of the nursing assessment paperwork

Obtaining a schedule from the EP Lab and prioritizing the first cases

Definition of the charge nurse function and consistently using the charge nurse for the morning.

On an informal visit on October 26, 2007, the staff all reported the "front end" was much improved with almost no late patients and a decrease in the calls for complaints by the Cath Lab. The patient comments have been mostly positive and one staff member said there was a major glitch which was reverting back to the old method. The staff have continued to identify glitches and have refined the sequence of work and patients dynamically on a day to day basis.

APPENDIX E

LIST OF ALL MRSA EXCELLENCE MAKEOVER GLITCHES AND IDEAS

IDEAS/GLITCHES

Idea/Glitch	Header	Detail
I	Patient Education	Did you dress? Please remember proper dress attire is mandatory!
I	Patient Education	Place signs above sinks in patient rooms educating patient and reminding staff about handwashing/Purell. Encourages patients to get involved in their health and well-being.
I	Patient Education	*Pass bottles of hand sanitizer with every new admit…like with lotions. Attack the problem from* every angle.
I	Process	How is dirty linen removed from room? A gloved employee in room bagging linen would contaminate outside of bag. Right?
I	Process	Transporting patient in isolation after gowning and gloving to go into room - take off the gown - leave in room and travel to department without yellow gown - change. Would be better to change yellow gown and wear it while transporting Many times have patient contact and have no gown for protection - what can be done?
I	Process	Remove gloves when touching supplies after touching patient. You can reglove or have a "clean" person helping you.
I	Process	Have a alert system when a patient comes into hospital. Ex: a star by their name.
I	Process	Test employee for MRSA to see if we have it.
I	Process	2x2 gauze pads for Phleb in the baskets and outpatient room. There would be less chance of contamination. Gauze pads would not be exposed. Leave in wrapping before using.
I	Process	Lab coats to pick up specimen on floors when being processor.
I	Process	Transfer report with essential info to OR, including MSRs.
I	Employee Education	Better employee training.
I	Employee Education	How do we take an AccuCheck accurately.
I	Employee Education	Some staff members have no medical background, do not know how easily bacteria/virus are spread, may need more educational material than others.
I	Employee Education	If in outpatients such as PT, are you allowed to ask if they have been swabbed for MRSA.
I	Employee Education	Add column to assignment pencil sheet listing isolation. Staff would enter type and then everyone would know. Also would help with swabbing on D/C.
I	Employee Education	Meditech - can we have a screen that pops up "D/C Swab."
I	Employee Education	*Need to educate physicians…glow germ for physicians (MD Lounge).*
I	Employee Education	MRSA screens on employees to pinpoint possible carriers.
I	Employee Education	Mount boxed or scrub brushes/soap combo at sinks to use at beginning and end of shift for staff.
I	Employee Education	Teach proper isolation technique - what to touch, how to clean off what you touch.
I	Employee Education	All trash should be put in red bags in an isolation room!
I	Employee Education	There needs to be on the wall thermometers in all rooms so you do not take the same one from room to room.
I	Employee Education	Replace all window curtains with blinds that you are able to clean.
I	Employee Education	Have each unit collect data for QA/QI on hand washing and use of PPE through direct observation. Any non-compliance will require a corrective action.
I	Employee Education	Portable hand sanitizer for employees. Would be more apt to use sanitizer.
I	Employee Education	Changing tables in visitor rest room, for infants.
I	Visitor Education	Visitors need to wear isolation attire - or learn H.H. technique.
I	Visitor Education	Family education including MRSA, especially with children.
I	Visitor Education	Family teaching for hand washing and gownings while at hospital!!
I	Visitor Education	Isolation - often see family without isolation attire - teaching and communication for visiting family members.
I	Visitor Education	Make sure everyone is following isolation practices correctly.
I	Visitor Education	Put timers in restrooms with sign to wash hands until timer goes off (20 seconds).

I	Miscellaneous	In men's lounge (by time clock), please a garbage can near the exit door for paper towels used to open door with clean hands.
I	Miscellaneous	AccuCheck Covers. Pen Covers.
I	Miscellaneous	Anonymous reporting of non-compliant employees to infection control.
I	Miscellaneous	Gown and glove patient when outside of room (i.e., amb. In hallways) instead of employee having to continually switch in/out of gowns.
I	Miscellaneous	Have a bug sticker to put on someone who is witnessed not washing hands - "You've Been Bugged."
I	Miscellaneous	D/C summary/instruction page - have a check box for MRSA D/C Swab.
I	Miscellaneous	Doctors should not wear ties with open lab coats - research study has shown that ties spread MRSA.
I	Miscellaneous	Place the nasal swab with the discharge instructions that are given to the patient - tape on sheet.
I	Miscellaneous	Disposable covers on chairs that patients sit in rooms. Change daily.
I	Miscellaneous	Have a hand clean "checkpoint" at hospital entrance for all visitors.
I	Miscellaneous	Charts should not go into isolation rooms.
I	Miscellaneous	Charts should not be placed on the beds.
I	Miscellaneous	Urinals should not be placed on overbed trays.
I	Miscellaneous	Specimens should not be on the desk.
I	Miscellaneous	Once in a room, gloves should be removed before coming out into hallway - even if you haven't touched anything in the room.
I	Policy	Difficult to apply gloves after washing hands. Can't we change policy to put gloves on prior to any patient contact and hand hygiene on removal.
I	Policy	Each patient should have a disposable stethoscope in their room on admission, whether or not they're in isolation. Often patients are not in isolation one day and found to be in it the next with something infectious.
I	Policy	Swab all scheduled surgical patients 72 hrs. prior to admissions. Allows earlier institution of precautions.
I	Policy	Random swabs on keyboards, phones, door handles, desks, etc. on all units (like we do for legionella).
I	Policy	Need a definitive policy regarding isolation patients and coming to therapy, dining room. 1. What should staff wear? 2. What should patient do/wear? 3. Treatment of patients with other patients. 4. Dining room protocol.
I	Cleaning	How often are the trash cans cleaned? Garbage always goes out, but the cans hardly ever get wiped off?
I	Cleaning	Do the window blinds ever get "cleaned?" Not dusted, but cleaned!
I	Cleaning	Sanitize clickers when patient D/C'd/between patient use.
I	Cleaning	Place trash cans by door of isolation rooms. When disgowning to leave should not have to walk to other end of room to throw away. Specific trash can for this!
I	Cleaning	What about curtains in room. Patient may touch them and then next patient touches them. Perhaps blinds that can be wiped down.
I	Cleaning	Entrance doors to dining room washed off every day - many hands touch those doors. Wash hands to go to lunch, then touch the doors which are not clean and eat our lunch - automatic doors would be best.
I	Cleaning	Clean the computer keyboards daily in the doctor's lounge.
I	Cleaning	Make sure that the side rails of carts and beds are wiped with sani wipes. This could be done daily for inpatients.
I	Cleaning	If germs and "bugs" were like blood an you could see the dirt (bugs), imagine how dirty your space is!
I	Cleaning	On discharge, patient known MRSA - rooms with curtains, blinds need torn down and cleansed. What about cleaning the walls, baseboards?
I	Cleaning	Get rid of carpet in all areas of hospital. Retains invisible bugs!
I	Cleaning	Use a new tourniquet on every patient (inpatient, outpatient, ER patient). By reusing, it's no different than using the same gloves just because they look clean.
I	Equipment	MRSA "board" (similar to a wt board, vss board).

1	Equipment	Please put hand sanitizers outside the cubicles in the surgery section of ambulatory care - plus outside the GI area.
I	Equipment	Put purell sanitizers outside every patient room and inside as well. Keep filled.
I	Equipment	Put signs above all patient beds - "Don't touch me until you wash your hands."
I	Equipment	Hand sanitizer at visitor entrance with posted sign.
I	Equipment	NN sanitizers in each cubicle - in and out in ambulatory care.
I	Equipment	NN sign in patient room or cubicle to remind personnel to wash hands before and after entering.
I	Equipment	Hand sanitizer that hooks around your neck.
I	Equipment	Have 'hands free" hand sanitizers by visitor elevator. Then the visitors can sanitize their hands before touching elevator buttons and visiting patients.
I	Equipment	Larger size isolation gowns.
I	Equipment	Change the way that the isolation kits placed on the doors of the rooms are organized. The place cards with type of isolation is not being changed properly. Maybe this can be revisited to be more user friendly.
I	Equipment	Hand sanitizer dispenser by cafeteria door and elevators with a sign prompting visitors to use while getting on elevator.
I	Equipment	Availability of masks in the OP area for employees when collecting nasal or throat cultures. HFLU protection, etc.
I	Equipment	Paper towel dispensers in all restrooms where you do not have to touch the lever to get the towel.
I	Equipment	Need a MRSA cart for the OR.
I	Equipment	More visible signs encouraging visitors to wash their hands and have more handsanitizer dispensers. My dad was in a Pittsburgh hospital and they had signs everywhere.
I	Equipment	Larger garbage cans in each isolation room.
I	Equipment	More soiled linen carts for each isolation room.
I	Equipment	Sinks with foot pedals in all three hallways.
I	Equipment	How do we know when they're clean when they're in the hall?
I	Equipment	More germinal wipes by door handles, especially next to isolation rooms.
I	Equipment	Put nice "wash your hands" signs on the back of <u>all</u> restroom doors to remind people.
I	Equipment	Hand sanitizer at the entrances so people coming in can sanitize coming and going out.
I	Equipment	Too small gowns.
I	Equipment	Outpatient specimen rooms need sprayer in restrooms to rinse out urine mats and stool container.
I	Equipment	Disposable thermometers are hardly ever used.
I	Equipment	Glove dispensers in bathrooms.
I	Equipment	A sign on colored paper on the inside of the top of the chart and on the inside of outpatient sheet marked in bold black letters + MRSA. This would really help anesthesia and OR.

G	Food Services	Isolation trays picked up out of rooms.
G	Food Services	Stop in person menu (order) service as diet aides are not washing hands in between patients and touching doorknobs.
G	Food Services	Are isolation meal trays treated separate when taken out? If not, tray would contaminate whole cart.
G	Food Services	Isolation trays are not being picked up by nursing assistants.
G	Food Services	With the hostess program, we are in and out of a room one day and the next day when we go to the room, there is a contac sign on the door.
G	Food Services	Trays that isolation patients eat from are put into carts with other patient trays. Have we tested to see if dishwasher kills those germs?
G	Equipment	Who cleans the IV pumps and feeding pumps between patients? At another facility, housekeeping cleaned them and placed clear plastic bag over pump when clean.
G	Equipment	How often are our computers cleaned? Screens, keys, desks.
G	Equipment	Need new trash cans both in patient rooms and bathrooms.
G	Equipment	Lowboy beds are in isolation rooms a lot of times and when they are cancelled, they are to be cleaned. Sometimes these beds are taken before they are cleaned. Make sure they are clean before use.
G	Equipment	Red bio bags on ISO rooms.
G	Equipment	What about taking computers into rooms to do admissions.
G	Equipment	Just a thought, when an isolation is identified, look at the discard of trash/isolation garments utilize more than one can, one for infect waste/one for clean.
G	Equipment	Foot pedals for all hand washing stations.
G	Equipment	Using yellow stethoscope when not an isolation patient - putting around neck and coming to the cafeteria.
G	Equipment	Nurse server removed from the room for isolation, i.e., greenery, nursing home patient to not contaminate supplies.
G	Equipment	Supplies in drawers and vent bags are reached into with gloved hands and rooted through, then put back in drawer/bag to be used again by next patient, such as tape, syringes in packages, etc. Put a cart with a basket of supplies at each patient's door, such as on isolation cart and unused items thrown away.
G	Equipment	Annual staff screenings yearly with TB shots.
G	Equipment	Designate cleaning of equipment on the units - document.
G	Equipment	Glo machine (glow germ) for equipment.
G	Equipment	Blood pressure cuffs and other equipment in MRSA rooms.
G	Environmental	Plastic throw away mattress covers.
G	Environmental	If we clean different rooms with Disbatch, why not clean all the rooms with it?
G	Environmental	We should not put dirty beds in hallways - all beds should be cleaned.
G	Environmental	Pens in each patient's room. More equipment wipes available.
G	Environmental	Housekeeping isn't just for housekeepers. If you see gum or tissue on floor, take time to pick it up. The longer germs are on the floor, the more time they have to spread.
G	Environmental	Discharge rooms should be cleaned from top to bottom, walls, curtains.
G	Environmental	Why don't door knobs, light switches, traction and underneath overbed stand get cleaned?
G	Environmental	Wipe down all common surfaces, i.e., squares you push to open doors (is this ever done?), mouse and keyboard in patient rooms and nurses' stations. Charts!
G	Environmental	Touching door handles and elevator buttons.
G	Environmental	Clean wall monitor equipment after isolation patient leaves room.
G	Environmental	How do you know that some equipment came out of an isolated room? It's just placed in the soiled utility room
G	Environmental	How often are the curtains cleaned? Are they changed between clean and isolation patients?
G	Environmental	Dirty urine bottles being left on the tables in patient's room.
G	Environmental	Plastic covers need to be kept on computer keyboards for easier cleaning.
G	Environmental	Pillows from deceased patients are being left in the morgue. Buggy??
G	Environmental	Personal items in rooms can become contaminated. Patients should have few items and should be in drawers so surface areas can be cleaned well.

G	Hand Sanitizer	Fill hand sanitizers timely! They are always empty.
G	Hand Sanitizer	Sanitize nurse's station.
G	Hand Sanitizer	Foam sanitizer works better.
G	Hand Sanitizer	Hand sanitizer at vendor sign-in location.
G	Hand Sanitizer	We need hand sanitizer inside the cafeteria across from garbage cans, so when we come through the door from SPD/and/pharm, etc., we can spritz hands after touching door handle.
G	Hand Sanitizer	Hand Sanitizer dispenser should be cleaned as it can be contaminated.
G	Hand Sanitizer	Can the soap be changed - needs more lather and it's too harsh.
G	Process/Procedure	Where is the sticker on the chart?
G	Process/Procedure	MRSA on registration screen to start isolation early for our own safety.
G	Process/Procedure	Proper posting of isolation precaution and communication of isolation patients to all departments.
G	Process/Procedure	Isol. Sticker should be placed on old records for quick visual for ER, other nurses/staff to be aware of.
G	Process/Procedure	In-services for not only employee, but volunteers on hand sanitizing.
G	Process/Procedure	Isolation patients getting tested - coughing. Should they be wearing masks?
G	Process/Procedure	MRSA + patients inevitably have to be transported out of their rooms for testing -potentially contaminating other departments.
G	Process/Procedure	If MRSA is airborne, why don't we have to wear masks?
G	Process/Procedure	MRSA patient sharing room?
G	Process/Procedure	Cleaning of entire room, including walls, window blinds and curtains when isolation patient is discharged.
G	Process/Procedure	Not wearing gloves in patient's rooms and not changing gloves.
G	Process/Procedure	Iso patients come to x-ray and the only way we know they are Iso is our escorts tell us. There is no documentation.
G	Process/Procedure	Positive list from Meditech.
G	Process/Procedure	People frequently ignore the basics - not cleansing or washing hands after and before each patient contact, taking equipment in and out of isolation rooms and out of rooms without appropriate precautions.
G	Process/Procedure	OR recovery room chart wasn't marked for MRSA.
G	Process/Procedure	Many times the admission papers from the ER are placed on the bed with the patient - could they come up in some kind of envelope separate from bed-blanket patient.
G	Process/Procedure	Are all patients from the greenery considered to be + MRSA?
G	Process/Procedure	All nursing home patients should be isolated until -.
G	Process/Procedure	Isolation marked on patient door - not indicated on the medical imaging requisition.
G	Process/Procedure	Why does it take so long to find out and to isolate or mark a room?
G	Process/Procedure	How do we know when outpatients have MRSA?
G	Process/Procedure	Today pre op check list stated contact MRSA, but cultures did not confirm.
G	Process/Procedure	We should add an isolation line to our pencil sheet.
G	Physicians	Doctors go into and out of rooms not wearing the gowns, masks and gloves.
G	Physicians	Lack of MD compliance!
G	Physicians	Doctors need to dress and always wash hands. See this not always happening.
G	Physicians	Does anyone see the doctors washing their hands between patients?
G	Physicians	Call all + MRSA cultures to patients even if treated appropriately with antibiotics.
G	Physicians	Problem with physicians not complying with isolation.
G	Physicians	Doctors enter rooms (isolation) ungowned - no gloves or mask - why?
G	Physicians	When x-ray does a Iso patient, we wear gloves, mask, and cover our film. But nursing might just have gown and gloves. Respir. Might just have gloves. and mask. Doctors are wearing nothing.
G	Physicians	Patients need to be educated and not afraid to ask doctor or other worker entering room to wash their hands.
G	Physicians	Lack of MD compliance using gowns and gloves.
G	Gowns	Patients in MRSA isolation coming to Amb Care - problem with disposal of gown and getting hospital personnel to put on gowns and gloves.
G	Gowns	Isolation gowns are cumbersome and difficult to keep fastened? Need better gowns!
G	Gowns	Larger size gowns for isolation.

G	Transport	I've seen patients in isolation transported without masks on. It should be a priority.
G	Transport	Should the patient wear a mask if they have MRSA naries? Especially during transport.
G	Transport	Transporting patients with MRSA through the hallways without gowns?
G	Transport	Patient in isolation going for test.
G	Transport	Patients coming from nursing homes - ancillary personnel and we need education and communication with transport and isolation consistencies.
G	Amb. Patients in Halls	Make sure that patients in isolation stay in their rooms and not walking around the floors.
G	Amb. Patients in Halls	Give handouts and MRSA info to all suspected and treated cases.
G	Amb. Patients in Halls	Why are patients allowed to walk in hallways while in isolation? And why aren't employees swabbed for MRSA?
G	Amb. Patients in Halls	When going into isolation room, put on your gloves and gown. If the patient walks two feet out into the hall, I don't need a gown or gloves to be with that person.
G	Amb. Patients in Halls	Keep isolation patients in their rooms and out of the hallway.
G	Visitors	Visitors to isolation rooms take no precautions.
G	Visitors	For isolation/contact precautions: Employee's gown and glove, but family members do not when they are visiting?
G	Visitors	Iso patients come to x-ray and we have to put their stretcher in the hallway (we just put a sheet over stretcher) - but the iso stretcher in hallway.
G	Visitors	Pastoral care volunteers are not putting on caps and gowns for isolation.
G	Visitors	Why do families come visit isolation and have been known to then visit non-isolation patients in other rooms?
G	Visitors	Visitors not wearing isolation gowns.
G	Visitors	Why does family/friends not have to gown up when visiting?
G	Visitors	Isolation patients eat/interact with other patients/family members gown/glove when visiting.
G	Isolation Rehab	When any isolation patient is on the rehab unit, how is it that they are allowed to go to the dining room with all the other patients. Confused. Workers have to glove/gown and mask?
G	Isolation Rehab	Patient in isolation is brought into dining room with other patients not in isolation. Seems counter productive.
G	Isolation Rehab	Patient in isolation mixed with patients in rehab gym.
G	Isolation Rehab	Dirty diapers in patient waste can by the bed.
G	Isolation Rehab	Rehab Dept. Gym - Once someone is + MRSA, does gym need to be empty? Difficult to isolate gym for 1 person.
G	Isolation Rehab	A patient from Rehab in isolation (in their rooms)! They can lay next to someone in the rehab exercise room on the exercise bed.
G	Isolation Rehab	On rehab, wear gown and gloves to take in the food tray in the room. But when they are in the rehab dining room sitting next to the other patients coughing and sneezing, they are OK?
G	Isolation Rehab	Wondering when patient in isolation on rehab, what do we do about therapy and going to dining room as far as gowning up?
G	Isolation Rehab	Visitor and family need educated about hand washing - need to wear isolation attire.
G	Isolation Rehab	Make sure all equipment from isolation is properly cleaned and sanitized.

APPENDIX F

EVALUATIONS OF THE MRSA EXCELLENCE MAKEOVER BY PARTICIPANTS

The best thing about the Excellence Makeover is...

- Learning can be fun.
- A very interesting and upbeat way to learn - also brought employees together to solve as a team effort.
- The awareness it has brought to everyone involved in patient's care.
- Well done.
- Very original way of presenting information in song.
- The singing program.
- The comradery of the hospital working together to acknowledge the problem of MRSA and eliminate infections. Thanks to the bug!
- The entire 3 days, very informative while entertaining. Great Job by all. We are in love with the green bug.
- Making everyone more aware of hand washing and spreading of MRSA
- It was fun yet educational. Food and t-shirts. Traveling to each department involved all staff not able to leave their departments.
- I thought everyday was great. I can't think of one thing I liked more than the other.
- The hard work that all of the employees put forth as a team to change how we care for our patients.
- Really raising awareness in a fun interactive way. Getting all the ideas for improvement in an anonymous/non-threatening way.
- Brought all the employees together for learning and f un. It was a nice break from the usual lunch! A lot of energy around the hospital for all positive reasons.

- Including everyone who lives it everyday and sees possible problems and asking our opinions on how we should change to make things better for our patients and staff.
- Creative demonstrations/programs - enjoyable - informative. Brought attention using comedy/facts on a serious subject - good participation from staff.
- An excellent effort to raise our awareness/knowledge of preventing MRSA - the free food, entertainment, prizes, etc. are much appreciated!
- Bringing the entire staff together for a common goal. As a team we will advance further. There should not be"the labs" fault or the "nurses" fault. It is a hospital problem, we should all work together.
- It brought everyone together focusing on a hospital-wide concern. It was very creative and fun and informative.
- You made everything fun.
- The skits and bug and bugettes.
- Great, great, great.
- Our bug, Ima Goner! Loved the shows!!!
- It is fun this week. Snacks are great.
- Everyone can be involved. Round the clock effort. Fun learning.
- Interactive with staff at department level and during lunch programs. Involving everyone for ideas.
- Knowledgeable information we received.
- The process was done in an entertaining yet informative way.
- It makes you very aware of being careful to prevent the spread of MRSA.
- Team work. Getting everyone involved to make a difference in our delivery of care.
- Serious subject presented in both a serious and fun way. Also was made available on more than 1 day and for all shifts. Best songs.
- You all did a great job.
- Something different - fun. Employees working together towards a solution.
- Bringing everyone in the hospital together to work on a common goal - eliminate MRSA. New and fun way to educate will make the learning experience memorable - people will remember the concepts. Including all shifts in the experiences.

Something that needs to be changed about the Excellence Makeover is...

- Nothing.
- Nothing - it was wonderful.
- Ask staff to be involved instead of just managers.
- Next time hopefully more staff will be involved so that the management staff can enjoy.
- Having more departmentalized time with more time to discuss in smaller groups with small

trials of ideas being implemented quickly.

- It was great.
- Nothing - it was excellent.
- Have it more often.
- Really - you guys did a great job.
- Having it an ongoing affair with monthly programs (or on a regular basis) to keep the morale of the hospital as a team.
- More involvement of physicians both in the makeover, as well as in the process day to day. MD's cannot feel exempt in the process.
- Nothing.

An excellent idea that we should consider for the next Excellence Makeover is....

- It was nice to enjoy a learning experience. It was also nice to see the entire staff having such a good time.
- Customer Service
- Involving everyone in patient safety.
- Patient safety.
- Answering the phone and identifying who you are talking to. Working together.
- Isolation races to see who can get on the proper isolation PPE's needed for each type of isolation.
- Any problems the hospital faces having to do with patient care.
- More entertainment - it is a welcome break.
- Customer service
- Involve physicians, too.
- Improve the process in discharging a patient within all departments - nursing, housekeeping, discharge planning, etc.
    - Request suggestions of things that need to be addressed as policy changes or rules to be followed with how MRSA patients need to be treated. Therefore it will not be left up to the staff to decide how and who needs to be addressed, i.e., if patients on 2 North can eat side by side in dining room with MRSA, why must they be seen separately and alone in PT gym?
    - Inform employees sooner and make them more aware.
    - Patient care delivery system.
    - The process we admit patients by and how we transfer to the floor from the ED.
    - Maybe making visitors aware of what they can do.
    - Employee safety - working safely, decreasing employee injuries.
    - Not a thing.

- Nothing.
- More employee participation

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