RD 3  Examples and narratives describing innovations in the provision of nursing care in the organization since designation as Magnet.

As cited in Patient Care Service’s vision and values statement, innovation is one of the core values that guides practice, education and research. Since being designated as a Magnet Hospital in 2003, numerous innovations in practice have been designed and implemented, including the following examples that have been submitted in the organization’s annual interim reports to the American Nurses Credentialing Center to maintain Magnet designation:

• The Perinatal Team Training Project was a demonstration program to embed principles of simulation-based event management and teamwork on an inpatient perinatal unit. Its principle objectives are to improve patient care and safety on the perinatal units through a systematic training program in teamwork and communication and to fully integrate a high performance team approach into daily operations. Teamwork and communication were targeted as essential concepts to address because communication failures account for the overwhelming majority of adverse outcomes in obstetrics. Differences in MD/RN communication style, traditional effect of unit hierarchy and size of the service were determined to be critical elements impacting the unit’s teamwork and communication.

Initially the steering group was co-chaired by a practicing high-risk Obstetrician who also served as the Director of Quality and Safety for the Department of OB/GYN and the Nursing Director for the inpatient Obstetrical Service. Membership included: Chief Nurse Midwife, Staff Certified Nurse Midwife, 2 Obstetricians, 2 Anesthesiologists, Obstetrical resident, Clinical Nurse Specialist, 2 staff Nurses (one Clinical Scholar and one Advanced Clinician), Team Leader for the Support Staff, and a PCIA (unit secretary). Leadership of the group has been transitioned to a Staff Nurse and a Staff Obstetrician.

The above group attended a daylong intensive training program in teamwork, communication and leadership. Goals for the next six months were identified. Outcomes include: dissemination of teamwork and communication training to professional staff and support staff, implementation of interdisciplinary patient rounds twice a day, establishing common language to indicate clinical disagreement or the need for greater clarity, creation of a quarterly service newsletter focused on quality and creation of a magnetic board displaying exactly which staff and leadership were on-site at a given time.
• The Emergency Department (ED) Psychiatric Clinical Nurse Specialist (CNS) and an ED staff nurse held a forum with nine Staff Nurses to initiate the creation of a Professional Development Committee. They worked on defining the culture and norms of the ED staff to serve as the basis for practice and professional issues. They conducted a survey of group members and are now reviewing the findings and will continue to meet on a bimonthly or quarterly basis.

• Working with a multidisciplinary team of Psychiatry, Social Services and Nursing, a role was created for a Substance Abuse CNS in the Emergency Department to identify patients to place on the withdrawal pathway. This role established relationships with detoxification centers, inpatient Psychiatric CNS staff and other providers. In addition, it has been pivotal in educating the ED staff in the care and treatment of the substance-abusing patient.

• Based on capacity management issues within the Emergency Department, the Staff Nurses from the Trauma and Major Multipurpose Cluster Committees proposed some reallocation of nurse/patient assignments to create a "Throughput Nurse" in each of those areas. That nurse constantly monitors the flow in the cluster, serves as a resource to new Staff Nurses as well as staff with heavy caseloads, and helps troubleshoot issues that impede patient flow in the cluster.

• A Staff Nurse and Psychiatric CNS in the Emergency Department developed a brochure to guide the nursing and physician staff in the care of a patient who experienced a sexual assault. This is a high-risk, low frequency patient population and medical and nursing staff often feel insecure in the forensic and documentation aspects of care. The brochure has been perceived as extremely helpful by the few providers who have had the need to refer to it.

• The Medication Delivery Project for Pediatrics was a collaborative effort by representatives from Pediatric Nursing, Pharmacy and Biomedical Engineering. A multidisciplinary taskforce was co-chaired by the Pediatric CNS and a Pediatric Pharmacist. The Pediatric and Newborn ICU and nurseries initiated a major medication safety initiative involving eliminating the “rule of six”, and implementing standard concentrations for vasoactive medications and continuous infusions. Patients range in age from pre-term neonate to 19 years and 364 days. Previously, administration of medications via continuous infusion in the NICU and PICU were prepared and administered
according to the “rule of six” method using patient weight. This method resulted in non-
standard and unlimited number of drug concentrations. The project goals were as follows: (1)
eliminate the “rule of six” method of administration, (2) establish standard concentrations for
continuous infusions, and (3) implement smart infusion pumps with MGH approved pediatric
drug libraries. Standard concentrations and smart infusion pumps using the MGH pediatric drug
library were implemented in the NICU and PICU. Future goals include: expanding the use of
the smart pumps and pediatric drug library to all inpatient areas caring for pediatric patients,
including the Emergency Department, operating rooms, cardiac OR, and cardiac catheterization
lab; and evaluating outcomes of this implementation.

• To improve communication and nursing relationships a new Staff Nurse position was created in
Oncology, where a nurse rotates between the inpatient Medical Oncology/Bone Marrow
Transplant unit and the Outpatient Oncology Infusion unit. It allows the inpatient staff to gain
an understanding of the care pre- and post-hospitalization care for Bone Marrow Transplant
patients and has strengthened relationships between the two staffs. The new role helped the
staff to experience the patient’s care across the continuum, and, in addition, has provided some
flexibility with staffing as more Staff Nurses are competent to practice on both units.

• The Pre-Admission Testing Area (PATA) created and designed a PATA Web Site for patients to
access information needed to prepare for PATA and the day of surgery as part of their effort to
improve patient information, access and expand patient care delivery. They have also started a
PATA Phone Assessment Program, which allows the RN staff in PATA to call patients prior to
surgery, complete a nursing assessment, provide pre- and post-operative education and to
answer any questions the patient or family may have prior to surgery. The program design
targeted two objectives: 1) to allow healthy patients the opportunity of not having to take a day
off from work and come in to PATA for an evaluation, 2) to expand the program to patients
that currently do not come to PATA and do not have a nursing assessment completed prior to
surgery. The goal is to have all elective surgical patients have a completed nursing assessment
and preparation prior to surgery by either a PATA visit or phone interview.

• The Rapid Response Team is an all-RN team of nurses deployed out of the Central Resources
Department to provide rapid, short-term intervention to assist units in managing sudden
fluctuations in acuity and workload. It supports the Safety in Motion Initiative (providing nursing care to high risk, complex patients during travel to testing and procedures), acts as mentors to less experienced staff on unfamiliar techniques/procedures and responds to emergencies as needed. Clinical Nursing Supervisors assign RN staff in response to formal requests for assistance or when they identify that a patient care unit may be in need of assistance. The Clinical Nursing Supervisors, Rapid Response Nurses and the Resource Nurse on the units collaborate to determine the most appropriate use of the resource. The volume of requests and activity has steadily increased since the inception of the team in October 2003, and the program has continued to be developed to optimize use of this clinical resource.

- The Nursing Directors from the Cardiac Nursing Service established a Cardiac Nursing Practice Group. The group includes representation from all cardiac areas: Cardiac Access Unit, Cardiac Care Unit, Cardiac Step-Down, Cardiac Surgical ICU, Cardiac Surgical Step-Down, Cardiac Catheterization Lab, Electrophysiology Lab, the Cardiac OR, and the North Shore Medical Center's cardiac program. A representative from the Treadwell Library joined to help with literature reviews to support evidence-based practice issues. The purpose of the group is to unite the service and specialty around evidence-based practice and to improve communication and relationships. The vision statement of the cardiovascular nursing group reads, “our primary focus is the delivery of nursing care to patients with cardiovascular disease and their families with an embedded commitment to reducing the incidence of cardiovascular disease and associated disabilities. Our nursing care is guided by knowledge, perfected by skill, and motivated by compassion.” The Cardiac Practice Committee approved the vision and goals for the Cardiovascular Nursing Services (attachment RD 3.a).

Hundreds of additional examples of innovation in practice, education and research are threaded throughout the pages of our Magnet Redesignation evidence in the 14 Forces. However, one example of innovation cannot go unmentioned in this narrative – the launching of The Center for Innovations in Care Delivery. As highlighted in Force 2.3 and Force 7.8, and in the Senior Vice President for Patient Care and Chief Nurse’s column in the November 2, 2006 issue of Caring Headlines (attachment 7.8.b), this interdisciplinary Innovations Center, housed within The Institute for Patient Care, is focused on bringing teams together to identify opportunities, to estimate the impact of change (including workforce demographics, new technologies and regulatory change), and
to construct and implement innovations to improve the delivery of patient care. Each of the
disciplines within Patient Care Services made a contribution out of their respective special funds to
launch the Innovations Center, and, in late 2006, a $1,000,000 donation was received from an
anonymous donor. Thanks to these generous contributions, clinicians from all disciplines will be
able to come together to think, explore, invent, and create better ways of doing business, and better
ways of caring for MGH patients and families. In January 2007, an all-day Patient Care Services’
innovations retreat was held to officially launch The Center for Innovations in Care Delivery.
Proceedings from this day are in attachment RD 3.b.
Goals for Cardiovascular Nursing

Vision:
Our primary focus is the delivery of nursing care to patients with cardiovascular disease and their families with an embedded commitment to reducing the incidence of cardiovascular disease and associated disabilities. Our nursing care is guided by knowledge, perfected by skill and motivated by compassion.

Goals:
1. The nurse/patient relationship is the cornerstone of our multimodal approach to fostering the cardiovascular health of our patients and their families. We use a holistic model of patient assessment which includes assessment of the needs and expectations of our patients and their families, individualized measures of cardiovascular health, integration of patient-specific nursing interventions to reduce cardiovascular risk, and evaluation of nursing care as it relates to the patients’ cardiovascular health.

2. We encourage our patients and their families to participate in decision-making regarding aspects of lifestyle impacting their cardiovascular health. Through the nurse/patient relationship, we partner with patients and their families to assess readiness-to-change risk factors, to identify resources needed to support lifestyle change, and to identify and use community resources.

3. We strive to maintain the highest standards of patient care through the synergy created by collaboration with colleagues and the development of an interdisciplinary team. Each team member values the expertise of the other members and considers the patient and his family as an integral part of the team. The strengths of the family are recognized and are used to improve the patient’s cardiovascular health.

4. Our expert nursing care spans the health continuum, from wellness through acute illness. Nurses specializing in the care of patients with cardiovascular disease are responsive to medically complex unstable patients requiring comprehensive therapies to optimize their cardiovascular health as well as responding to the needs to support a healthy lifestyle.

5. Cardiovascular nursing expertise is advanced from novice to expert through a comprehensive orientation to the inpatient setting of acutely ill patients; educational programs focused on evidence based cardiovascular nursing practice, national credentialing, and life-long learning opportunities with an emphasis on recognizing the wide variation in patient presentation of cardiovascular disease.

6. We actively seek opportunities to improve cardiovascular nursing practice within MGH and in the community. We embrace the spirit of inquiry by developing programs of cardiovascular nursing research with the research questions generated from our clinical practice, by designing cardiovascular nursing interventions to improve patient care based on research findings, and by translating research findings into clinical practice.
7. We seek to optimize cardiovascular patient outcomes beyond the care delivered by nurses at MGH. We share our wealth of knowledge with colleagues that include Advanced Practice Nurses, clinical nurses, and experts in other disciplines related to the care of cardiovascular patients. We create educational programs designed to share the knowledge developed from research on nursing clinical practice and patient needs. We offer consultative services fostering optimal care of cardiovascular patients to new programs under development in other healthcare organizations.
The Center for Innovations in Care Delivery Retreat
January 22, 2007

Introduction
Jeanette Ives Erickson, RN, MS, Senior Vice President for Patient Care and Chief Nurse
Barbara Blakeney, RN, MS, Innovations Specialist

In launching the day’s activities, Jeanette Ives Erickson, RN, MS, Senior Vice President for Patient Care and Chief Nurse at MGH, shared a quote from Sir Leuan Maddoc, who said, “To cherish traditions, old buildings, ancient culture and graceful lifestyles is a worthy thing – but in a world of technology, to cling to outmoded methods of manufacture, old product lines, old markets, or old attitudes among management and workers is a prescription for suicide.” Erickson noted that this is an apt quote for MGH, as the organization comes from a long and rich tradition of caring. But, she noted, “We need to innovate – to make sure that the delivery of patient care and the structures that support it change to meet the changing populations that we serve. We need to meet the needs and expectations of our patients and our staff.”

Erickson shared the initial mission statement for the Center for Innovations in Care Delivery, which is:

The central purpose is to couple interdisciplinary research with opportunities for changes in care delivery. The intent is to bring teams together to identify opportunities, to estimate the impact of change (including workforce demographics, new technologies, and regulatory changes) and to construct innovations.

She said this is an initial statement and is likely to change based on the work of those who will craft the Center itself – work that will begin with this day’s retreat.

Erickson cautioned the group not to confuse innovation with creativity. She said health care professionals are perhaps more comfortable with creativity than with innovation. “Innovation means action,” she said. “It is an outcome. Innovation brings new things to life. You must turn creativity into something that has an impact.” She asked the audience to keep six points in mind as they begin to envision the Center for Innovations. These are:

1. Our employees are our greatest asset
2. It take great leaders
3. Imagination is necessary and fun
4. Collaborative decision-making is core
5. A professional practice environment is the foundation from which we will build our future
6. Patient focused care is key

Erickson shared a new iteration of the professional practice model that has been in place since 1996 at MGH. (Refer to OOD.14). Several elements were re-crafted to reflect the evolution of the concepts that has occurred since the model was first introduced. “Philosophy” has become “Innovation and Entrepreneurial teamwork;” “Descriptive Theory Model” has become “Narrative Culture;” “Peer Review” has changed to “Clinical Recognition and Advancement;” and “Collaborative Governance” has changed to “Collaborative Decision-Making.”

Erickson turned the podium over to Barbara Blakeney, RN, MS, Innovations Specialist and Director of the Center for Innovations in Care Delivery. Blakeney noted that 140 people were invited to come and craft the initial course for the Center. She said, “The Center is yours. It is not mine, it is not Jeanette’s. We are thinking today about a platform for the Center to move forward. You are here to help us think about that. We ask you to do everything you can – physically and mentally – to take yourself ‘out of the box’ so that you can do things differently, think about things differently.” Blakeney concluded with the following inspirational quote: “An innovator sees what everybody else sees, but thinks what no-one else has.”

**Transforming Care at the Bedside**

**Pat Rutherford, RN, MS**

*Pat Rutherford, RN, MS, is Vice President at the Institute for Healthcare Improvement (IHI) – an organization that promotes initiatives designed to improve health care throughout the world. She is principal investigator on IHI’s joint initiative with the Robert Wood Johnson Foundation, “Transforming Care at the Bedside” (TCAB). She spoke about this project and challenged audience participants to consider many of its tenets as they embark on paths of innovation at MGH.*

Rutherford began by saying that the mission at IHI is similar to that of the new Center for Innovations in Care Delivery at MGH in that both are concerned with improving outcomes for patients by engaging the creativity and problem-solving skills of the health care workforce. She said that being invited to the Center’s retreat is an ideal example of the kinds of partnerships that IHI strives to achieve in order to accomplish its mission, and she looks forward to hearing about the innovations that come out of the new Center in the months and years to come.
TCAB background and overview

Rutherford said the TCAB project was begun about 3 ½ years ago by IHI and the Robert Wood Johnson Foundation (RWJ). Researchers at RWJ were looking at ways to improve retention of hospital nurses to augment the work they had done around recruitment. Meanwhile, IHI had been looking at so-called “micro-systems” in the health care environment such as intensive care units and office practices, and they wanted to begin to look at the systems involved in medical/surgical practice. Rutherford noted that med/surg units have been operating under the same basic system design for many decades, yet the care needs on these units have changed dramatically in that time, with sicker patients who are discharged after short stays and direct care staff who are pulled away from the bedside with a myriad of non-direct-care chores (such as documentation or procuring supplies). These factors gave rise, said Rutherford, to IHI’s and RWJ’s belief that systems supporting care in medical surgical units were in need of “dramatic, system-level redesign.”

The organizations joined forces to create the TCAB initiative, whose strategic objective is: “To develop one or more models of care at the bedside on medical and surgical units that will result in improved quality of patient care, improved quality of patient service, more effective care teams, improved staff satisfaction and retention, and greater efficiency.” Rutherford shared that she and her colleagues chose the word “transforming” deliberately because of the magnitude of change that would be needed in order to achieve the stated goals. The project has recruited 13 hospitals across the nation who are working on developing and testing ideas to transform care on medical surgical units.

The work on TCAB did not “start with a blank slate,” said Rutherford. “We are standing on the shoulders of the work that has gone before us,” she said, noting that the project drew on the experiences of many other groups who study innovation, including IDEO (a design innovation firm) and Toyota. IHI shares a common belief with these and other organizations in the “empowerment that comes from unleashing potential at the front line.” The following premises form the underpinnings of the TCAB work:

- Patient-centered work redesign can create value-added care processes and result in better clinical outcomes and reduced costs.
- Effective care teams can have a positive impact on patient outcomes.
- Management practices and organizational culture have a significant impact on the work environment.
• Matching staff’s knowledge and capabilities with work responsibilities enhances job satisfaction.
• Eliminating inefficiencies through work redesign enhances staff satisfaction and morale.

The Idealized Design Model

The “how” of TCAB

Rutherford presented IHI’s “Idealized Design Model” which was used to frame and develop the work of the TCAB project. The model calls for three basic project “milestones,” with detailed work occurring within each. They are: generate new ideas, test new ideas, and spread new ideas. It incorporates the “plan/do/study/act” approach, which calls for a work team to plan for a change, try a strategy, observe the results, and then act on what has been learned from the process.

In generating new ideas, Rutherford said four elements have proven useful:

• “Snorkeling” – An adaptation of IDEO’s concept of a “Deep Dive,” snorkeling engages front-line staff in thinking “outside the box” to come up with ideas for change. Elements in a typical snorkeling session might include a review of the project vision, discussing what is already known about the issue, asking, “How might we…?”, and beginning to brainstorm about innovative ideas.

• Adapting strategies from other industries – Rutherford noted that leaders in health care have begun to learn a great deal from studying other industries, particularly “high reliability” organizations such as the airlines.

• Adapting “best practices” – As groups consider ideas for innovation and improvement, they are also learning about and implementing practices that have already been shown to be effective. Rutherford gave the example of the six strategies promoted by the IHI’s 100,000 lives campaign (deploy rapid response teams; deliver reliable, evidence-based care for acute myocardial infarction; prevent adverse drug events; prevent central line infections; prevent surgical site infections; prevent ventilator-associated pneumonia.)

• Creating Learning Communities - Rutherford talked about how those involved in TCAB plan site visits to participant hospitals as well as other locations to learn all they can about work that may help generate ideas and further project goals.

Rutherford said that once staff have one or more new ideas in hand, small scale testing can begin right away. The model allows for the rapid cycle testing of multiple new ideas in order to encourage innovation. Says Rutherford, “The mantra we have is to take a new creative idea, adopt it,
adapt it, or abandon it. Take a crazy idea and see if it will work with one patient, one nurse, one shift. Do a small scale test to see if there is potential. If there is, do further testing.” Rutherford said that planners should make predictions about what they think the results of the test will be and compare the actual results against these predictions to increase learning. She recommends running multiple tests of change at once, and notes, “It takes many tests to build innovation.” Tests that have a track record of showing improvement can then be spread to other areas.

**TCAB Themes and High-Leverage Changes**

*The “what” of TCAB*

Rutherford presented an updated project map that summarizes key design themes and changes that have been studied to date. She said five major design themes have been identified, with high leverage changes to achieve the goal stated in each. The IHI color-codes each change on the map to signify whether it is a ‘best practice’ that exists on 25 or more med/surg units (green); a best practice that exists on 5 med/surg units (yellow); or an innovation that is undergoing further tests (red). The five themes are:

- Safe and reliable care
- Vitality and teamwork
- Patient-centered care
- Value-added care processes

As noted in Appendix B, numerous tests of change are in various stages of implementation under each goal. Each is a change project in its own right, within the overall umbrella of the TCAB work. These changes, said Rutherford, when taken together, will be what will transform the health environment, supported by the “leadership leverage points” as noted on the map. “Design targets” give change teams something to aim for in planning and measuring their innovations in each area.

**Sample results**

Rutherford shared some results from the project. Aggregate data on all the TCAB sites shows a trending decrease in codes on med/surg units following implementation of rapid response teams and other measures. Voluntary turnover of nursing staff at TCAB sites has decreased from 15% to 6%. Participant hospitals have made progress in patient-centered care by having patients and families establish daily goals and communicate them using white boards in the room, and by involving patients and families in rounds and handoffs. Trials that are examining the effects of
having three clinicians (physician, nurse, and pharmacist) doing an admission assessment together are showing encouraging results. And innovative work is in progress to more closely document the time that nurses spend in direct patient care so that improvements can be planned.

The TCAB work, said Rutherford, calls for “transformational leadership” – a group of characteristics that includes overseeing and supporting innovation at the bedside and aligning the system to support change. In the end, she notes, “The whole is greater than the sum of its parts.” Many if not all of the high-leverage changes to date – though they may have originated under one of the five design teams - can be shown to impact all five of the overarching TCAB goals. Rutherford is looking forward to more exciting work on the project and said the American Organization of Nurse Executives is launching related work in the spring of 2007.

For additional information on TCAB:
http://www.ihi.org/IHI/Programs/StrategicInitiatives/TransformingCareAtTheBedside.htm

Using Simulation to Safety Trial Innovations in Patient Care
Jeff Cooper, PhD
Jeff Cooper, PhD, is Director of Biomedical Engineering for Partners Healthcare, Associate Professor of Anesthesia at Harvard Medical School, and the founder of the Center for Medical Simulation. He is co-founder and board member of the Anesthesia Patient Safety Foundation and board member of the National Patient Safety Foundation. Dr. Cooper is the recipient of numerous awards including the 2003 John M. Eisenberg Award for Lifetime Achievement in Patient Safety from the National Quality Forum and the JCAHO. He spoke about the scope and impact of simulation in health care to date, and about its potential for facilitating innovation in the future.

To begin his remarks, Dr. Cooper expressed his appreciation for the environment at MGH that has given him the “freedom to experiment” for nearly 35 years. Addressing the retreat’s focus on innovations, he said, “I don’t see myself as a highly creative person. I’m an engineer. But I’ve managed to do some things that some people would see as creative. I’m a living example – myself and this environment at MGH – of how working with teams can be an incredible facilitator to do whatever you want.” He went on to describe how the “open, collaborative, smart, diverse” group of colleagues that he has worked with through the years inspired his work and made it possible.

He prefaced his remarks on simulation by giving some background on the Center for Medical Simulation in Cambridge – a collaborative effort among all the Harvard-affiliated hospitals that includes highly sophisticated simulation tools and settings.
What is simulation?

Cooper described simulation as “a technique, not a technology, for interactive and often ‘immersive’ activities that re-create experiences of a real-world environment, to amplify or replace actual experiences.” Quoting from the work of DM Gaba (2004), he noted that simulation and immersive learning can be applied to health care in many ways. He said Gaba conceptualized a “spectra of simulation” as: the purpose of simulation; the unit of participation; the health care domains and disciplines involved; the knowledge, skills, and behavior that simulation can target; and the technologies that support simulation.

*The purpose of simulation* – Simulation can be used for education, training, testing, patient care (such as surgical case planning, protocol design, or experimenting with innovations), and research. Cooper said that simulation is increasingly being used for formative and summative testing of clinicians and feels that one of the potentially strongest uses will be faculty development – learning the best ways to teach future providers of health care.

*The unit of participation* – Individuals, crews, teams, work units, or entire organizations can participate in simulation experiences. Cooper noted that one recent simulation project at his center involved an entire senior management team.

*Health care domains it can impact* – Domains that have used simulation include imaging, procedural, primary care, in-hospital, and ‘high-hazard’ domains such as ORs, ICUs, EDs, and cath labs.

*Health care fields or disciplines that can use simulation* – Those who can use simulation include aides and clerks, allied health professionals, technicians, nurses, physicians, managers, executives, trustees, regulators, and legislators.

*Impact on knowledge, skills, and behavior* – Cooper noted that simulation can be used to enhance the users’ conceptual understanding, technical skill, decision-making ability, or attitude and behavior. He said that when simulation is used to impact behaviors, debriefing is a particularly important part of the process.

*Technology applicable to simulation* – Cooper spent some time discussing technologies that can be used for simulation which range from simple to complex. Verbal simulation is creating a “what if?” scenario or using role-playing. “Your probably already do this,” said Cooper. “You think about, ‘what if?’ You imagine ways to do something. That is verbal simulation.” He encourages the use of role-playing, especially in difficult patient situations.
A next level of technology for simulation is a standardized patient. Cooper said many medical schools use standardized patients – professional actors who learn about a particular disease and take on the role of a patient.

A “part-task trainer” is simulation that trains users on a particular task. Cooper said more and more clinicians are using this technology to learn complex skills such as putting in a central line, intubating a patient, or performing a diagnostic procedure such as sigmoidoscopy – skills that used to be learned on patients. Another level involves creating patient scenarios on a computer screen (patient simulation).

The most complex level, electronic patient simulation, is a full virtual reality including a replica of a clinical site and one or more physical mannequins representing the patients. Cooper said that these kinds of simulations occur at the Center for Medical Simulation, including simulations of full vaginal and cesarean deliveries. Cooper noted that obstetricians now receive discounts on insurance premiums for participating in clinical simulations, and that risk management foundations have funding available to support these kinds of projects.

Cooper noted that the Knight Center Nursing Simulation Program at MGH was one of the first nursing simulation programs in existence and uses many of the concepts he is discussing. He noted, “You have a great group of educators who are using these tools. You have an opportunity that a lot of places would like to have.”

**Using simulation to test an innovation**

Cooper explained that innovations can be tested at many levels. He noted that, when testing an innovation, one would typically like to know how it would work in a real environment. Yet – especially in health care environments – it makes sense to test the innovation first in a setting where there is control over what will happen. He illustrated the range of test possibilities using a graph that depicted the context of various testing scenarios in terms of how close to “real life” they were.

At the “low realism” end of the scale are methods such as focus groups or labs. While these methods may be useful in some scenarios, many clinical innovations should ideally be tested in more realistic or “high-fidelity” settings. A simulated setting provides a high degree of realism without the attendant risks associated with testing in the actual clinical environment. It allows testers to introduce critical situations while testing a new innovation to see how clinicians will react. And it allows testers to record data without concern over patient confidentiality. The main disadvantage to
hi-fidelity simulation is cost. However, Cooper reminded the group that most innovations do not require high realism for adequate testing.

Cooper gave examples of innovations that one might want to test outside the real environment. This included: new ways of transporting patients, electronic medical record systems, new forms of monitoring, new ways of assigning tasks, and new ways of managing critical events.

If you have an idea – what next?

Cooper shared thoughts about how staff at MGH can proceed if they have an innovation they want to test. He advised that someone write down the idea and talk about it with colleagues, including resources from the Center for Innovations in Care. He shared that the MGH Biomedical Engineering Model Shop is a good place to start, explaining that it is a resource that most hospitals don’t have. Staff in the model shop have created numerous tools for clinicians, including a device to measure the head-of-bed angle, mounting brackets for equipment, and much more.

Cooper concluded his remarks by noting that simulation in health care is growing at a rapid pace. He predicts that in the near future, all hospitals will have simulation of some kind. He commented, “We are in the middle of transforming health care. We are at the beginning of something new, and it creates a lot of opportunities for innovation.”

For more information:

The Center for Medical Simulation: http://harvardmedsim.org/cms/
The Bioengineering Model Shop at MGH: http://biomed.partners.org/ModelShop/
Capturing Insights at the Bedside
Richard Bohmer, MD, MBA

Richard Bohmer, MD, MBA, is Senior Lecturer at Harvard Business School and was formerly Clinical Director of Quality Improvement at MGH. He studies and teaches health care operations, patient safety, and process management. Dr. Bohmer shared his ideas on how insights and innovations occur at the bedside, and how, under the right circumstances, they can be used to improve outcomes.

Dr. Bohmer said he believes that insights that clinicians gain at the bedsides of patients is a major source of health care innovation. He said he would be talking about how to capture these innovations systematically with the hopes of generating improvements in patient care.

The flow of innovation and insight

Bohmer challenged the group to look critically at what he called the “prevailing notion” that health care delivery is the final act in a linear flow of innovation and insight that begins with bench research, moves through clinical trials, and ends with application of a proven medical intervention to the patient. First, he said this process is not as straightforward as it seems, as clinical trials often produce conflicting results and there are longstanding issues around busy clinicians having reliable ways to interpret all the results that are available. Recently, efforts such as the Cochrane Collaboration, which performs meta-analyses of available clinical data, and other efforts around evidence-based medicine from the Institute for Healthcare Improvement (IHI) and others, have begun to make inroads into these issues. But Bohmer contends that this one-way, linear view of how the science of health care develops is in itself flawed. He suggests that, at least in some circumstances, the generation of new knowledge and insight begins not in the lab but at the bedside; that practitioners “create their own science along the way.”

Managing uncertainty in practice

Bohmer stopped to analyze how practitioners go about caring for patients. He said that medicine is taught by presenting students with a body of knowledge about a given condition, typically in combination with an “idealized” description of the patient with that condition. That is, students are told, “A patient with this diagnosis will look like this.” Yet patients rarely if ever present exactly like the “textbook” case, and they always bring a context that includes values, preferences,
social situations, and their own biology. So the clinician sets out to manage the uncertainty in both
diagnosis and therapy that is inherent in any real clinical situation.

The experimental nature of care

Given these inherent uncertainties in practice, Bohmer notes, “I would argue that the vast
majority of medical care – the care rendered by any one of the healing professions – is experimental.
You try it out one patient at a time. Why? Because patients are different.” He went on to say how
the “typical” patient can be seen as a mean on a distribution of various parameters (signs and
symptoms, diagnosis, response to therapy), but that an actual patient falls somewhere else on the
distribution curve. Further, patients change over time, so even if a patient is at one point on the
curve now, he or she may be at a different point in two weeks. Bohmer said, “We tell clinicians,
‘Here is the typical patient,’ and we leave it to them to figure out what the range of variation around
that norm is.”

Bohmer went on to say that if medical care is experimental, than it is, by its very nature, also
a source of insight. That is, clinicians at the bedside will inevitably see and take note of the results of
their experiments. He said much of this so-called experimentation is what we call experience, and he
referred to the work of Patricia Benner on the meaning of experiential learning in a practice
discipline. However, he added, “Every once in a while, we learn something [through experience]
about the disease itself – something that is generalizable beyond that patient that is in front of you.”
These are the kinds of insights, says Bohmer, that need to be captured, tested, and disseminated in a
systematic way.

Uncovering insights

Bohmer gave the example of Thalidomide. He said the birth defects caused by Thalidomide
administered to pregnant women came to light because three or four people around the world were
watching their practice carefully. A German physician wrote a letter to colleagues in 1961 asking if
anyone else was seeing birth defects in children of women who took the medicine. This is an
example of new information about a treatment that came from the bedside, not the lab. A similar
process uncovered the problems associated with the dietary supplement, Fen-Phen.

Bohmer cautioned that not all insights or ideas gained at the bedside are worthy of action or
implementation. He cited the case of clinicians assuming that total body irradiation and bone
marrow transplant was good for patients with breast cancer because it seemed to make sense based
on its effects on other cancers, even though there was no hard science to support its use in the
treatment of breast cancer. Many patients underwent this highly intense and toxic treatment before
randomized trials showed that it was not useful. Bohmer said, “Unless we have some way to filter
these observations through a second round of more rigorous evaluation (simulation is one type),
then we run the risk of this.” Bohmer went on to describe some of the characteristics of clinical
insights that can impact their strength or significance.

**Characteristics of clinically-based knowledge**

Bohmer described the importance of what he called “signal strength” related to clinical
observations. The stronger the signal strength, the more likely it is to be noticed. For example, if an
obstetrician gave Thalidomide to three patients and all three had deformed babies, that is a very
strong signal strength. On the other hand, if physicians are prescribing a drug to patients with heart
disease and the drug is causing them to die at a slightly higher rate, that is a weak signal; it might not
be immediately apparent to the clinician but may only come to light through statistical analysis.

A second characteristic related to systematically capturing insights from the bedside is what
Bohmer described as the length of the feedback loop – that is, how long it takes for a particular
intervention or treatment to cause an effect. For examples, clinicians would be slow to notice effects
of a drug on multiple sclerosis symptoms if the drug is given to patients who might have 6-15
months between flares of their symptoms. If there is too much time between cause and effect, the
signal is more difficult to catch.

Bohmer added that a “stable process” eliminates background noise that can obscure
anomalies that might otherwise be noted in practice. If there is a lot of variation in practice,
abnormal signals are more difficult to detect.

**Learning system**

Bohmer said that in order to capture insight and innovation from the bedside in a systematic
way, one needs a learning system that has three components.

First, there needs to be a way to detect the signal. This will be partly a function of the
inherent signal strength. As noted, stronger signals will be more easily detected. To help detect or
enhance weaker signals, clinicians need the ability to manage data sets or groups. In addition,
bringing groups of clinicians together on a regular basis to freely discuss what they are seeing in
practice is another way to bring weaker signals together to make them stronger and more noticeable.
The second element of the learning system Bohmer described is a mechanism to analyze the signal. Some of the hunches or insights from the bedside might be wrong. The analysis can occur on multiple levels but must be a part of the process.

Finally, a mechanism is needed for getting innovations with proven merit into practice. Best practices and protocols are examples of how this can be done.

Concluding remarks

Before ending, Bohmer spent some time discussing the Toyota Production System (TPS), which he described as a system that promotes keeping the flow of work within a facility as smooth and level and invariant as you can. Eliminating waste and ensuring that every step of a production process adds value are also important elements of the process.

Bohmer added that learning from experiences at the bedside absolutely requires a culture that simultaneously allows openness and dissent. He said it is not a good thing for a nurse or anyone in a work setting to fix a problem without telling anyone, as it is then likely to be repeated. Rather, it’s a good thing to complain when something is not working properly. This culture must coexist with a culture of conformity – that is, when a best practice is identified and the systems in place are supporting it, clinicians have to be willing to change their practice as needed to conform to what has been shown to be best. Bohmer said, “We need a culture in which it is ok to follow the standard procedure, but when it is not working, it is ok to ignore it and do something else. We need a complex interplay between a culture of dissent and a culture of conformity. This is how we will abstract results from this fundamentally experimental process at the bedside.”

For more information:

TPM (Toyota Production System):
The Quest for Quality: Innovation and Safety Lessons from Outside of Healthcare

Gregg S. Meyer, MD, MSc

Gregg Meyer, MD, MSc, is Medical Director of the Massachusetts General Physician’s Organization (MGPO) and Senior Vice-President for Quality and Safety at MGH/MGPO. During a luncheon session, Dr. Meyer drew from his personal experiences as a physician and aviator as well as his in-depth knowledge about quality and safety to share stories that contained important lessons for those planning innovation and change.

Dr. Meyer used a number of anecdotes to illustrate important points for the audience to consider when thinking about quality and safety in health care.

He began by telling the story of TWA Flight 514 which crashed into a hill outside Dulles Airport in 1974, killing all on board. In the airline industry, the accident was classified as “controlled flight into terrain,” meaning the pilot had flown the plane right into the hill. Everyone wondered how this could have happened. As the incident was investigated, it came to light that a similar incident had occurred 6 weeks before. A United plane on the same flight path had nearly crashed into the same hill, but the crew was able to make a correction in time. They cleared the hill by a mere 100 feet and landed safely. Later, this crew learned that they had misinterpreted instructions from the flight tower in a way that had led them into the hill. Concerned that others might make the same error, the United crew posted a notice to their colleagues at United but did not have a mechanism to spread the warning more broadly. Had the miscommunication been more widely known, the TWA tragedy may not have occurred.

Meyer related an incident from health care that he said was similar in that tragedy could have been averted had a systematic system for reporting problems been available. In 1986, a pregnant woman was diagnosed with lymphoma at a New York hospital. She asked that she be kept alive long enough to deliver her baby safely. Two chemotherapy medicines were prescribed. One was to be given intravenously, the other intrathecally (injected into the spine). The two medicines came due at the same time and there was a mix-up. The intravenous medicine was given into the spine, which proved lethal since the medicine was a neurotoxin. The baby was delivered prematurely but also died. Meyer said the saddest part of this story is that similar incidents had been reported dating back nearly 20 years, and 3 years after the pregnant woman died, a young boy in Pennsylvania also died due to the same mix-up.

Meyer used these stories as background as he turned to a discussion of systems issues that result in errors and accidents.
The Swiss Cheese Model of System Accidents

Meyer presented the “Swiss Cheese Model of System Accidents” as described by Reason in 2000. The model depicts slices of Swiss cheese lined up together. The holes in the cheese represent system problems or errors. Sometimes, the holes (system problems) do not line up and do not result in harm to the patient. But when problems line up in a certain way – as illustrated by the holes in the cheese lining up – the error can reach the patient and harm can occur.

Meyer illustrated these points by discussing the Titanic tragedy, noting that a number of errors or misjudgments, taken together, were more responsible for the loss of 1500 lives than the fact that the ship hit an iceberg. He said, “The important lessons are not as apparent as they seem. There were a set of issues that led to this tragedy.”

For example, Captain Smith knew that he was heading into an ice field. But he was under pressure from the owner of the line to break a speed record on the maiden voyage of the ship. He didn’t stand up to that pressure in the interest of safety. The wireless officer on the ship had one channel for communication. On that channel, numerous warnings about ice were being transmitted to ships in the area. However, the wireless officer was not monitoring these transmissions, choosing instead to use the one line to enable high-paying passengers to send personal messages to contacts on shore.

Meyer called these the “sharp end” errors and feels that, taken alone, they would not have resulted in a tragedy of the magnitude that occurred. He said an additional factor combined with theses errors to produce the final result. When the ship was designed and equipped, a new system for stacking lifeboats in pairs had been developed to meet new regulations that had been developed in the industry but were not yet enacted. The owner of the Titanic did not want the extra lifeboats because it would cut into the space on the promenade deck of the ship where the first class passengers strolled. He placed the comfort of the first-class passengers over the safety of the ship, meaning that not enough lifeboats were available.

Turning to the Three Mile Island disaster, Meyer described how that system was “designed for failure.” Numerous problems existed that, taken together, allowed the accident to occur. (The holes in the cheese lined up.) Pressure gauges in the system read “low” when they were not functioning. Warning lights went off all at once but did not give users a clear idea of what was wrong. The safety backup system was unreliable and had been disabled by staff. There were
unrealistic workloads, faulty management practices, and inadequate training of staff. All of these in combination enabled the accident at Three Mile Island to occur.

The Iceberg Model of Accidents and Errors

Meyer presented the “Iceberg Model of Accidents and Errors,” noting that incidents that produce actual harm – the visible part of the iceberg above the surface – are typically part of a large problem, as evidenced by the large iceberg below the surface, representing numerous near misses or “no-harm events” related to the same systems issue. He further illustrated this point by discussing “Heinrich’s Ratio” – which stems from studies of industrial accidents in Europe in the 1940s and posits that for every major injury, there are 29 minor injuries, 300 no-injury accidents, and countless “close calls.” (Heinrich 1941; The Stationary Office 2000). He said this ratio has been studied in aviation, the nuclear industry, and in health care and it holds in each industry. He cautioned the group to be aware of near misses and systems issues and to be proactive in addressing them before harm occurs. “You don’t have to wait for something to happen,” he said.

The Iron Laws of Improvement

The “Iron Laws of Improvement” are principles that Meyer says will help in the avoidance of error in health care. He described them as follows:

- B Teams with A Systems always beat A Teams with B Systems – Meyer said that organizations in health care who have invested in superior systems are faring better in terms of patient safety than organizations who may have more skilled individuals but inferior systems. Further, he added that skilled teams are more important than skilled individuals, and those teams need A systems in order to provide quality care.

- It’s not the seed, it’s the soil- This refers to the importance of people and culture in implementing systems for improvement. Meyer noted, “In the end, it’s great to have good systems and wonderful innovation. But the bottom line is, if people aren’t ready and don’t want to use it, it’s not going to happen.” He illustrated this further by noting that “culture trumps all” and “The political is much more challenging than the technical.”

- Data plus anecdote = Action – Meyer said that nothing is more powerful in convincing a group of people of something than relating a personal incident.

  Meyer drew on his experience in the Air Force and described something he called “Bo’s Law” which states: “The fastest way to get yourself killed is not to follow standard operating
procedure. The second fastest way to get yourself killed is to always follow standard operating
procedure.” He explained, “That is your challenge. When things are heading in a certain direction,
you need to recognize that and innovate your way out of it. Blindly following a standard is as scary
as not following it at all.”

Similarly, Meyer cautioned the group to remember the adage, “To err is human; but to really
screw up you need a computer.” The true message from that saying is not that technology is bad,
but rather that it needs to be applied thoughtfully and carefully. The same is true of any innovation,
he said. Innovation is good, but must be applied thoughtfully and carefully. In his concluding
remarks, Meyer noted, “Everyone has two jobs – to do the work and to improve the work.”
References


Gaba DM. The future vision of simulation in healthcare. *Quality and Safety in Health Care*, 2004; October 13 (Suppl) 1:i2-10.
