THE QUALITY IN-TRAINING INITIATIVE:
AN ACS NSQIP COLLABORATIVE

THE BASICS OF QUALITY IMPROVEMENT

Practical QI:
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Introduction

The American College of Surgeons (ACS) has more than 100 years of experience with evaluating and improving surgical care. With quality improvement programs in many different clinical areas, there is a great amount of leadership, knowledge, and lessons to share—and this current curriculum seeks to help accomplish that.

One of the important things to communicate is that measuring and achieving sustained high quality surgical care is often complex and can be challenging. Plus, there are increasingly more aspects to understand – various components of “quality,” varying techniques of quality improvement, different ways to measuring quality, expanding regulatory concerns, etc.

So, how do we keep up?

The good news is that there is a tremendous amount of opportunity – and we have seen positive deviance that has led to great quality of surgical care in many different settings and pockets. The immediacy of information, our connectedness, standardization, our advances in measurement and analytics, and our advances in care have all brought forth great lessons for achieving reliable and high quality care. These opportunities will continue to expand how we are able to deliver optimal care.

We have also seen great opportunity within the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) to work with trainees to achieve optimal care – which is largely how the Quality In-Training Initiative (QITI) came about. It was clearly recognized that there was a great opportunity to ask our trainees to join in and bring forth their ideas, efforts, and enthusiasm to achieve high quality of surgical care. We believed that once a foundation of quality knowledge was gained, the new generation of trainees would help lead the quality efforts in the future.

The collective work to put together this curriculum has been a great feat by all of the authors, led by Rachel Kelz. They have provided the vision, the perspectives, and the details. They have included theories and, importantly, have translated them into the concrete clinical examples that we all face daily in our patients. They have provided the steps to take when performing quality improvement and strategies to consider in the process.

Increasingly, we are learning that achieving meaningfully demonstrable and sustained quality of surgical care can be difficult – and to do so requires teamwork, communication, and an appropriate climate as well as ownership, tenacity, and innovation. I am confident that this curriculum will provide a key basis onto which trainees will build as they work to achieve reliable and sustained optimal surgical care and outcomes.

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Integrating Quality Improvement into Graduate Surgical Education

This primer is designed to help surgical residents begin to understand the art and science of quality improvement (QI) in surgery. While the desire to continuously improve the care that we provide to patients is simple, the concept of quality improvement has become very complicated and often intimidating. Furthermore, as surgeons, we are wired to master technical skills. Confidence is our hallmark, guided by scientific pragmatism and a perseverance to fix. Throwing stitches to create a beautiful anastomosis or quickly recognizing when a patient needs a surgical procedure are the kinds of skills we value most.

But real-world differences in patient outcomes today result from variation in nontechnical skills more often and with greater consequences than from variation in technical skills. Despite tremendous advances in American medicine, the most dangerous procedure in the ER today is a patient handoff. And preventable harm stemming from variations in surgical quality remains endemic.

Historically, nontechnical skills (soliciting timely help, applying evidence, creating safe protocols, and so on) were rarely taught compared with technical skill training. In fact, root causes of nontechnical skill-related complications were traditionally discussed in a reactionary context. But increasingly, these best practices are recognized to contribute to patient outcomes evidenced by their role in Morbidity and Mortality conference cases reviewed and sentinel event root-cause analyses.

In total, the problem of harming patients in the process of trying to help them represents an infant field of American medicine—but perhaps one of our most important fields. On a nationwide scale, using the most updated figures on the burden of iatrogenic harm, medical mishaps constitute the third most common cause of death in America after cardiovascular disease and cancer. On a policy level, funding on this topic has been far outpaced for other less frequent causes of harm. Given the magnitude of the problem, governing boards in medicine and surgery are turning their attention to quality and safety.

While we as a profession espouse discipline and excellence in the mastering of many technical skills, the teaching of nontechnical skills is highly variable, underdeveloped and historically under-recognized to warrant special training. This important work represents a change in the way we approach improvement in the surgical profession. From our scientific work and the empirical evidence of front-line surgeons taking care of patients, teamwork and safety culture impacts patient outcomes. While there are no silver bullets to improve safety culture, there are many components in the form of the way we interact and protocolize that which we agree to be standardized good care.

While both confidence and self-awareness are important surgeon traits, humility is the more difficult trait to model well in the operating room, (for example, calling a senior partner to the OR for an opinion, or encouraging those involved in the patient’s care to voice their safety concerns freely). These characteristics are increasingly being recognized to be important skills that attendings, residents, and nurses should model to those they teach. They were the basis for the original surgical checklists and are also the basis for much of the science presented here.

Because the field of quality science has grown, there are new skills and terms that surgeons need to understand in order to be successful in their care of the surgical patient during each phase of their career. While the details may seem prohibitively complicated, in fact, the fundamentals are logical and simply an expansion of our natural approach to problem solving. The same approach to improving direct patient care can also be applied to improving indirect patient care issues that relate to the quality of the training experience. The process of quality improvement is a journey that requires an open mind, the willingness to balance art and science and a blame-free culture.

In this manual, you will discover the steps to take when you perceive a quality improvement “opportunity,” the language required to communicate effectively in the modern health care environment, an understanding of the broad concepts that comprise quality improvement and the skill set required to develop your own quality improvement initiatives. The same scientific rigor and pragmatism that we use to perform a surgical procedure is being applied to the nontechnical skills important to patient care. Hopefully, by reading the materials compiled in this document, in parts or in its entirety, you will begin to appreciate that “Quality” can always be improved regardless of our level of expertise. As such the idea that we need to engage in quality improvement should not mean that we are performing poorly but more so that we can do better.
User’s Guide

This manual is intended to be a primer for the study of quality improvement. Section I is required to understand the basics. Beyond that, each section can be read independently to focus your learning on relevant issues to the patients for whom you care and the local opportunities for improvement. Each section has references; however, if you are looking for more detail without necessarily wanting to read the primary sources, you should consider the recommended readings located just below each section.
OBJECTIVES

At the end of this section, the learner should be able to:

• Understand the role of data in quality improvement

• Be familiar with regulatory functions in quality improvement

• Know who to ask about the quality improvement infrastructure in the hospital in which he or she provides care

The purpose of this section is to give you a basis to understand the various methods for assessing quality and safety, to help you examine your own results, and to provide a background in the regulatory world you will face as a practicing surgeon. Surgical residency is no longer a matter of accruing 5 years and more than 750 cases. The surgical resident needs to understand the standards and criteria they will be judged by once in practice. Safety and quality are not abstracts to be learned and forgotten. The concepts of this manual will serve you for the rest of your career and it will be expected that you will involve yourself in a quality project and reflect on your own results in order to help you become the best and safest surgeon you can be for your patients and yourself.

A. KEY CONCEPTS

1. Overview

To discuss quality improvement in greater detail one must first understand the definition of quality as it applies to surgical care. Quality is the standard of something as measured against other things of a similar kind; the degree of excellence of something. In the surgical profession, there are many metrics of patient care that we can use to benchmark our performance against that of our peers. When surgeons talk about quality improvement they refer to (1) working to achieving better surgical outcomes; (2) employing better, more efficient processes of care; and (3) encouraging organizations to provide the highest standards in staffing and resources to care for their patients.

The goal of quality improvement is to elevate the standard of surgical care. It is not an end game; it is a continuous process that uses rapid cycle interventions to perpetuate a constant effort to better the care that we provide to our surgical patients. Quality improvement is a science with data and techniques that are used to design or plan “experiments” to fix problems. The trials or experiments are called quality improvement projects or initiatives. Projects should be run quickly, as once a problem is recognized it should be addressed. As with other science experiments, success in fixing the problem is not guaranteed the first time the project is attempted. However, if successful correction of the quality deficit is not achieved during the initial attempt, then the project should be scrutinized to identify the reasons why success was not achieved and the project protocol should be modified so that knowledge is gained from each “failure.” After the project is modified, implementation should occur again. The process is a cycle and there are many ways to describe it. Common expressions include: trial and error; rapid cycle intervention; fail fast forward; and PDSA. PDSA stands for (plan a project, do the project, study your results, and act on your results). The cycle is continuous and only stops once sustainable change has been established.

Quality improvement is largely about fixing processes of care or systemic issues to achieve better surgical outcomes. Quality improvement is rarely about individual performance improvement. Quality improvement methodology is centered on data. People are the key to the success or failure. Data are used to define problems and to test the success of quality improvement initiatives. The goal is standardization to enable the delivery of optimal patient care across all practice settings. Data will be discussed in detail below.

Teamwork and collaboration are required to succeed in quality improvement. Surgeons must be able to function effectively within interprofessional teams, foster open communication and mutual respect for other providers and patients, and share in decision-making to achieve quality patient care. Teams should be created with frontline providers who understand how patient care is delivered and include administrative support. The team should consider the interests of all people that stand to gain or lose from proposed changes. Interested parties are often called stakeholders. Patient input should be solicited to inform improvement strategies. The team must have tempered expectations and cannot fear failure. Surgeons must learn to be leaders in the process as the champions for our patients.
Leadership is the act of directing an organization or group of people. The leader is the person who leads or commands a group, organization or country. Leadership strategies can be widely divergent. Successful leadership styles likely vary across cultures. Moreover, leadership styles may vary depending upon the task at hand. In discussing leadership in this manual, we will focus on the leadership skills for a leader in quality improvement.

Within surgical quality improvement, the best leaders often spend 70% to 80% of their time listening and the rest of their time on empowering their disciples to succeed. This switch in the surgical leadership style from dictator to humble leader is one of the most powerful changes that is going on in the surgical profession today. Inspiring leaders have vision, charisma, compassion and emotional intelligence amongst other traits. These traits however, do not determine the effectiveness of a leader; it is action and the ability to inspire action in others to make sustainable change that mark the success of a leader.

The leader’s role is often to extract information from the team in order to develop a practical plan for quality improvement. The leader must be able to envision what the changes will “look like” and then work backward to develop a strategy to achieve well-stated goals. He or she must be able to anticipate the unintended consequences of the proposed changes. When success does not come easily, the leader needs to be able to encourage the team to successfully identify the reasons for failure and use the knowledge to create a new plan and try again.

There are many barriers to achieving buy-in to quality improvement in the surgical profession (and other medical disciplines). First, the leader of the group must endorse a culture of quality. The historical surgical mentality, built on a hierarchical structure, is often perceived as being antithetical to the more harmonious culture required to create a high performance organization. However, a hierarchy can exist within a culture of quality provided the individuals within the group are emotionally intelligent with well-developed communication and interpersonal skills. Emotional intelligence is not the same as intellectual intelligence (EQ≠IQ) and this is often a barrier to change.

There are also practical problems. There is a lot of bureaucracy and the system is underdeveloped and under resourced, so change often requires a lot of work. Surgeons and surgical residents are often overworked and have multiple competing priorities, resulting in very high activation energy to take on a process that requires a lot of repetitive work to achieve success. There is also just a simple resistance to iterative change. Skeptics are critical of the meaning of the data used for benchmarking as the data may not be robust like scientific data used for research. However, trends and imperfections must be used to drive quality improvement; if we wait for perfect data, many more patients would be at risk.

These barriers can be overcome. You can start with yourself. Learn for yourself and apply the concepts to the way that you care for your patients. You will find others who are motivated and interested to join your mission. Over time, you will find that the quality improvement approach will make you a better surgeon, technically and as judged by your patient outcomes. The improvements in tangible and intangible measures will motivate you to continue to strive for quality improvement and your success will be infectious to those around you.

Project management is fundamental to success. Time should be used wisely. Optimizing the time spent in meetings communicates a sense of respect to the team members and sensitivity toward their other competing interests. Meetings should follow an agenda. Action items should be generated and assigned to individuals to create a sense of responsibility. Each agenda should include past business and next steps so that people are held accountable for their responsibilities. Working meetings are often helpful; but the stated goals for the meeting must be clear in advance. When there is no information to share, meetings should be cancelled.

Success can be defined both as learning from mistakes and ultimately as improving care. As such, the best quality improvement projects are designed to achieve “early wins.” Enabling the team to feel the excitement of improving the project and improving care makes the project fun and strengthens the team. Projects should be designed to include processes of care that are controlled by the team members. This will engender buy-in and a sense of pride when success is accomplished. Early wins should be acknowledged. Small gestures such as a treat for the team, a sign for the ward or a public announcement can accomplish this objective and foster good team spirit. Positive energy can be contagious and establishes a great culture for patient care.

Quality improvement projects should be as simple as possible. Each piece of patient care must be considered as one of many inter-related parts that together comprise the patient experience. Therefore, changes must be implemented in a way that minimizes unexpected consequences.
The **patient experience** is what the patient goes through before, during and after the operation. It begins before the patient meets the surgeon and ends long after the last surgical encounter. It includes hundreds if not thousands of encounters with health care associated personnel across multiple settings. It also includes interactions with nonmedical people, as the effects of the surgical procedure will often leave physical changes that attract attention, and often the medical condition requires additional treatment following the operation. Each encounter has the potential to influence the patient’s overall recovery. It is important to consider this perspective when facilitating the optimal approach to patient care.

Quality improvement is frequently discussed simultaneously with patient safety and value-based delivery of health care. These concepts are related but not synonymous. **Patient safety** is a construct that implies behavior intended to minimize the risk of harm to patients through both system effectiveness and individual performance designed to avoid injuries to patients from the care that is intended to help them. In some sense, it is tightly coupled to the principles put forth in the Hippocratic oath: “first, do no harm.” Alternatively, quality improvement posits that through attention to detail we can consistently improve upon the care that we deliver to help our patients. When combined, the two ideas are aimed at safeguarding patients from human error through systematic protections and automated processes developed by people. The heart of quality improvement is the people. Quality improvement is aimed at improving patterns of behavior and the culture of health care delivery in order to create a system that supports the needs of our patients.

Quality improvement is many different things. It is safety, appropriateness and efficiency. It relates to almost every facet of the human experience with the surgical profession. Consider the common example of a patient with a postoperative fever. In order to minimize the risk of septic shock and death from an infectious cause, there are no less than 10 steps that present as potential opportunities for the care delivered to be excellent or poor (Table 1).

### Table 1: Examples of Patient Care Required to Manage a Postoperative Fever

- Detect the fever in a timely fashion
- Evaluate the patient and pay attention to patient complaints or physical signs
- Provide medical management for symptom control to maintain patient satisfaction (But do not treat the physiologic derangements that are protecting the patient like tachycardia)
- Order tests (are they the correct or appropriate tests, were the proper number of studies ordered?)
- Make sure tests are completed (Are they done properly in other words, technically correct? Did the proper tubes get used and stored correctly until the test was performed? Did the technician know how to complete the test to minimize error?)
- If the patient had an adverse event during the test, was rescue available? Was it successful?
- Examine the results of the tests
- Consider the interpreting source of the tests (Is the student reporting the results? Who actually read the imaging study? Does this effect the reliability of the information?)
- Communicate with the patient and family so they understand the plan
- Communicate with members of the care team
- Provide correct medical management to treat the cause in a timely fashion
SECTION I

Making Sense of Quality from the Resident Perspective

2. Getting Started

When you are ready to begin to improve the quality of care that you provide, it is helpful to start with a discrete quality improvement project. Begin by examining your own patients’ outcomes and your own frustrations with the system in which you work. Then, ask for data around these events to see if the issues are more prevalent in your hospital. If so, you have identified a problem to solve. It’s important for your project to be aligned with the institutional goals or needs so that you will have an appropriate amount of support. Make sure you choose a manageable part of the problem; in other words, one that is feasible. Ideally, the project should have minimal cost requirements and have short term goals that can be accomplished during a reasonable amount of time. (Although cost containment can be a source of frustration, the reality is that if you do a good job managing a real problem then your efforts will result in cost savings and you will develop credibility. Then future financial support for bigger projects will start to become available to you. There is nothing wrong with an organization that prefers to withhold monetary commitments prior to establishing credibility). Define the process and if possible start the project with a process measure to gauge your success. Try to pick a project where you can have early wins so that you can see progress from your efforts. An early win is a tangible improvement that can be appreciated by the quality improvement team in a reasonable amount of time. It is something that should be relatively easy to accomplish. For example, if you would like to improve the job satisfaction of the emergency department consult resident and decide that the use of a pager is an important part of the problem, then put “update the pager to a cell phone” on the list of required elements to improve the consultation process. You cannot do this alone; all quality improvements require a team. The team must have a coach, a captain and players. The surgeon’s role on the team may vary depending upon the initiative. This is true for surgical housestaff as well. The team typically includes the captain (often played by a surgeon) who calls the shots and plays harder than or as hard as all of the other team members. The coach is frequently someone in a position of authority who has the power to play a supportive role, influence the direction of the project and perhaps also help to provide resources to make the goals achievable. Key players often include patients, surgeons, residents, technologists (X-ray techs, surgical techs and so on), nursing staff, administrative personnel, and other specialists who understand the components of the problem. The disciplines represented and specialists consulted will differ depending upon the initiative at hand.

Section II will explore common tools to facilitate your ability to design and implement your quality improvement project. Sections IV and V have a variety of examples using core measures and systems issues to highlight the importance of the art and science of quality improvement in achieving optimal patient outcomes. The examples might help you generate ideas for your own personal, departmental, divisional or institutional quality improvement project.

For people who are new to QI, here are a few hints when designing your first project:

A. Identify a project that has a reasonable scope and addresses a real problem that you feel strongly about. Start focused. If you pick a broad area like reducing VTE rates, map it out and focus on one small piece of the project. If you discover that high risk patients are not getting pre-op therapy or therapy after discharge you could focus on risk stratification or the administration of appropriate preoperative prophylaxis or extended prophylaxis in a specific surgical population. Pick something that seems easy (it probably will not turn out to be so!). Choose an area where you know you can easily identify a faculty sponsor or one that is already on the institutional radar.

- How do you know you need to improve your quality? Check the data.

B. Make sure the concept is measureable. Pick something concrete. Try to use a process measure instead of an outcome measure to track your progress. If you want to try to decrease postoperative VTE in colon surgery patients by improving adherence to guidelines for preoperative VTE prophylaxis and you decide to track the VTE rates (outcome), it might require a long time to see any effects of your efforts. If you decide to track adherence to best practices, you could follow compliance with the administration of preoperative prophylaxis (a process measure) and you might see results more quickly.

- How do you know you’re improving? Follow a measure.
C. You must assemble a multidisciplinary team including a team leader with the ability to inspire change (YOU), a faculty sponsor, administrative support with access to data, frontline providers, and managers.

- Think about what it takes to run a successful meeting.
- Ask your faculty mentor if you can sit in on a few quality improvement meetings to get a sense for what works and what doesn’t.
- As the leader, you should spend 70 to 80% of the time listening.

D. You must get buy-in from all of the potential stakeholders. This is one area where a faculty sponsor may be particularly helpful. If there are stakeholders that you do not know how to contact, your sponsor should be able to guide you to the best way to get in contact and present your project in a way that will have meaning for each stakeholder.

E. Track your progress. Make sure to provide feedback on all progress to the team. Share early wins. Make sure you can adapt quickly if you don’t see success where you expect it. Be sure to report out to the committee.

F. Measure your success.

- How long does your improvement last? Continue to track your measure.

3. The Quality In-Training Initiative (QITI)

The Quality In-Training Initiative (QITI) is a national collaborative of academic hospitals working together to teach “applied” quality improvement to surgical housestaff and encourage resident involvement in quality improvement. The QITI is sponsored by the ACS NSQIP. The initiative has three main goals:

1. To enable easy manipulation of complex data to provide standardized resident report(s).

2. To develop a quality improvement (QI) curriculum that integrates into the surgical curriculum and addresses real issues in surgical care.

3. To develop a new culture by training residents to be surgeons that are well versed in quality science through a collaboration among academic hospitals.

One part of the initiative is the delivery of resident-specific outcomes reports. These reports include 30-day outcomes reports that will provide individual residents with longitudinal information on their patients, along with comparisons to residents of the same post-graduate year across institutions. Team reports with comparison data for the same team in the same program across time are also provided. The reports are a great way to start talking about quality of care.

Resident reports can be useful in many different ways. With the implementation of milestones, discussion at the sixth-month meeting with the program director is a natural way to begin the dialogue. Reviewing the reports can provide information on the ability of residents to outline a strategy for addressing potential quality issues, perform self-assessment, and cope with outcomes with which they may not have been familiar due to discontinuous care. The team reports can be very helpful for team training exercises and team building. The principles put forth by the QITI embrace the spirit of continuous quality improvement. We will attempt to move residency training from a “to-do” checklist mentality to one where upon completion of the “to-do” list we pause to reflect upon what more could be done for each patient. Even for patients who experience good results, there are likely opportunities to move from good to better and capitalize on each case as a “teachable moment.”

As the QITI reports become more mature and procedural comparisons and risk-adjustment at the team level become possible, they will serve as a cornerstone to the identification of QI projects. For now, however, opportunities for improvement come up weekly if not daily.

The principles of the QITI can be applied locally. Work within your organization to identify data to describe variations in care. Share the data. Teach people how to critically evaluate the data. Work to improve. Quality improvement is infectious, once you get hooked, you will see opportunities to improve everywhere and then the real fun will begin.

B. REGULATIONS IN QUALITY IMPROVEMENT

Surgical patients are vulnerable. Therefore, society provides protection for each patient in the form of rules and regulations from varied sources, both governmental and professional organizations. These governing bodies and policies exist at both the local and national level.
Furthermore, as surgeons, we also provide protection for our patients and police our own profession. Understanding these constructs will help to effect changes that will optimize patient care while preserving the surgeon patient relationship and providing opportunities for future advances in surgical care.

The following section contains a lot of material that relates to new regulations in health care delivery and cost containment. If you are not ready to consider the policies and payment plans that influence surgical care and the credentialing process for new surgeons, you should move on to Section C. Otherwise, continue along for a brief overview of some of the basics of politics and governance at play in surgical practice.

The trendsetter for many of these initiatives is the Center for Medicare and Medicaid Services (CMS). CMS provides health care coverage or insurance for more than 100 million United States citizens. It is a government run insurance plan that also pays for graduate medical education. This means that your salary as a surgical resident is subsidized by CMS through the hospital that employs you. As a collective workforce, if your institution does not comply with CMS regulations or performs poorly on certain quality indicators, partial payment for your job may be withheld.

The Surgical Care Improvement Project (SCIP) is an example of a CMS initiative. It was established in 2006 by CMS in order to reduce the rate of surgical complications. There are nine publicly reported SCIP measures, six of which focus on postoperative infection. They include selection, timing, and discontinuation of preoperative antibiotics; appropriate hair removal practices; perioperative normothermia; and normoglycemia in selected patients. The final three measures include routine venous thromboembolism prophylaxis (ordering and administration) and perioperative use of beta blockers.

The SCIP measures are a good example of a process measurement in surgical procedures. Amongst other metrics, they are considered core measures. Core measures are indices established by CMS used to score or evaluate hospital and individual surgeon compliance with standards of care. They were designed to enable the measurement of the quality of care provided to patients.

Medicare is a federally funded insurance plan. As such, it is tightly regulated by the government and payments issued to hospitals and physicians are controlled by the law. Recently, in the spirit of patient protection and cost containment, federal law mandated that hospitals cannot receive additional payment from Medicare or charge Medicare patients for treating them for hospital acquired conditions. Hospital-Acquired Conditions (HAC) are preventable events occurring during a hospital stay. A few examples include venous thromboembolic events, catheter-associated urinary tract infections (CAUTI), and decubitus ulcers. Preventable infectious conditions are often referred to as Healthcare-Acquired Infections (HAI).

CMS is also interested in negotiating a better overall experience for their patients beyond clinical outcomes. As such, they helped to develop the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) to capture patient-reported outcomes of the medical and surgical care that they receive. HCAHPS asks patients about their opinions regarding the quality of care provided by nurses and doctors, the hospital environment, and their overall care. This includes an assessment of the clarity of the information they received at discharge.

The information recorded in the HCAHPS survey will be used to calculate value-based incentive payments in the Hospital Value-Based Purchasing program. The Hospital Value-Based Purchasing program is a new system of reimbursement designed to pay hospitals for inpatient care based on their performance on core measures and patient satisfaction scores. It is an attempt to move from paying for the quantity of services performed to the quality of care provided.

As an extension of the Hospital Value-Based Purchasing efforts, the Bundled Payments for Care Improvement (BPCI) Initiative is a three-year trial designed to test four new models of payment for health care services. Each model defines the service provided differently and broadly links services, in unique combinations in an attempt to identify the most cost effective way to deliver medical services while factoring in health care-related outcomes and patient experiences. In one model, there will be one payment to the hospital for all care rendered during the hospitalization and for any subsequent hospitalizations during the 30 days following discharge. This means that any hospitalization within those 30 days will have to be paid for by the hospital and, furthermore, that the hospital will decide the physician payment schedule, not CMS.
CMS is also working to get physicians more interested in the outcomes of the patients that they treat. In an effort to get an accurate measure of individual physician outcomes, the **Physician Quality Reporting Systems (PQRS)** was mandated by the Tax Relief and Health Care Act of 2006. The PQRS is a program that uses a combination of incentive payments and payment adjustments to promote reporting of quality information by eligible professionals. To promote the reporting of individual quality information, there was an incentive payment awarded to physicians in 2013 for self-reporting, beginning in 2015, there will be penalties applied to payments made to professionals who fail to report their quality measures.

On the horizon, many insurers including CMS will subject practices and perhaps individuals to “quality tiering.” Quality tiering will determine if a group’s performance is statistically better than, or the same as, or worse than the national mean. Quality tiering could result in a positive or negative 2015 payment adjustment. [Available at: www.cms.gov/Medicare/Medicare-Fee-for-ServicePayment/PhysicianFeedbackProgram/ValueBasedPaymentModifier.html. Accessed April 10, 2014.] Trainees should understand and appreciate these concepts now as they will be integral to their future surgical practice. If you focus on mastering the care of the surgical patient as a resident, then you will have nothing to fear because providing high quality care will be a part of your surgical soul.

Individual hospitals are required by the **Joint Commission on the Accreditation of Healthcare Organizations and Programs (JC)** to have a **Focused Professional Practice Evaluation Plan (FPPE)**. FPPE serves as a method for credentialing new physicians or examining the performance of physicians when a trigger or threshold is met either through OPPE (see below) or through another avenue that raises a question of competency. The program for new surgeons may include proctoring and direct supervision, review of cases and indications for surgical procedures, or review of results from a limited number of cases. Each hospital and department or section determines the criteria for independent privileging. This is usually a time-restricted review with the monitoring dependent on the physician.

JC also mandates an **Ongoing Physician Performance Evaluation Plan (OPPE)**. The OPPE functions as a method to assess a medical practitioner for competency in an ongoing manner in order for the organized medical staff to be able to recommend credentialing and privileging at the hospital level. This has also been termed “evidence-based credentialing.” It is usually a prerequisite for re-credentialing and any other changes with privileges. Multiple factors can be incorporated into these evaluations. These can include performance on core measures, cost, professionalism and patient feedback. Frequently, a hospital will appoint a **Peer Review Committee** at the departmental, sectional or hospital-wide level. This provides a process by which a designated peer group reviews the surgeon’s outcomes to determine areas for process improvement or the need for FPPE for an individual practitioner. In certain organizations, the OPPE will tier their physicians and use this to motivate practitioners to reflect on the quality or cost of the care that they provide and initiate an improvement effort.

Quality assessment relies on the ability to triangulate data to get an accurate measure of organizational or individual performance. **Triangulating** data means validating the results by cross-verification from two or more sources. Therefore, we must be able to consider data from multiple sources, as well as those that cover multiple domains such as those discussed regarding clinical outcomes and patient opinions. While CMS provides the core measures, other organizations have developed similar metrics for use in quality assessment.

The **Agency for Healthcare Research and Quality (AHRQ) Patient Safety Indicators (PSIs)** are quality measures based on International Classification of Diseases Ninth Revision Clinical Modification (ICD-9-CM) codes. ICD-9-CM codes are assigned at the time of hospital discharge by professional coders and abstracted from the physician documentation in the medical record. They reflect the patient diagnoses and, in conjunction with the procedural codes, determine the hospital payment for the care rendered to the patient during the acute hospitalization. **Patient Safety Indicators (PSIs)** measure complications for disease-specific areas by attempting to detect complications and adverse events using secondary diagnosis codes. Many PSIs have been shown to be unreliable in detecting preventable adverse events following a surgical procedure. At the provider level, however, the PSIs are being used to present a picture of patient safety within a hospital. The measure set covers a variety of areas such as selected postoperative complications, selected technical adverse events, technical difficulty with procedures, and obstetric trauma and birth trauma. Examples of the PSI’s include PSI-04 Death in Surgical Patients with treatable complications,
Making Sense of Quality from the Resident Perspective

PSI-09 Postoperative Hemorrhage or Hematoma and PSI-14 Postoperative Wound Dehiscence Rate. Despite the well documented limitations, PSIs are regularly reported to CMS for all acute hospitalizations.

As an alternative solution to the outcomes measured by CMS and AHRQ, The American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) provides physicians and hospital systems with data on the relative quality of care they deliver and highlights areas in which improvement might be considered. The program reports on a number of general surgical complications across multiple specialties and procedure-specific outcomes for a variety of individual procedures. The 30-day outcomes measured by the ACS NSQIP are risk-adjusted and validated to measure and improve the quality of surgical care. The collection process is standardized and captures data on a convenience sample of patients undergoing both inpatient and outpatient procedures.

Here’s the good news. All of these tools will continue to be developed; the transition to surgical practice will become a team effort. You will not have to fight for the rights of your patients over the rights of the “big dog” surgeons because in hospitals that provide high quality care, patients will be at the center of the processes of care and not providers. And, when problems appear or opportunities for improvement occur, you will have the skill set to get to the bottom of the problem and work toward quality improvement.

C. KNOW YOUR LOCAL QUALITY IMPROVEMENT INFRASTRUCTURE

Quality improvement requires a multidisciplinary team effort. Because you work within a system of health care delivery, it is important that you recognize the important role that each member of the staff plays in the patient experience. When you build your quality improvement project team, you should be sure to include a representative from each group that may be affected by your proposed changes. These people are called stakeholders. You also must have a champion of the team. This person is someone in a leadership position that can bring their influence to the team to help get things accomplished. Ideally, the champion should also “have skin in the game,” as a personal investment is always more meaningful when there is something to be gained or lost to the individual.

Every hospital has annual QI targets or projects. Make sure you (as a residency program) know what they are and ask for a brief report and update on the background and significance, implementation plan and regular updates regarding the progress of the projects in achieving the goals. As an integral part of the care team, residents should ask why when processes of care are changed or new order sets become available in order to make sure that their voices and concerns are addressed.

If you have a more global interest in figuring out how to deliver better care to your patients now is a great time to distinguish yourself as a QI leader. You should approach your program director and discuss your interests. Then, identify a person within your organization who works with the quality improvement initiatives within your department. In some hospitals the person might be a patient safety officer or the chief quality officer/chief medical officer; in other hospitals the right person might hold a different title. Find someone who has the time for you. Schedule a phone call or meeting to discuss your interest in getting involved in QI. You may need to meet with several people before you find the right person. Many hospitals now have a housestaff quality committee. These committees function as an excellent portal for interested residents to becoming more prominent figures in the organizational QI program.

RECOMMENDED READING


OBJECTIVES

At the end of this section, the learner should be able to:

- Describe several techniques available for use in surgical quality improvement
- Detail the steps used to approach a surgical quality improvement problem using one of the methods described
- Describe the difference between a data registry and a claims database

The field of quality improvement is not limited to medicine. In fact, many of the modern tools we use have been developed in outside industries where public health concerns exist when things go wrong. The airline industry and car manufacturing companies represent two examples. Many of these techniques have been able to be tailored for use in medicine. The application of these tools and techniques within medicine has proven valuable. Change has resulted in improved outcomes, and reduced waste and inefficiencies in the medical process. In this section, we will review some of the most common models of quality improvement.

Most of the quality improvement techniques rely on the same few principles and can be distilled to a data driven approach to testing a change designed to fix a “problem.” The typical approach involves the identification of a problem or quality issue, followed by a deeper understanding of the issue involving the development of a plan to address the problem. Then, the next steps involve the implementation of the plan, the study of the effects of the change and the refinement or expansion of the change to other locations. The process is typically one that requires constant refinement and enforcement as quality improvement is a continuous process; rarely is a problem treated successfully with a one-time fix.

People use many expressions to describe the desired approach to new quality improvement projects; for example, “fail fast forward” and “rapid cycle intervention.” It doesn’t matter how you say it or what technique is employed—it is all basically the same iterative data-driven process and requires trial and error. Short-term solutions that are easy are necessary to engender buy-in, but they will fail unless a consistent effort is directed toward their success. This is why teamwork, discussed in Section III, is so important, as it can ensure sustainable change.

There are many different approaches to effect change. You should tailor your tools to your needs. Use DMAIC (Six Sigma - below) or PDSA (Plan, Do, Study, Act) for quality improvement. Try Lean for issues related to efficiency. When trying to prevent a second sentinel event try a root cause analysis. All of these techniques will be discussed in this Section. Furthermore, although collecting data is only one essential component of the process and is not the ultimate solution to effect change, understanding the value of data and the data themselves is critical to measuring change to evaluate for improvement.

A. DATA

1. Quantitative Data, Administrative Claims, and Clinical Registries

In 1966, Avedis Donabedian described the classic approach to quality assessment that we use in the surgical profession today. The central concept is that care can be divided into three domains: structure, process and outcomes. The Donabedian principles provide a framework for the development of common language across disciplines to make the quality improvement movement possible. Structural measures refer to the physical and organizational aspects of care settings (for example, number of hospital beds, nurse to patient ratios, academic versus private hospitals, volume of care provided, and so on). Processes of patient care refer to the type of care delivered and include appropriate use of preoperative antibiotics and postoperative DVT prophylaxis. Process measures are often the best targets for the assessment of a resident directed quality improvement. Outcomes refer to what actually happens to patients, often as a result of the structures and processes of care. Mortality, postoperative complications, and functional outcomes are all examples of outcomes measures.² The theory alone however, will not improve quality. Therefore, this manual will expand on the theory through real life examples that highlight the complexities of a successful quality improvement program.

Several principles are fundamental to understanding the processes of quality improvement; among them, measurement and benchmarking represent the most basic of the concepts. In order to improve, there should be a baseline, a standard and a goal. Accordingly, many health care organizations and governing bodies maintain datasets and registries to serve as a repository of data for use in the assessment of outcomes and quality.
In order to participate in continuous quality improvement, one typically requires access to data regarding the structure, process and outcomes of interest. **Quantitative data** include numbers. There are many different types of data that can be used in quality improvement: discrete, continuous, categorical, and so on. Regardless, the data need not be “research quality” as quality improvement should not wait for the data to be perfect to attempt a change.

The easiest form of data for analysis is dichotomous or binary data where there are only two possible classifications. This works extremely well when the data naturally fit within this construct like in-patient death (yes/no). However, oversimplifying the data to make it dichotomous can sometimes diminish the value of the improvement process by making it unbelievable. For example, when trying to classify preventable in-patient mortality, if you make a dichotomous variable preventable death (yes/no) there might be frequent mistrust of the results. Here there is subjectivity to the definition, and stakeholders might be more comfortable dealing with categories of preventability such as unavoidable death (death in a 90 year old admitted with a perforated bowel from a terminal malignancy and new massive MI), potentially preventable (death in an otherwise healthy 90 year old admitted for acute appendicitis who was septic upon arrival to the emergency department) and preventable death (death in otherwise healthy 90 year old admitted for acute appendicitis with mild stranding around the appendix on CT scan and no physiologic derangements aside from a mild leucocytosis).

Although this example may be simple, data can be very complicated and the type of data chosen for a given quality improvement program will influence the success of the program.

Data must also come from a source. The source of the data can influence the reliability and accuracy. For example, data on the time of antibiotic administration taken from the nurse’s progress note that summarizes an eight to twelve hour shift is likely to be inaccurate while the same data taken from the electronic medication dispenser that logs the time that the nurse removed the medication for administration might be more accurate. The key to selecting the appropriate data for use in a quality improvement project will involve finding a balance between availability, ease of abstraction, the ability to measure the process or outcome of interest and feasibility of analysis.
Clinical registries can be more reliable than claims data for examining particular surgical populations and outcomes. The best registries require a trained person to collect the data using strict definitions. Rigorous definitions make it possible to standardize the data collection process across hospitals. As such, the data are ideal for benchmarking or comparing outcomes or processes of care across organizations. Importantly, the data abstractor can use test results to support the information collected even without documentation by the care providers. These registries can be expensive to maintain due to the need for additional personnel. As such, they often rely on the collection of a sample of data or a portion of the population in lieu of the entire volume of patient encounters and the entire volume of patients. Additionally, registry data is frequently collected prospectively and can discriminate between preoperative comorbidities and postoperative occurrences. For these reasons, clinical data is typically preferred for informing quality improvement projects. The ACS NSQIP database is the best national risk-adjusted, validated registry available for use in the assessment of surgical quality.

It is important to note that not all registries adhere to the best data collection methodology. Some registries collect data entered by the clinicians caring for the patients. In this setting, the data may be less reliable due to the innate conflict of interest when reporting clinical outcomes on one’s own patients. Other data registries fail to provide comprehensive data definitions making comparisons across centers or even providers difficult due to variability in the meaning of the data recorded. When considering the use of a clinical registry, it is important to review the data definitions and understand the data collection methodology in order to evaluate the quality of the data itself.

Here is a quick example to illustrate a subtle but meaningful difference in the data collected for claims compared with a robust clinical registry. During the postoperative period, a clinician treats a patient for a suspected pneumonia, documenting his/her suspicion in the chart. The subsequent workup, including a chest X-ray and a CBC, are all normal and the clinician stops the antibiotic treatment but fails to update the chart to reflect the absence of the pneumonia. According to the hospital claims data, the patient would likely be recorded as suffering a postoperative pneumonia. Because registry data use independent definitions of pneumonia and other complications, the patients would not qualify as having pneumonia.

2. Qualitative Data, Expert Opinion, and Patient Input

Occasionally, the quantitative data are not sufficient or fail to reflect the constructs to be addressed. For these reasons, the most robust programs must also be able to identify meaningful qualitative data that can function as metrics in the evaluation of quality in less concrete areas like interpersonal communication. Unlike quantitative data, which deals with numbers, qualitative data involves descriptions. Frequently, successful hospitals consider expert opinion and patient input on these matters. Recently, software programs have been developed to abstract this data electronically; however, these are not yet widely available. Therefore, this process can take much longer than a review of quantitative data and is often more labor intensive.

A resident’s ability to communicate effectively may influence clinical outcomes. Evaluating communication skills often includes the need to obtain qualitative information. Interviews may be conducted or opinions solicited from colleagues and hospital staff. Questions asked might include: Does the doctor make you feel like it is OK to ask a question if you do not understand what he or she is asking you to do? Would you call the doctor to help if you were worried about a patient but lacked a clear concern? The information gathered in this way would be considered qualitative data.

In order to tailor the surgical care to the local environment, the use of expert opinion and patient input should be considered even when there are meaningful quantitative data to consider. The importance of these two elements cannot be overstated. Understanding and caring about the opinions and beliefs of practitioners and patients alike will foster a healthy environment in which high quality care can be delivered.

B. COMMON APPROACHES TO ACHIEVE QUALITY IMPROVEMENT

1. Six Sigma

OBJECTIVES

At the end of this section, the learner should be able to:

- Describe the history of Six Sigma
- Understand what DMAIC is, what each step represents, and how to use it for projects in an organization
- Understand what Six Sigma is and how to use it to improve surgical processes
Fundamentals of Surgical Quality Improvement Tools

Six Sigma is one of the most prominent process improvement methodologies. Six Sigma started as a process improvement methodology for Motorola in 1986. Its success with Motorola, and then GE, brought it to national recognition in the 1990s. Since then the method has been applied to multiple industries throughout the world, including medicine.

Six Sigma is a process improvement technique that derives its name from its stated objective of reducing process errors to a rate of six standard deviations below the mean. This translates to a process being 99.99966% error free. Most standard industrial processes start out at a rate of about 3.4 sigma, while most medical processes average between 3 and 4 sigma level. In the clinical setting, a sigma rate of 3.8 corresponds to 5,000 incorrect surgical operations per week. Reducing the error rate to Six Sigma reduces that number to only 1.7 incorrect surgical operations per week. As the complexity of the technical and medical processes of care increase, the cumulative effect on errors can become exponentially greater.

While many processes are quite complex with multiple steps, most industries have found that the majority of inefficiencies are within a select few individual steps. The idea dates back to the Pareto principle, where 20% of the processes contribute to 80% of the errors Fairbanks 2007. Six Sigma takes advantage of this by trying to focus on those processes to improve their rate of error as much as possible.

Six Sigma accomplishes this by applying the steps outlined in the acronym DMAIC. DMAIC stands for Define (D), Measure (M), Analyze (A), Improve (I), and Control (C). The first step when applying DMAIC to quality improvement is to define the problem. This goes much further than just narrowing in on a single problem (such as surgical site infections). The problem needs to be clearly defined. The process that one is looking at regarding that problem needs to be delineated. The scope of the project needs to be articulated. The members of the team need to be assigned and delegated appropriately. A time frame needs to be established during this step as well. An example of performing a definition stage is listed in Figure 1 regarding surgical site infections:

<table>
<thead>
<tr>
<th>Category</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem</td>
<td>Greater than 5% of patients undergoing elective cholecystectomy at Hospital X had a surgical site infection rate during the year 2013.</td>
</tr>
<tr>
<td>Process</td>
<td>The proper care of surgical wounds in Hospital X</td>
</tr>
<tr>
<td>Scope</td>
<td>The general surgery service in Hospital X</td>
</tr>
<tr>
<td>Team Members</td>
<td>Attending surgeon, residents, physician assistant, nursing staff, nursing assistants, anesthesia team, environmental service members</td>
</tr>
<tr>
<td>Time Frame (?)</td>
<td>Needs to be completed prior to next NSQIP biannual report</td>
</tr>
</tbody>
</table>

The second step of the process is Measure. By using the definitions obtained in the Define step, data are collected. An example of what data to collect is seen in Figure 2.

The third step involves analysis of the problem. Once the data are collected, they need to be rigorously analyzed. A process map is usually helpful in organizing the potential causes of the end problem. Once a process map is made with the corresponding data, a root cause analysis is usually done in order to help brainstorm for the top potential areas of problems. The intent is to identify the key steps that will have the greatest impact as outlined by the Pareto principle. A fishbone diagram, as seen in Figure 3, can help illustrate areas of deficiencies to work on.

Careful analysis should reveal a few significant areas of errors. For example, it may be found that only 36% of patients received the proper intraoperative antibiotics and that these patients were a major contributor to the surgical site infection rate.
Once the analysis is properly completed, the team should reconvene and brainstorm to identify the best way to improve each of these areas of weakness. Multiple improvements can be implemented at the same time for synergistic effect. It is critical that the results of this project are clearly recorded in order to document both the success of implementation and the overall outcome.

There are two overall ways that a process can improve the error rate. The first is to shift the overall process so the end metric of a particular step is improved. One example would be to change the peri-operative antibiotic regimen based on peer-reviewed data to reduce the overall risk of surgical site infections. The second way is by reducing variability in a process. This can be achieved by standardizing a practice. By doing this, there is also significant reduction in human error. One example would be to standardize a prepping procedure so the same method was in place for the entire service. The combination of these two methods can demonstrate significant changes in the overall outcome metric.

The final step of the process is Control. It is important to ensure that these measures remain in place and to not return back to the pre-intervention levels. This requires monitoring the process to help keep track of changes. Team members should be informed of any problems that come about. One way to keep on target would be to use ACS NSQIP generated data for measures such as surgical site infection rates at the hospital.

<table>
<thead>
<tr>
<th>Category</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement</td>
<td>Surgical site infections on a general surgery service for all patients who had laparoscopic cholecystectomies</td>
</tr>
<tr>
<td>Type of Measurement</td>
<td>Outcomes</td>
</tr>
<tr>
<td>Type of Data</td>
<td>Categorical (binary)</td>
</tr>
<tr>
<td>Definition</td>
<td>Patients who develop a superficial surgical site infection as defined by the NSQIP official guidelines</td>
</tr>
<tr>
<td>Collection Method</td>
<td>Using the Electronic Medical Record System</td>
</tr>
<tr>
<td>Sampling</td>
<td>All patients who had laparoscopic cholecystectomies, ideally 100% sample</td>
</tr>
<tr>
<td>Baseline Six Sigma</td>
<td>Defects Per Million Opportunities (DPMO)</td>
</tr>
</tbody>
</table>

Figure 3: A fishbone diagram done during the analysis phase

- Adequate hand washing prior to entering room
- Wound not changed for 24 hours after surgery
- Sterile Technique used to change bandage
- Room adequately cleaned between patients and maintained clean
- Pre-operative antibiotics given appropriately
- Properly Prepping Patient
- Change equipment prior to closure
- Maintaining a sterile field
- Proper Dressings used to maintain field
- Proper scrubbing
In conclusion, Six Sigma can be used to find key areas that may be contributing to undesired outcomes. A team approach with membership from every service is ideal. It is a data based process improvement strategy that can be used to help improve outcomes in a health care setting.

RECOMMENDED READING


2. Root Cause Analysis

OBJECTIVES

At the end of this section, the learner should be able to:

- Describe the history of root cause analysis techniques in industry
- Understand the application of root cause analysis in surgical procedures
- Develop a fishbone diagram for surgical process improvement

The goals of a root cause analysis are to determine exactly what happened, why it happened and what should be done to prevent it from happening again. This needs to be done in an organized, team based approach. The group’s goal is to find process improvements to prevent future errors rather than blaming specific individuals for their errors.

The history of root cause analysis can be traced back to Sakichi Toyoda and his quality improvement initiatives with Toyota. It was initially brought to light in 1966 by Avedis Donabedian to help simplify evaluation of quality health care. Implementation began in the 1990s for certain adverse events. It is now being utilized in a variety of situations in the health care field.

There are four main steps to perform a root cause analysis. The first is defining the problem. The second is developing an understanding of why the problem occurred using a cause and effect chart. The third is identifying solutions to the problem. The fourth is implementing and monitoring the solutions.

A. Defining the Problem: This usually occurs following an adverse event, often dubbed a ‘sentinel event’. However the sentinel event may not be the true problem, but rather the consequence of one or more problems. This step requires careful gathering of all facts leading up to the sentinel event. It may be helpful to develop a time line in order to help organize details that result in the particular problem.

B. Cause and Effect Chart: The second step is to develop a cause and effect relationship relating to the problem. Once the data are collected, they must be analyzed to identify potential cause and effect relationships that are related to the event. Multiple members of the health care team should be involved in order to give insight into every aspect of the process. A cause and effect diagram is very helpful to help organize ideas.

The most popular cause and effect diagram is the fishbone diagram. It originated from Kaoru Ishikawa, a Japanese pioneer of quality improvement in the 1960s. It is a tool used to help brainstorm and organize the cause and effect relationship of a quality improvement initiative. First, identify the effect and put it at the end of the large arrow on the chart. (e.g., “Effect” in Figure 1)
Second, sort out broad categories of causes, such as steps in a process or a component such as personnel, equipment, and so on. These should branch out from the initial arrow. Finally, brainstorm within each category of the fishbone for potential problems. An example fishbone can be seen in Figure 1.

C. Identify Solutions: Once multiple root causes are identified, the team must try to develop potential solutions. The entire group should come up with solutions as a team to help determine each solution’s impact and the level of feasibility. An impact matrix can help decide which ideas are worth pursuing by plotting the level of resources and level of impact for each project. The ideas with the most impact that require the least resources should be attempted first, with lower-impact and higher-resource projects being discarded. Once one or more solutions are chosen, they are implemented to improve the process. A sample matrix can be seen in Table 1.

D. Implement and Monitor: The last step is implementation. The projects that have been chosen should be implemented. All process changes must be monitored to determine their effectiveness and should be continually reevaluated and reinforced.

In conclusion, root cause Analysis is a method used to determine latent errors in a process. Using a team-based approach, data must be evaluated in order to discover potential faults in the system that need corrections. This should lead to a careful evaluation of potential solutions with subsequent implementation and monitoring.

RECOMMENDED READING

3. Lean

OBJECTIVES
At the end of this section, the learner should be able to:

- Understand the applications of Lean in medicine
- Work with a team to identify areas of waste for improvement in surgical outcome

Lean process improvement is one of the most popular and successful methods of quality improvement today. Lean’s origin comes from Toyota manufacturing in the 1970s. The success of Toyota’s method was brought to public attention in the 1990s by Womack et al in The Machine That Changed the World. Since that time, Lean has been applied to many different industries throughout the world including medicine.

The purpose of Lean is to reduce excess waste in any process. Waste in Lean has a stringent definition. It is often replaced with the Japanese word for waste, muda. Waste in Lean refers to the amount of work that does not directly impact what a customer deems important for the product. This concept is essential, because a company may see a step as important to a process when a customer does not.
Fundamentals of Surgical Quality Improvement Tools

Lean is important to the quality improvement process in surgical procedures, as resources (e.g., the amount of time in the day for an intern to accomplish all of his or her tasks) are often scarce. Therefore, reducing inefficiency benefits the quality of the care provided. For example, decreasing the amount of time the intern spends babysitting a surgical patient after the operation is completed before the recovery room bed is available would enable the intern to spend more time with other patients and address their needs in a more timely fashion.

Waste has many different forms (Figures 1, 2). Some common examples are product defects, overproduction, excessive inventory, unnecessary steps or actions, and waiting time between steps. An example in the surgical field would be having the operating rooms set up so each operating room is fully stocked with multiple gloves, sutures, and equipment for every surgical procedure that is performed in that operating room. Because many operating rooms are designed in a cell block fashion, if the stock supplies could be kept in the center section and only the supplies needed brought into the operating room prior to the operation, that would save a significant amount of space would be in each operating room and would cut down significantly on inventory costs.

The primary way Lean solves the problem with waste is by using flow manufacturing, or “just in time” manufacturing. Flow process involves streamlining the entire process and eliminating as much redundancy and waste as possible. This is accomplished by using pull, where the downstream process signals the need for further production. Flow stands in contrast to the more traditional batch and queue process, popularized by Henry Ford. Batch and queue requires large batches of a single component in order to create massive quantities of a final product. In contrast, a Lean organization only produces what is needed for a given time. An organization must be very flexible in order to adapt to the changing signals from downstream demand. While this may seem counterintuitive at first, the results can be quite striking. An example may be a hospital that keeps hundreds of different meshes for inguinal hernias. Instead of keeping the inventory fully stocked for any potential hernia (a batch and queue model), a lean hospital may only have a limited supply of meshes and would only order the meshes when necessary a week or two in advance. Like the prior example, this would cut down significantly on the amount of space necessary to hold inventory, along with all of the costs to maintain that inventory.

The best way to determine the initial flow of work is to conduct a value stream map (Figure 1). This is a map which outlines the current flow of work. These maps include the amount of time that contributes to the overall process and the amount of time that contributes only to the value of the product as deemed by the customer. When constructing a map, it is important to have several features. It should include the amount of value added time (VAT), or time that directly contributes to the value as defined by the customer. This is in contrast to non-value-added time, which is time required for a project that does not directly contribute to value by the customer. Cycle time (C/T) is the amount of time one cycle of a step in the process takes, and change over time (C/O) represents the amount of time to change over from one cycle to the next. For example, in an operating room, the amount of time for a single case in the operative room would be a cycle time, and the turnover time needed to be ready

Figure 1: An example of Taiichi Ohno’s seven wastes

Key Concept:
Understand Taiichi Ohno’s Seven Wastes

- Overproduction
- Defective Products
- Stock on Hand (Waste)
- Movement
- Processing
- Transportation
- Time on Hand (Waste)

Figure 2: Clinical examples for each form of waste

Relentless “War on Waste” Key to Quality

7 Wastes:
- Waste of overproduction
- Waste of transportation
- Waste of over processing
- Waste of inventory
- Waste of motion
- Waste of making defective products or poor quality
- Waste of time

→ Lab tests
→ Patient transfers
→ Charge tickets
→ Drugs, supplies
→ Searching for charts
→ Professional liability
→ Patients in waiting rooms
for the next operation would be a change over time. The time waiting between steps is represented by queue time (Q)—this can often be a significant source of waste within a process. The value added time divided by the total amount of time represents the efficiency of the process. Many overall processes are below 10% efficiency.

Once the entire process has been characterized, Lean process improvement focuses on simplifying the process in order to reduce waste. Lean processes have fewer and more simplistic steps to reduce inefficiencies. Another feature of Lean is to allow adequate flexibility to correct errors as soon as they happen and not wait until the end of the process to fix them. Lean requires less inventory and space by encouraging pull manufacturing. Pull will require increased flexibility on the part of the worker.

The original Toyota manufacturing employed a system called 5 S. These stand for five Japanese words Seiri, Seiton, Seiso, Seiketsu, and Shitsuke; however they often go by their English counterparts: sort, straighten, sweep, standardize, and sustain. “Sort” refers to separating of essential tools from the unessential tools and removing the unessential ones from the workspace. “Straighten” refers to arranging parts for ease of use. Sweep refers to maintaining a clean work environment. Standardize refers to conducting the former tasks frequently in order to maintain them. Sustain refers to transforming the former tasks into a habitual behavior. Together these steps not only create a Lean process but also help form a lasting culture of waste reduction.

Taking the original process map, a team consisting of people from all steps of the process should come up with a new and improved work flow. By incorporating members from each step and all levels of management, the process has the best chance of becoming lean. A new, future stream map should be plotted with new functions of each step and how the new steps relate to each other. An example of a Future Stream Map is given in Figure 2 and Table 1.

An example of a Lean process would be focusing on streamlining the preoperative workup in a surgery clinic. A current state of the clinic from the initial consult until scheduling for a surgical procedure can be seen in Figure 2 and Table 1. A significant amount of time for the patient is nonvalue, requiring multiple office visits on different days. This could be eliminated by screening the patients before their initial visit so that patients with a high likelihood of a surgical procedure could have all of their preoperative workup the same day as the initial consult. An example of a future state to reduce this waste can be seen in Figure 3 and Table 2. This demonstrates a reduction in overall waste and an improvement in the overall efficiency of the process. Similar process improvement projects have been successful in the surgical field.

Like all process improvement plans, it is essential that there be a way to continually monitor the progress of the process improvement. Once improvements are documented, these changes must be instilled into the production team to prevent the team from reverting back to the early state. In addition, Lean is not a one-time change for an organization but rather a continual process to strive for as much waste reduction as possible.
Fundamentals of Surgical Quality Improvement Tools

Table 1: Current State

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Value Added Time</td>
<td>164 minutes</td>
</tr>
<tr>
<td>Non-Value Added Time</td>
<td>306 minutes</td>
</tr>
<tr>
<td>Queue Time</td>
<td>10,270 minutes (7.1 days)</td>
</tr>
<tr>
<td>Lead Time</td>
<td>10,740 minutes</td>
</tr>
<tr>
<td>Efficiency</td>
<td>1.5%</td>
</tr>
</tbody>
</table>

Table 2: Future State

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Added Time</td>
<td>144 minutes</td>
</tr>
<tr>
<td>Non-Value Added Time</td>
<td>146 minutes</td>
</tr>
<tr>
<td>Queue Time</td>
<td>120</td>
</tr>
<tr>
<td>Lead Time</td>
<td>410 minutes</td>
</tr>
<tr>
<td>Efficiency</td>
<td>35.1%</td>
</tr>
</tbody>
</table>

Figure 2: Future Stream Map: Original Process, Current State

Figure 3: Future Stream Map: Future State
Lean is a methodological process improvement strategy that can be used to help improve outcomes in a health care setting. It can be used to minimize waste and streamline the process for an efficient, safe process.

RECOMMENDED READING


4. The Modern Morbidity and Mortality Conference

OBJECTIVES

At the end of this section, the learner should be able to:

- Understand the history of the Morbidity and Mortality Conference within Surgery
- Appreciate the balance between quality assurance and medical education within the Morbidity and Mortality Conference
- Learn about the different structures of the conference across institutions in order to stimulate the generation of ideas for local improvement in the educational value of the Morbidity and Mortality Conference

The Morbidity and Mortality (M&M) conference is one of the most visible and important forums to discuss adverse events and errors in the medical field. In the early 20th century physicians began advocating for hospital errors to be reviewed. Conferences in the 1930s and 1940s, such as the Anesthesia Study Commission, began systematically looking at adverse events of surgical complications. These conferences have since evolved into a standard conference for hospitals across the world.

In the surgical profession, M&M conferences are highly utilized and deemed critical to both surgical training and practice. Despite this widespread use, recent papers have brought to light deficits within the data presented. Some of the major criticisms are the incomplete reporting of complications, unclear presentations, and the lack of benchmarks.

In order to have and maintain an excellent morbidity and mortality conference an institution should hold a conference regularly. Most institutions hold them at least monthly, with many holding them weekly and dubbing them the ‘golden hour’. These conferences must have a high level of attendance by both faculty and residents to function optimally. Timing is often critical, and some institutions have found that simply rescheduling the timing for M&M conferences can significantly increase participation. One example would be changing the timing from the afternoon when operations are at risk of interfering with participation to the morning prior to the first start of elective surgeries.

A list of cases or potential cases is often selected prior to the presentation. Case reporting differs across institutions. Some rely only on resident reported cases and others pull from hospital datasets that track clinical outcomes. The completeness of the data and the discussion that follows will be heavily influenced by the method of case reporting. For an ideal conference, the case list should pull form the most complete and reliable source of adverse events across the continuum of the patient experience, not just the in-patient course.

The name of the conference will often set the tone. In some hospitals the classic name of Morbidity and Mortality conference has been changed. In order to attempt to change the culture and facilitate a civilized conversation regarding best practices instead of a blame-filled contentious discussion about poor quality care, some institutions have renamed the conference “Case Management Conference.” Others, in order to deem the discussion “protected” from legal discovery, have renamed the conference “Quality Assurance Conference.” This approach has been suggested for institutions that are trying to rebuild or modernize their conference to permit a more meaningful use of the opportunity to reflect upon cases when adverse events occur.
Fundamentals of Surgical Quality Improvement Tools

Some hospitals use the conference to simultaneously provide education on quality and satisfy regulations governing quality assurance. In this case there must be a balance between the functions of the conference. The dual mission of the conference can impair its effectiveness as an educational conference. In order to optimize the educational benefits of the case-based learning opportunity, there must be order and clear objectives. Most conferences do not have overt objectives beyond the global desire to discuss complicated cases to learn as a collective. The laxity in the objectives often leaves the content of the discussion short on evidence and replete with multiple conflicting approaches to patient care. As such, residents are often left confused about the best practice to maximize quality care.

The lack of standardized presentations can limit the efficacy of the Morbidity and Mortality conference. Standardization of the presentation format can result in improved efficiency and a decrease in the amount of time needed for each case. Presenters must be able to succinctly and effectively explain the case to the audience. Many programs have demonstrated effective change by creating a standardized template for all presentations.

The Situation, Background, Assessment, and Recommendation (SBAR), borrowed from the industrial quality improvement sector, is an effective tool. The situation is the initial piece of information that can help the presenter set the agenda for the conference. This has been shown to clarify the case for the audience and improve the quality of the presentation. The background is the second portion of the presentation, which delves into the facts of the case. The presenter should focus on the pertinent points of the case, skimming or omitting portions that may add no benefit to the understanding of the case. Time lines may help add an additional level of clarification. The assessment involves the actual analysis of the adverse event. The root cause may be unifactorial or multifactorial. Constructing a fishbone diagram to detail possible opportunities can often be illustrative. References may be used during this process in order to help add objective data in the understanding of an adverse event. The recommendation summarizes the action plan to either prevent the adverse event or help manage it better in the care of future similar cases. Formal recommendations on the timing include allotting 15 minutes for the presentation and five minutes for

<table>
<thead>
<tr>
<th>Table 1: Sample template for M&amp;M conference (SBAR)</th>
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<tbody>
<tr>
<td><strong>Situation (&lt; 1 min)</strong></td>
</tr>
<tr>
<td>Patient</td>
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<tr>
<td>Staff/Resident</td>
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<tr>
<td>Diagnosis</td>
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<td>Operation/Procedure</td>
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<tr>
<td>Complication</td>
</tr>
<tr>
<td>Outcome</td>
</tr>
<tr>
<td><strong>Background (&lt; 6 min)</strong></td>
</tr>
<tr>
<td>HPI: brief, relevant points</td>
</tr>
<tr>
<td>PMH: relevant</td>
</tr>
<tr>
<td>PSH: prior abdominal operations</td>
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<tr>
<td>PSH: prior abdominal operations</td>
</tr>
<tr>
<td>PSH: prior abdominal operations</td>
</tr>
<tr>
<td>Meds: list relevant</td>
</tr>
<tr>
<td>(Anticoagulation, cardiac)</td>
</tr>
<tr>
<td>FH/SH: only if relevant</td>
</tr>
<tr>
<td>Pre-op work up: include pertinent labs/imaging</td>
</tr>
<tr>
<td>Operative course: discuss operative conduct, especially deviations from standard of care</td>
</tr>
<tr>
<td>Post-op course: relevant findings/imaging</td>
</tr>
<tr>
<td>FH/SH: only if relevant</td>
</tr>
<tr>
<td>Pre-op work up: include pertinent labs/imaging</td>
</tr>
<tr>
<td>Operative course: discuss operative conduct, especially deviations from standard of care</td>
</tr>
<tr>
<td>Post-op course: relevant findings/imaging</td>
</tr>
<tr>
<td>Brief discussion on diagnosis and indication for operation</td>
</tr>
<tr>
<td>Include relevant literature on disease or complication</td>
</tr>
<tr>
<td><strong>Assessment (&lt; 3 min)</strong></td>
</tr>
<tr>
<td>Discuss possible causes for complication</td>
</tr>
<tr>
<td>Error in technique</td>
</tr>
<tr>
<td>Error in judgment</td>
</tr>
<tr>
<td><strong>Recommendation (&lt; 3 min)</strong></td>
</tr>
<tr>
<td>Discuss how to prevent or manage in future</td>
</tr>
<tr>
<td>Staff questions/comments at this point</td>
</tr>
</tbody>
</table>
The case discussion should involve both residents and faculty. A moderator should facilitate the process by encouraging productive conversation and limiting repetitive comments or comments with no constructive basis. One additional idea is a policy of no questions during the presentation of the patient.

Departmental leaders often determine the specific complications to present. Superficial surgical site infection, CAUTI, and a venous thromboembolic event may be considered boring and therefore not selected for presentation at the M&M conference Thomas 2012. From the perspective of quality improvement, minimizing the importance of these events in the patient experience presents a barrier to achieving optimal care. Many of these complications are potentially preventable. Additionally, these often herald worse outcomes, such as pulmonary embolus or sepsis. Moreover, these events are often tied to institutional penalties either directly through reimbursements, or indirectly by patients seeking out hospitals with reduced rates of adverse events. The sharing of the institutional data regarding the aggregated performance on quality measures can be a useful addition to the morbidity and mortality conference. This addition to the conference does not have to be weekly but can be effective on a quarterly basis to highlight local performance with comparison to peer institutions. Alternatively, the institution specific complication rates with benchmark to peer institutions can be shared during the assessment portion of each presentation. Benchmarking the outcomes will encourage residents and faculty to work toward improvement in areas of deficiency.

One example would be a patient with pancreatic cancer who presented to the hospital for an elective Whipple operation and subsequently developed a pulmonary embolus. On review of the patient’s history, it might have been noted she had a lapse in her subcutaneous heparin dosing and frequently did not wear her compression stockings. While reviewing the contributing factor, ACS NSQIP data could be used to examine the rates of DVTs in the hospital for the last several years with comparison to national data on DVT rates for patients who had pancreas surgery. By using both sets of data, the investigator can help determine whether if DVTs are a particular deficiency within that hospital system. Real patient examples help to make clinical problems real to providers and may inspire increased compliance with DVT prophylaxis. The M and M conference is a great platform to discuss quality improvement strategies.

The conference should be used to share any changes to practice that are developed as a result of cases discussed. Frequently, residents complain that they never get follow-up of actions taken when bad things happen. This is discouraging because it gives the impression that nothing is done and that this is acceptable. Therefore, when a follow-up root cause analysis or other quality improvement investigation ensues following a bad outcome, the improvement strategy should be shared at a subsequent conference to highlight the hospital’s commitment to providing high quality care.

More recently, conferences have begun to highlight an interesting case to permit a more meaningful discussion about a specific topic each week. An individual case can be used to highlight quality improvement initiatives within each organization or provide closure for issues discussed at previous conferences. For example, in the case of a wrong-sited surgery, discussions at an initial presentation can be heated and many ideas may be generated for the prevention of wrong-sited surgery in subsequent cases. However, frequently, the follow-up is not publically shared with the surgical services. In this example, an interesting case might highlight the epidemiology of the problem of wrong-sited surgery and then discuss subsequent QI tools that were employed to address the local issue. Then, the system wide changes that have been implemented to minimize the risks to subsequent patients treated at their hospital (new consent process, new time out for patient safety and so on) can be shared.
Fundamentals of Surgical Quality Improvement Tools

In summary, the M and M conference or its equivalent should achieve the following objectives:

- To align the organizational quality goals with the departmental goals through an annual report of previous successful quality programs and upcoming areas of concentration
- To list all adverse events for quality assurance purposes on a weekly basis
- To explore the quality of care delivered at the hospital/department compared with institutions through an assessment of aggregated data on a quarterly basis
- To discuss all case details in the event of a potentially preventable adverse outcome
- To review best practices in the case of a potentially preventable adverse outcome
OBJECTIVES

At the end of this section, the learner should be able to:

- Identify three examples of clinical communications that can influence the quality of care provided to surgical patients
- Describe techniques to improve communication
- Provide two examples of positive and negative culture that can influence the quality of care provided

Culture might be the most important component in delivering high quality care. The energy required to overcome a bad culture results in waste and frustration and detracts from the positive aspects of being a surgeon. This is extremely important to residents although often difficult to change. Balancing the persona needed to achieve technical success in the operating room against the persona necessary to achieve optimal care outside of the operating room is often a challenge for surgeons. It has often been said of surgeons that, “In the operating room [he/she] is a hero, but outside of the operating room [he/she] is just another A**hole.” We must find a way to deliver direct and focused care without arrogance or apathy.

Surgeons often set the tone for the surgical culture. As such the balance that we strike between each component of our persona will influence the environment in which we practice. It is hard to be approachable amidst the enormous pressures that we face to perform on a regular basis. But, as they say, if it was easy, everyone would want to be a surgeon.

Try to think about the places in your life that you felt had the best culture. What was it that made it so special? Were the people friendly, competent, did it “feel like you were at home?” Break down the structure and personal attributes that defined the group. Use these to motivate you to bring those values and characteristics to the care that you provide and inspire those around you. One person at a time, we can develop a safety culture where optimal care is the standard, efficiency is maximized and people are happy to participate in all aspects of surgical care.

We must begin by asking, what is a safety culture?

A. DEVELOPING A CULTURE OF SAFETY

There are broad definitions of culture in general, but with respect to health care and patient safety, a culture focused on safety is best demonstrated by the behavior of those within a health care system whereby actions, values, and peer expectations are directed toward a common goal of safe patient care and preventing harm.\textsuperscript{1,2} This type of culture is an environment whereby the behavior of many individuals with common goals influences others to act in a manner that fosters the universal objectives of patient safety. The expectations and normative behavior are established in a way that guides health care personnel in the practice of safe patient care while promoting awareness of patient safety along a continuum.\textsuperscript{3,4}

In \textit{To Err is Human}, a landmark report published by the Institute of Medicine, preventable medical error was identified as a significant source of patient harm and death, as well as a significant burden with respect to cost, length of stay, and resource utilization within the U.S. health care system. Suddenly, the medical community recognized that we were unintentionally harming patients while providing care through errors that were in fact preventable. This state of practice is contrary to the very oath we are founded upon, and it was therefore proposed that a culture of safety be pursued to eliminate this deficiency.\textsuperscript{5} Reinforcing this proposal, it has been demonstrated that a positive patient safety culture has been associated with reduced patient harm and preventable error.\textsuperscript{4}

Culture influences outcomes. In a study by Abstoss et al, an in depth set of interventions was instituted with the goal of improving safety culture within an ICU. At the end of the study period, the rate of medication errors was reduced by 71%. The authors concluded that improved safety culture was associated with improved patient safety, and importantly, they also concluded that numerous safety checks in place prior to beginning the study are likely to be more effective in the setting of positive safety culture.\textsuperscript{9} An institution-level commitment to patient safety has also been shown to significantly reduce patient harm secondary to medical error. In a study that utilized a multi-faceted approach to staff training in recognition of patient safety issues and opportunities for preventable harm, the number of preventable incidents of patient harm was reduced by half. Furthermore, in the same study period, the in-hospital mortality rate was also significantly reduced.\textsuperscript{6}
Communication and Culture

It is becoming clear that patient safety, in spite of institutional checkpoints and controls designed to prevent harm, requires adoption of safety culture in order to be truly effective. This has traditionally been a difficult task because the cultural norms of a surgical residency program live within a larger organization and have frequently already been established. Therefore, the incorporation of safety into this culture demands a commitment from all levels of the program, including administration, faculty and residents. For each of these players, having this commitment means that you strive toward the same set of patient care standards and are supportive of each other’s efforts to achieve those standards. All should recognize this commitment to quality and patient safety as the “norm,” and should approach initiatives aimed at improving these with the same vigor and dedication as when we approach learning a new procedure or running a clinical trial. Just as the goal of traditional research is aimed at improving patient outcomes, so is the goal of patient safety and quality improvement. If we strive to practice evidence-based medicine for our patients, why should providing evidence-based, safe, patient-centered care be any different? Therefore, a strong surgical culture is one that is just as focused on providing safe, quality care as it is on the traditional metrics of technical merit, research, and education. Equal respect for the contributions of each of these components is paramount, and mutual respect obligatory.

Promoting a culture of safety means establishing goals, allowing individuals to voice their safety concerns, asking for clarification, providing feedback, and encouraging all members of the team to strive for the common goal. In other words, play nice in the sandbox. Work together. You don’t always need to wield pom-poms and say cheers, but don’t be obstructionist either. Be open to new ideas, new cultural “norms.” Promoting a culture of safety sometimes means trying something new or changing your processes of care. Undoubtedly, you have experienced the tension between the utopia of this patient-safety culture and the hidden curriculum (Pearson, hidden curriculum). As with all change, there are growing pains. This tension, in a sense, signifies progress because a lack of tension means that we have failed to continue to seek ways to improve how we take care of patients. It is okay to recognize and feel the tension. But, if you always remind yourself that everything we do is for the good of our patients, there should be no choice but to accept, become part of, or help mold the culture.

In order to do this, it is important that you learn to recognize what the cues for patient safety are in your institution in order to gauge the maturity of the culture. Are people embracing the culture? Is it central to what you do at your institution? Do your co-residents and attendings think about safety and incorporate it into their practice? Or, is there still a resistance to a patient safety culture? Is it seen as a less rigorous form of practice by some, and not important? Taking a mental inventory of where your institution or program lies on the spectrum of patient safety culture adoption is a crucial first step for any resident.

Instruments used to improve safety culture, and therefore patient safety, include classes or trainings, visible reminders of unit goals (like a poster keeping track of the number of catheter-associated urinary tract infections or bloodstream infections), frequent reviews with staff of safety events and countermeasures, checklists (like the OR timeout), and standardized protocols (such as nurse-driven foley catheter removal). There may be a culture developing around you that you weren’t even aware of, but as you learn to recognize these efforts as quality improvement and patient safety efforts specifically, you may realize that this culture is a greater part of your training than you realized. On the contrary, you may realize that the patient safety efforts at your institution are not visible to residents. This may represent an opportunity for you to contribute to creating the culture in a more focused way. Regardless, your role within this culture will mature along with your technical skill and clinical acumen. As a resident, you are an integral part of creating and perpetuating the culture, and should be wary of expressing attitudes or actions that may be detrimental to the sustainability of a healthy culture and an important mission.

B. TEAMWORK

Teamwork has become inherent to the practice of medicine due to increasing specialization of providers necessitating a multidisciplinary approach to patient care. A team can be defined as two or more individuals who work together to achieve specified and shared goals, have task-specific competencies and specialized work roles, use shared resources, and communicate to coordinate and to adapt to change. Regardless of specialty or level of training, physicians, nurses, midlevel providers, and countless other hospital staff members work together in coordinated fashion in order to provide optimal care for each patient. The importance of successful
teamwork as it relates to outcomes and safety has been well documented in other industries, particularly the aviation industry.\textsuperscript{2} Research within these industries highlights skills such as situational awareness, group decision making, task management, communication, and leadership as leading to positive outcomes.\textsuperscript{3}

Failures in these nontechnical skills within the medical field have been associated with adverse events.\textsuperscript{3} Surgical residency has traditionally focused on the development of technical skill, clinical decision-making, and medical knowledge. In 2007, the ACGME developed six competencies including patient care, medical knowledge, practice-based learning, interpersonal and communication skills, and systems-based practice as a means to integrate both technical and nontechnical skills into residency training programs.

The impact that failures in teamwork have on adverse events and medical errors has been highlighted by many observational and retrospective studies. Teamwork and communication failures are highlighted most frequently (22\% to 32\%) as contributing to adverse events.\textsuperscript{5-7} The operating room environment is understandably dependent on the performance of a team and this team can be dynamic and unpredictable at times. While there is no question that this particular setting demands strong teamwork dynamic and communication skills, the importance of heightened awareness and potential for error in such an environment cannot be emphasized enough. Clearly in our efforts to do no harm, we are placing patients at risk for adverse events. Lingard et al. observed communication events in the operative setting and documented failure 30\% of the time. Of these failures, approximately 36\% resulted in visible consequences such as delay, tension among team members, or procedural error.\textsuperscript{8} These visible consequences only reflect the immediate impact of communication error given the observational nature of this study.

Communication error is addressed in part through the development of the surgical safety checklist. Wiegmann et al. performed another observational study evaluating the effects of disruption on the surgical process. Surgical errors were found to have increased significantly with increased disruptions and that teamwork and communication problems were the strongest predictors of surgical errors.\textsuperscript{9} Catchpole et al. found during observational studies of both simple and complex surgeries that surgeons and surgical teams that had high levels of leadership and management skills and situational awareness were able to complete the operations quicker and with fewer errors than those that had lower teamwork skills.\textsuperscript{10} In their evaluation, they described four major domains which contributed to the overall successful outcome of the operative team (Fig. 1). This model was initially developed for use in the aviation industry, but adapted for use in the medical field as an assessment for the classification of teamwork.

A 2008 RAND report prepared for the Agency for Healthcare Research and Quality (AHRQ) evaluated the evidence base for the ability of teamwork in health care to reduce errors, improve care quality, increase efficiency, and reduce costs. The report cited empirical evidence to support the relationship between teamwork and clinical outcomes, including risk-adjusted mortality, cardiac arrests, adverse events, and complications.\textsuperscript{11} In response, the U.S. Department of Defense working with AHRQ, developed the Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) program. This program has been implemented throughout the active military and federal health care systems.\textsuperscript{12,13} The curriculum focuses on leadership, situation monitoring, mutual support, and communication, with emphasis

![Figure 1: The four domains of behavior associated with the level of OR team function](image-url)
on defining team skills, demonstrating the tools and strategies team members can use to gain proficiency in the competencies/skills, and identification of tools and strategies that can be used to overcome common barriers to achieve desired outcomes.¹⁴

Teams make fewer mistakes than individuals, especially when each team member knows his or her responsibilities, as well as the responsibilities of other team members. However, simply conducting training or installing a team structure does not ensure the team will operate effectively. Teamwork is not solely a consequence of co-locating individuals together. Rather, it depends on a willingness to cooperate, coordinate, and communicate while remaining focused on a shared goal of achieving optimal outcomes for all patients. Teamwork does not require that team members work together on a permanent basis, yet it is sustained by a commitment to a shared set of team knowledge, skills, and attitudes, rather than permanent assignments that carry over from day to day.¹⁵

Of course, the primary purpose of operating room teamwork is to improve patient safety. However, it has also been shown to improve operating room efficiency. Wolf et al. reported on operating room performance after all operating room personnel participated in a one-day intense team training program. Baseline performance metrics were compared 12 and 24 months after the training. There were significant reductions in case delays, equipment issue delays and improved compliance with the SCIP measures after the team training.¹⁶

Clearly, there is evidence to support that teamwork and specific tools to improve communication within operating room teams lead to fewer intra-operative and postoperative adverse events, decreased operative times, and perhaps decreased postoperative mortality. In Flin and Yule’s study of attitudes about teamwork in the operating room, while surgeons viewed their teamwork interaction and respect for colleagues, both surgeons and nurses, as quite high, nurses felt that the level of respect shown to them by surgeons was significantly lower than what the surgeon perceived as they were providing.¹⁷ When asked about their leadership style, the majority of surgeons felt that they had a “collaborative” style. However, the majority of anesthesia providers, surgical trainees and nurses viewed the surgeon’s leadership style as ‘autocratic.’¹⁸ In another study specifically evaluating teamwork in the operating room, only 5% of surgeons felt that they did an inadequate job of explaining the planned procedure to the rest of the team.¹⁹ Remarkably, the rest of the team felt otherwise with 50% of anesthetists and circulating nurse rating surgeons as providing inadequate information. Of all the aspects of teamwork evaluated the greatest measured discrepancy between the surgeon and the rest of the operating room team was establishing a shared mental model of the planned procedure and expected outcome.

Teamwork is clearly critical to error reduction, efficiency, cost reduction, and improved quality regarding patient care. Surgery demands that individuals come together and function as a team and traditionally, the surgeon has taken the leadership role. This mentality may be considered ineffective in the absence of strong nontechnical skills. Without communication from the surgeon regarding operative plan and without the team having a shared mental model, the team cannot perform optimally.

The concept of teamwork and leadership in patient safety is not new. In fact, the hierarchical structure of the surgical training program is designed to allow a graduated level of responsibility. The success of the team is dependent upon each resident knowing his or her role within the team and knowing his or her strengths in that capacity. It should not be seen as a weakness for a resident to acknowledge a deficiency within the team, but as an opportunity for the team to become stronger and safer through this acknowledgement. Ideally, a strong resident leader (chief) should strive to be able to recognize the strengths and weaknesses of their team in order to provide the best patient care.

Team training and leadership development opportunities exist in some, but not all, residency programs. When available, residents should capitalize on such opportunities in order to expand the way they think about leadership. But, formal leadership training is by no means necessary in order to develop these skills. Role models can provide positive and negative examples of leadership behaviors. By taking advantage of the smorgasbord of leadership styles and traits inherent in the faculty of a program, residents have the chance to test out and refine the skills that will help them to develop into successful leaders and effective team members. The structure of the surgical training program, when recognized, can provide an excellent informal education in teamwork and leadership that will undoubtedly positively influence your lives and the lives of your patients.
C. Communication

1. Handoffs

Handoff communication has become a subject of discussion since the implementation of the ACGME duty hour restrictions in 2003 and the subsequent modifications established in 2010. The duty hour restrictions, created in response to a 2008 report from the Institute of Medicine, were designed to protect patients against fatigue-related errors and to enhance the resident learning environment. While intended to simultaneously improve the resident educational experience and patient care, the duty hour restrictions—specifically the limitation in duty hours—resulted in an increase in the number of physician handoffs performed.

Existing studies suggest that poor handoffs lead to worse patient outcomes, including adverse events, increased surgical intensive care unit readmissions, delayed diagnoses, redundant tests, and longer length of stays, leading to higher costs. The Joint Commission identified communication as a root cause in nearly 60% of sentinel events in 2012. Gawande et al found that breakdowns in communication during these handoffs in patient care were the second most common factor reported as contributing to adverse events. Greenberg et al. found that 43% of communication breakdowns occurred with handoffs and suggested that utilizing strategies from other high-risk fields, such as nuclear reactor control rooms, should be adapted for the medical field to address this inadequacy. Specifically, the standardization of content and format, read-backs to ensure the information was correctly received, and the unambiguous transfer of responsibility were suggested interventions to aid in communication breakdown prevention.

The ACGME recognized the risk for error during handoffs and declared structured handoff to be a main priority in 2010 requiring “sponsoring institutions and programs [to] ensure and monitor effective, structured handover processes to facilitate both continuity of care and patient safety. Programs must ensure that residents are competent in communicating with team members in the hand-over process.” What was not included in these requirements was how these requirements are to be met.

Multiple studies have been conducted assessing resident perception of handoffs and proposing means to “standardize” the handoff process. Health care providers estimate that 15% to 70% of medical errors are attributable to communication breakdown or inadequate handoffs. Handoffs are recognized as important and as a learned task; however the different needs of different clinical disciplines make it unlikely that a single tool will adequately meet the needs of every health care team. It is generally agreed upon, however, that training of some kind is necessary and that the tool best suited to a given specialty or training program or health care team should be under continuous evaluation. Training, in fact, has been shown to have direct impact on patient-focused outcomes. Regardless of the specialty or format used, what defines an effective handoff will inevitably vary between specialties preventing the creation of a single handoff tool. It is imperative that physicians be aware of the impact that this process can have on patient care as improvements in communication can impact patient care by decreasing adverse events during transitions in care.

In this era of duty-hour restrictions and a “shift-work” type of mentality, it is imperative that residents view handoffs not simply as the last hurdle to jump at the end of a day (which is tempting), but as a critical safety element in patient care. The handoff is really a team effort, and is not limited to the two (or few) people directly involved at the time of transfer. The plan for each patient should be discussed as a primary team using the most up to date information, and should be clear to all involved. The team should consider the “what if’s” and anticipate questions in order to prepare the receiving team, and consider concrete triggers for an intervention, if necessary. The receiving person (or team) should be engaged in the handoff conversation, also prepared to ask questions and anticipate problems.

One useful mnemonic to help structure handoffs that has been proposed is “SHOUT.” Sick or Not Sick, History and Hospital Course, Objective Data, Upcoming plan/disposition, and To Do, Time for Questions. Like many things in the surgical field, approaching a task in the same way each time ensures that things are not forgotten. Learning to apply this to the handoff process is no exception.

2. Medication Reconciliation

Adverse drug events have been described at times of transition in patient care. The Joint Commission therefore focused one of its 2005 National Patient Safety Goals on the process of medication reconciliation. Medication reconciliation is a three step process of verifying medication use, identifying variances, and rectifying medication errors at interfaces of care. Performing this task can involve checking and re-checking medication lists...
Adverse drug events and medication errors contribute to 20% to 72% of adverse events around the time of hospitalization and 7% to 12% of all permanent disabilities and deaths due to adverse events. Medication errors at the interfaces of care (admission, transfer and discharge) are particularly common, and many of these errors put patients at risk of clinically important harm. One study found that medication errors were reduced by more than 76% when medication reconciliation was implemented at admission, transfer, and discharge. Another study in critical care found that errors at the time of discharge from a critical care unit were virtually eliminated by a reconciliation process.

There has been no standard regarding what constitutes a comprehensive medication history. Additionally, a complete medication list may be difficult to achieve. Patients take a combination of prescription, over-the-counter, vitamins, supplements, and other medications on a scheduled or PRN (as needed) basis. As current health care information is not integrated throughout all health care operations, it is not easy to validate or fill in the gaps from patient-reported information. Patients and family members may not be good historians of a medication record, and due to limited access to pharmacy records, only an incomplete recording of current medications may be obtained. Lau and colleagues compared community pharmacy drug lists with hospitalized patients and found 25% of prescription drugs in use at home were not recorded on the hospital admission record.

Unlike handoff communication, which is focused on the exchange of physician-to-physician information, the communication required to perform medication reconciliation returns our focus to the multidisciplinary nature of medicine. Communication must be facilitated between physicians, nurses, ancillary staff members, and most importantly, patients themselves. It also serves as a tool that can be utilized during transitions in care and provides an opportunity for prevention of adverse drug events.

An accurate medication reconciliation either in the office at the preoperative visit or on admission to the hospital is particularly important for the safety of surgical patients. Important considerations for drug interactions must be made for the safe administration of anesthesia. Close attention should be paid to other important medications that may affect peri-operative outcomes. The postoperative setting, when a patient’s sensorium may be impaired indefinitely, is a poor time to ask them to recall the specifics of important medications. Relying on family members is an option, although not ideal. While residents’ involvement in such preoperative discussions may be sporadic, resident involvement in the discharge process is inevitable. You subsume a substantial responsibility when reconciling and prescribing medications at the time of discharge. Surgical patients leave a highly monitored setting to the less regulated outpatient setting, where your name is attached to any new medications, often narcotics, anticoagulants, or other potentially harmful medications. In this regard, your consideration for patient safety should extend beyond the confines of the inpatient setting. Ensuring the appropriate medication regimen begins at the preoperative visit and depends on a multidisciplinary team for safe transitions throughout the patient experience.

3. Surgical Checklist

The 1999 Institute of Medicine report To Err Is Human put a spotlight on death from preventable medical errors. Surgically related errors are second only to medication errors as the most frequent cause of error-related death. Although many hospitals have ongoing programs to improve medication safety, a specific focus on operating room safety offers another opportunity for error prevention.

Used for decades in many other industries, checklists serve as aid that ensure that essential steps are carried out in the appropriate sequence and allows team members to focus on completing the task at hand or address unexpected situations. The introduction of the World Health Organization Surgical Safety Checklist in 2009 demonstrated the potential impact that checklists have on improving clinical outcomes. The 19-item checklist was introduced in hospitals ranging from the developing world to tertiary care academic centers. Institution of this checklist resulted in significant reductions in both morbidity and mortality in surgical patients. These findings have been reproduced in subsequent studies. While the mechanism of the improvement is unclear, it mandates that team members contribute and communicate, underlying the importance of teamwork in patient care.

Checklists have previously had profound impact when utilized within the medical field prior to being introduced into the operating room. Surgical Care Improvement Project (SCIP) measures, ventilator-associated pneumonia (VAP) reduction measures and central line insertion

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with sources such as patient records, other physicians, pharmacists, and the patients themselves.
bundles are all checklists instituted to ensure that known best practices are followed.\(^4\) Catheter-related bloodstream infections, once an expected risk developed by critically ill patients, are now a rarity after the introduction of the checklist.\(^5,6\) Checklists in surgical procedures are tools to provide a structure for enhanced patient-centered communication between team members. It is a process that levels the playing field and allows all team members to participate. It creates a shared vision for how the operation is to proceed and allows team members the opportunity to question, clarify, and ensure that standards of care are being met.

As led by the airline industry, perioperative services demand high organizational reliability and commitment to reduction of safety-compromising events. The airline industry has a long history of checklist implementation for risk reduction. The aviation checklist provides structure for the communication of critical information to ensure that all team members possess accurate data and that cross checking can occur. The key feature of the preoperative team checklist system is that it would ensure the exchange of pertinent information among all operating room team members; it would supplement rather than supplant existing communication practices within each discipline. It also requires classification of the current patterns of weakness or failure in this communication process, as well as the outcome dimensions that could be measured following a checklist intervention.

In health care, preventable injuries from care have been estimated to affect between three to four \(^3\) of hospital patients.\(^9\) Complications from unintended harm adversely affect patients and their families and increase institutional health care costs.\(^1\) Without the checklist, systems failures portend poor communication, increased team tension, resource waste, inefficiency, and procedural error. Previous studies have shown that use of a comprehensive surgical checklist enhances communication and reduces postoperative complications and death.\(^3,7\)

The checklist is merely one tool in the quality armamentarium. On its own, it yields no power. Several countries have mandated the use of a checklist in an attempt to improve surgical quality. Unfortunately, the regulation of the mandatory implementation of a surgical checklist in Ontario did not result in a significant reduction in surgical morbidity and mortality.\(^11\) More than 90\% of the hospitals opted to adopt a standardized checklist without local modifications. Although it cannot be proven, it is quite possible that the mere implementation of the checklist without modification may represent a lack of teambuilding on the whole and explain the poor results. Surgical quality cannot be affected by the use of independent tools. The change requires people committed to improved communication and teamwork to ensure that everyone feels respected and accountable.

4. Patient Education

Patient education is a critical component of health care and has gained attention particularly following the American Hospital Association’s adoption of the Patients’ Bill of Rights in 1973. The Patients’ Bill of Rights addresses several aspects of patient education including the right to relevant, current, and understandable information about ones’ diagnosis, treatment, and prognosis and the right to discuss and request information related to the specific procedures and/or treatments available, the risks involved, the possible length of recovery, and the medically reasonable alternatives to existing treatments along with their accompanying risks and benefits.\(^1\)

The process of consenting patients for surgical procedures is an ideal opportunity for a meaningful discussion between patients and surgeons in the decision making process. It is also a good time to review the aforementioned areas of patient education and ensure the patient has a good understanding of their diagnosis, proposed treatment, risks and alternatives. Unfortunately, the consent process has evolved into a formal legal process and has lost much of its educational value.\(^2\)

The informed consent process arose from the Nuremberg trials in 1947 to ensure that the atrocities that were committed on human beings in the pursuit of medical research were never repeated. The basic idea of informed consent is that each individual has the right to make decisions affecting his or her well-being.\(^3\) Informed consent means a patient must receive sufficient information to balance the benefits against the risks before consenting to a medical procedure.\(^4\)

Before delivering medical care, physicians are obligated to provide the patient with detailed information on the risks, benefits, and alternatives, including the option to not perform the procedure or treatment regimen and the effect that doing nothing would have on that patient’s health status. Clinicians are also required to inform the patient about any potential clinically significant adverse drug reactions or other concerns when a new medication
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is ordered. It is imperative for the physician to foster an open dialogue with the patient and allow adequate time for discussion, translating key terms to common language and providing commonly asked questions that may put the patient at ease and stimulate further questions. Physicians need to verify understanding by asking patients to restate or recall key elements to ensure that they have an accurate understanding and does not develop unrealistic expectations, which often result in unfair complaints about the practitioner’s care. In a review of 23 studies evaluating surgical patients’ understanding of informed consent, less than one third of studies reported that patients had an adequate understanding of the various aspects of informed consent.

An area often minimized prior to medical care is the recovery period. Prior to treatment, the physician should discuss any limitations or unwelcome surprises that may arise. Often the focus is on early medical issues (for example, pain, possible infection, drainage), but it is valuable for the patient to also understand what life will be like for a longer period of time. Perhaps they will require readily accessible restrooms or will not be able to perform household activities. Finally, physicians will strengthen understanding and reduce potential complaints by including family members or friends in the discussions.

Effective communication is an important factor in patient satisfaction and perceived quality of care second only to clinical skills. Studies have shown that patient satisfaction correlates strongly with the amount of information received. The elderly patient in particular needs effective and empathic communication as an essential component of treatment.

Request for Treatment is a new approach to consenting a patient that facilitates patient-centered care. The physician and patient discuss the same information pertaining to the surgical procedure as in the past, but the patient then takes the consent document and completes it at home in their own words. The patient is required to engage in their care and be able to describe their understanding of the surgical procedure, risks, and alternatives. The physician and patient meet again to discuss errors of understanding or omissions and the document is amended to reflect the patient’s more complete understanding of the procedure, risks and alternatives. Physicians have better insights into what the patients actually were thinking about their treatment and disease and the process helps them refine and improve their communication with patients. Patients have a better understanding of the operation, with any misconceptions addressed and their decision making competence better documented.

In a systematic review of patient education outcomes in surgical procedures from 2004 to 2010, current trends included scheduling education early in the surgical process; increased message exposure through several interventions or reinforcements; addressing postoperative management of care; and measurement of patients’ cognitive, experiential and bio-physiological outcomes.

The review evaluated patient education interventions on format, content and outcome. Format included verbal, written and visual education incorporating booklets, leaflets, DVDs or Internet websites. Content focused on pathology, treatment, exercise, use of devices, surgical procedure, complications, prognosis, pain management, activities of daily living, lifestyle after an operation, and alternatives to standard treatments such as nonpharmacologic strategies to reduce pain and anxiety. Measurement of anxiety, knowledge, pain, and length of stay were among the outcomes most frequently evaluated.

Education scheduled before admission was recommended, with the trend supporting a continuum beginning up to six months before a surgical procedure and continuing as long as three months after the surgical procedure. Several interventions or reinforcements, with sessions lasting 10 to 300 minutes, are reported. Particularly, with the trend toward shorter hospitalizations and family members providing home care, thoroughly addressing postoperative management of patient care is essential. Appropriate follow-up after discharge is important because some information presented preoperatively may be applicable months after an operation and will likely need to be reviewed or reinforced.

A review of literature on surgical patients’ informational needs from 1994 through 2004 revealed that surgical information needed to be given on more than one occasion beginning preoperatively in clinic and continuing through hospitalization and discharge. Also, an awareness of the influence of one’s culture, and that knowledge is situation-specific, was underscored. Acknowledging that patients differ in their learning needs, and in their needs for content, and quantity of information, emphasis should be on evaluating and assessing needs on an individual basis.
The American College of Surgeons provides patients with a “ten questions that patients should ask before their operation” document. Keeping these questions in mind will assist the clinician in framing the discussion; this includes a discussion of the procedure, why it is needed, alternatives, risks, options for anesthesia, preparation for an operation, expected recovery, surgeons experience with the operation, facility accreditation and staffing, and cost of the surgical procedure.\(^{11}\)

Successful exchange of medical information between physician and patient contributes to improved outcomes, reduced treatment time and hospital stay, and reduced morbidity and mortality. A study exploring this issue found that surgeons thought that patients wanted more information on cause and effect, and prognosis of disease. Both surgeons and patients judged symptomology associated with the disease as important. Anatomical considerations were considered less important by both surgeon and patient.\(^{12}\) Patients identified information related to activity, wound care, complications and pain management as highly important.\(^{13}\)

When preparing education materials or discussing surgical procedures with patients, surgeons must consider a patient’s health literacy. Health literacy is defined by the American Medical Association as the “ability to obtain, process and understand basic health information and services needed to make appropriate health decisions and follow instructions for treatment.”\(^{14}\) Unfortunately, a systematic review of informed consent reported the majority of patients studied have an inadequate understanding of the risks and benefits of their surgical procedure.\(^{15}\) Fifty-three percent of adults have an intermediate level of health literacy and 36% fall below this level.\(^{16}\)

The complexity of written educational content for patients must be evaluated. The Flesch Grade Level Readability Formula was developed by Rudolph Flesch and John Kincaid. It evaluates number of words per sentence and average number of syllables per word, and results in a score that indicates grade-school level. Text can be inserted into the calculator to grade the level of difficulty.\(^{17}\) Clinicians must take into consideration that the average adult in the United States reads at a seventh to eighth grade level\(^{18}\) and 14% of the population is illiterate.\(^{19}\)

Residents play a critical role in the delivery of a quality experience for the surgical patient. Compared with a busy attending, the resident may have additional time to spend educating patients, both in the preoperative and postoperative inpatient setting. Often, this extra time spent with patients translates into improved hospital ratings, improved compliance with prescribed regimens, and improved patient satisfaction. Residents should also recognize these teaching moments not as burdensome to the flow of their workday, but as an opportunity to test their own knowledge of the subject, and as an opportunity to learn from their patients. You should be able to provide patients with appropriate, trusted resources where they might go to find further information about their operation or disease process. One such place is the American College of Surgeons website, which contains consent forms for common general surgery procedures and helpful graphics.

### D. PROFESSIONALISM

Professionalism has been variably defined. In fact, it is often defined by its absence, but several definitions have been offered that encompass the breadth of the term fairly well. For instance, the American College of Physicians Foundation, the American Board of Internal Medicine Foundation, and the European Federation of Internal Medicine drafted a Physician Charter that set forth the tenets of medical professionalism as the primacy of patient welfare, patient autonomy, and social justice, as well as the commitment of the profession as a steward of limited and precious resource.\(^{1}\) Subsequently, the American College of Surgeons (ACS) drafted a *Code of Professional Conduct* that begins with, “Professionalism serves as the basis of the social contract between medicine and the society that it serves.” Importantly, the social contract between surgeons and the society it serves is based on trust, namely the trust of the patient in the surgeon’s honesty, integrity, and respect for persons. The *Code of Professional Conduct* lists and clearly articulates the behaviors that define professionalism as a surgeon and the requisite personal qualities therein. A few of these behaviors deserve special mention with respect to patient safety:

- Be sensitive and respectful of patients, understanding their vulnerability during the perioperative period.
- Respect the knowledge, dignity, and perspective of other health care professionals.
- Improve care by evaluating its processes and outcomes.

It has been noted that surgeons have long served as leaders in patient safety.\(^{3}\) No other relationship is like that...
Communication and Culture

of surgeon and patient. The implicit trust in the surgeon is unquantifiable, and the vulnerability of the patient is profound. For these reasons, professionalism as defined means that the surgeon is the principal guardian of the patient’s safety, and professionalism for the surgeon includes safe patient care.

In the course of caring for a patient, several opportunities exist to interact with other health care professionals, including nurses, specialists from other fields, or other surgeons. Considering the increasingly complex and sometimes chaotic environment in which we function, the delivery of safe patient care relies on the respectful interaction and effective communication between individuals with a mutual goal. Nowhere in the health care arena is this more important than in the operating room. It has been shown that unprofessional behavior by surgeons negatively affects morale and hampers the effectiveness of those caring for the patient. As high as 60% of preventable medical errors can ultimately be linked to a failure in communication. Abusive, disruptive, or disrespectful behavior undermines the interaction and communication between professionals and ultimately leads to a less than optimal outcome for the patient. In essence, the ultimate victim of a lack of professionalism is the patient.

Surgeons are in a unique position to analyze outcomes, in that complications and poor results are often apparent soon after intervention. This is perhaps no more evident than in the practice of introspection during the morbidity and mortality conference. Surgeons take a look through the retrospectoscope when assessing sub-optimal outcomes. From a sociological perspective, the M&M conference has been described as a forum for surgeons to demonstrate professionalism in accepting responsibility and seeking to improve. The ACS has moved to standardize and improve examination of outcomes through its National Surgical Quality Improvement Program (ACS NSQIP). It has been shown that traditional morbidity and mortality methods identify fewer complications compared with ACS NSQIP collection methods. There is room for improvement in assessing outcomes and such assessment should be continuous for the sake of patient safety and the expectations of surgical professionalism.

In summary, the definition of professionalism is broad, but many of the key components of professional behavior by surgeons have a direct effect on safe patient care. First among these is the unique relationship between patient and surgeon. The potential for harm is ever present in surgical procedures, and the surgeon is the custodian of patient safety. For this reason, the surgeons should always seek to protect the patient and do everything possible to ensure an optimal outcome, including effective collaboration with other multi-disciplinary professionals. Finally, professionalism demands constant assessment of outcomes with the goal of continual improvement to deliver effective, and most importantly, safe patient care.

RECOMMENDED RESOURCES

There are multiple and creative methods to assist and educate patients from frequently asked questions, to video clips.

Examples

Hiatal hernia repair surgery (5:29)
https://www.google.com/search?q=You+tube+Hernia-hiatal+hernia+Repair+surgery+pre-op+patient+education&amp;sourceid=ie7
Abusive, disruptive, or disrespectful behavior undermines the interaction and communication between professionals and ultimately leads to a less than optimal outcome for the patient. In essence, the ultimate victim of a lack of professionalism is the patient.

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In summary, the definition of professionalism is broad, but many of the key components of professional behavior by surgeons have a direct effect on safe patient care. First among these is the unique relationship between patient
Practice-Based Learning and Improvement and Clinical Quality Improvement Measures

OBJECTIVES

At the end of this section, the learner should be able to:

• Understand the purpose of the Quality In-Training Initiative
• Develop an approach to a quality improvement project
• Appreciate the importance of the “minor” complications to patient well-being and health care expenditures

A. CLINICAL MEASURES

In order to improve the quality of surgical care provided to patients across multiple institutions, the Centers for Medicare and Medicaid Services, in partnership with multiple other organizations, has identified certain costly complications as potential targets for universal quality improvement. The events are considered preventable due to wide variation in occurrence rates across institutions. On the whole, these measures include both uncommon events that are devastating to individuals, like wrong-sited surgery, and common occurrences that, en masse, are unpleasant for the individuals and costly to society, such as surgical site infections.

Measures can be generic and apply to all patients, specialty specific and apply only to surgical patients, and procedure specific. These measures are frequently the surgical risks that we don’t typically think to discuss during the informed consent process. Generic clinical measures include items like deep vein thrombosis, pulmonary embolism, ventilator-associated pneumonia and sepsis. Surgery specific measures include surgical site infections, postoperative bleeding, and death following a complication of a surgical procedure. Procedure specific complications include measures like anastomotic leak following a colon resection or a laryngeal nerve injury following a thyroidectomy.

Each hospital has its own safety profile. As a result residents in different hospitals might learn to practice surgical procedures differently. To this end, learning to evaluate the training that you are receiving through an assessment of the hospital’s performance will be important to your future ability to provide optimal care for your patients. You should make sure that you review your departments profile to understand the strengths and weaknesses in comparison to other institutions. You should consider multiple sources of data so that you can get an accurate picture of the quality of care provided to your patients while understanding the differences in the sources of data that you examine.

In this edition of the Practical Quality Improvement Manual, we will review the details of three clinical measures with prompts for you to consider how you could approach each of these issues if you have a local problem. The approach to the other clinical measures may be similar and so you can extrapolate the information in the manual to other events once you understand the basic principles. Here we will review venous thrombotic events, catheter associated urinary tract infection and hospital readmissions.

1. Venous Thromboembolism

OBJECTIVES

At the end of this section, the learner should be able to:

• Describe the epidemiology of venous thromboembolic events (VTE)
• Delineate the proper approach to the assessment of patient risk for VTE
• Prescribe the appropriate VTE prophylaxis for patients
• Develop a plan for a quality improvement project using this module as a template to address other problems

Venous thromboembolism (VTE) is a common cause of preventable death in hospitalized patients. Each year in the U.S., deep venous thrombosis (DVT) occurs in 2.5 million people, with pulmonary embolism (PE) occurring in approximately 700,000 people. Across all specialties, surgical procedures are associated with an increased risk of thrombosis, and those undergoing an operation for oncologic indications are at even higher risk. In the U.S., it is estimated that one-third of VTE-related deaths (150,000 to 200,000) occur following a surgical procedure. Prior to the widespread use of prophylaxis, PE accounted for as many as 5% of postoperative deaths.

To appreciate the significance of the impact of VTE, take into account that postoperative VTE has been cited as the most common cause of preventable hospital death, the second most common medical complication, the second most common cause of excess length of stay (LOS), and the third most common cause of excess mortality and excess charges. DVTs may increase hospital
LOS by two to five days resulting in additional costs of approximately $7,500, while PE can increase hospital LOS more than five days, resulting in an ICU admission, and incur additional costs upward $10,000. These events have significant implications to the patient in terms of additional morbidity, mortality, additional medications and their costs, protracted hospital stays, and delayed return to work, just to name a few. They additionally have significant impact for the physicians and institution, as the incidence of VTE is increasingly being used as a quality measure with negative implications for reimbursement.

Without prophylaxis the risk of VTE following a major surgical procedure is 20%, with a 1% to 2% risk of PE and a rate of fatal PE in the 0.1% to 0.4% range. As such, the optimal treatment of thromboembolism is prevention. Understanding appropriate and effective thromboprophylaxis is essential to curbing the incidence of postoperative VTE.

a. Risk Factors/Stratification

One of the essential components of appropriate and effective thromboprophylaxis is the ability to understand the risk factors in various groups and to be able to stratify patients, as this will affect the evidence-based recommendations regarding agents and methods for thromboprophylaxis. There are two commonly used VTE risk classification schemes and they are included below (Figure 1, Figure 2).\(^{11,12}\)

Table 1: ACS/NSQIP Standardized Definition of Venous Thromboembolic Event (or Vein Thrombosis Requiring Therapy)

<table>
<thead>
<tr>
<th>Definition:</th>
<th>New diagnosis of blood clot or thrombus within the venous system (superficial or deep) which may be coupled with inflammation and requires treatment.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criteria:</td>
<td>Must be noted within 30 days after the principal operative procedure AND one of the following A or B below:</td>
</tr>
<tr>
<td>A. New Diagnosis of a [new] venous thrombosis (superficial or deep), confirmed by a duplex, venogram, CT scan, or any other definitive imaging modality (including direct pathology examination such as autopsy) AND the patient must be treated with anticoagulation therapy and/or placement of a vena cava filter or clipping of the vena cava, or the record indicates that treatment was warranted but there was no additional appropriate treatment option available.</td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td>B. As per (A) above, but the patient or decisionmaker has refused treatment.</td>
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</tbody>
</table>

Note. Quality Improvement Pearl—When you are using this information to help providers risk stratify their patients (so that they provide appropriate care), make it easy for them. Most surgeons do not want to be schooled about the risk stratification system. Make a handout with the information in case they are interested but make it separate from the risk stratification tool. Take 5 minutes at a departmental or divisional meeting to introduce the problem and the project so that you can get feedback and raise awareness of the problem. Make sure to share local data to make it relevant to the audience. Make the tool easy, check boxes and then an obvious therapy once a score has been assigned. Make sure to trial it in paper form before you have your IT team build the software as it will be easier to adapt quickly if you have complete control until you have it done correctly. Make sure to include basic considerations regarding contraindications to recommended therapy.

These models can be used to calculate a risk score for each individual patient. That information can then be utilized to classify a given patient’s VTE risk category as demonstrated below. These models take into account the intrinsic difference in risk of VTE between different surgical procedures (Figure 3).
b. Thromboprophylaxis Strategies

There are numerous tools at the disposal of the clinician to prevent VTE. There are mechanical prophylaxis options such as elastic stockings (ES) and intermittent pneumatic compression (IPC) devices. From a pharmacologic standpoint, the options include low-molecular weight heparin (LMWH) or low-dose unfractionated heparin (LDUH), fondaparinux, and low-dose aspirin. From an interventional perspective, inferior vena cava (IVC) filters are another instrument available to clinicians in the appropriate clinical circumstance. Guidelines have evolved as evidence-based studies, reviews and consensus statements have guided best-practices. The latest iteration of the American College of Chest Physicians (ACCP) guidelines regarding prevention and treatment of VTE were released in 2012. Guidelines regarding prophylaxis in the care of nonorthopedic surgical patients are included in Appendix 1. For comprehensive details regarding the latest recommendations, one can refer to the executive summary included in the selected readings or access the guidelines from the ACCP website, which were all released in a February 2012 supplemental edition of the journal CHEST. An abbreviated reference for thromboprophylaxis recommendations is included below (Figure 4).

When implementing thromboprophylaxis prevention measures, particularly pharmacologic interventions, particular attention must be paid to the patient’s risk factors for bleeding and therapy should be individualized and tailored accordingly. A summary of risk factors for major bleeding complications from the ACCP 9th edition prophylaxis guidelines is included below (Figure 5).

c. Clinical Case-Based Application

Figure 6 is a graph of our ACS NSQIP Postop VTE rates by Quarter (Hershey Medical Center Unadjusted Data). The blue bars represent the DVT rate, while the red bars represent the PE rate. The green line is a ACS NSQIP national estimate. Please feel free to substitute your own institution’s data in this location. Based on this data, how would you organize an effort to improve our institutional VTE rates? The goal of this exercise is to use this clinical scenario to organize and institute a hypothetical plan to address the institution’s high incidence of VTE compared with national averages.

Alternatively, one can use the following scenario to prompt discussion and carry out this exercise:

You are a general surgery resident on a large surgical service and have just finished a long day in the OR. The team is scattered finishing up various tasks from the day and you are working on discharging a patient. You know the patient well because he has had a very complicated hospital course and you’re glad he will finally get to go home. While filling out the discharge paperwork, the nurse notifies you that the patient has suddenly started complaining of shortness of breath and chest pain. You go to examine the patient and are immediately concerned the patient has a PE. You ask the patient if he has been wearing his TPCs and he tells you they are too uncomfortable. You order the appropriate workup and the results demonstrate a left-sided PE and DVT in the right lower extremity. You cancel the discharge and start treatment for this patient.
Practice-Based Learning and Improvement and Clinical Quality Improvement Measures

Figure 2: Caprini model of risk assessment (1, 12)

<table>
<thead>
<tr>
<th>Table 7—Caprini Risk Assessment Model</th>
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<tbody>
<tr>
<td>1 Point</td>
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<tr>
<td>Age ≥ 61 y</td>
</tr>
<tr>
<td>Minor surgery</td>
</tr>
<tr>
<td>BMI &gt; 35 kg/m²</td>
</tr>
<tr>
<td>Swollen legs</td>
</tr>
<tr>
<td>Varicose veins</td>
</tr>
<tr>
<td>Pregnancy or postpartum</td>
</tr>
<tr>
<td>History of unexplained or recurrent spontaneous abortion</td>
</tr>
<tr>
<td>Oral contraceptives or hormone replacement</td>
</tr>
<tr>
<td>Sehritis (&lt; 1 mo)</td>
</tr>
<tr>
<td>Serious lung disease, including pneumonia (&lt; 1 mo)</td>
</tr>
<tr>
<td>Abnormal pulmonary function</td>
</tr>
<tr>
<td>Acute myocardial infarction</td>
</tr>
<tr>
<td>Congestive heart failure (&lt; 1 mo)</td>
</tr>
<tr>
<td>History of inflammatory bowel disease</td>
</tr>
<tr>
<td>Medical patient at bed rest</td>
</tr>
<tr>
<td>2 Points</td>
</tr>
<tr>
<td>Age ≥ 75 y</td>
</tr>
<tr>
<td>Major open surgery (&gt; 45 min)</td>
</tr>
<tr>
<td>Laparoscopic surgery (&gt; 45 min)</td>
</tr>
<tr>
<td>Varicose veins</td>
</tr>
<tr>
<td>Pregnancy or postpartum</td>
</tr>
<tr>
<td>History of unexplained or recurrent spontaneous abortion</td>
</tr>
<tr>
<td>Oral contraceptives or hormone replacement</td>
</tr>
<tr>
<td>Sehritis (&lt; 1 mo)</td>
</tr>
<tr>
<td>Serious lung disease, including pneumonia (&lt; 1 mo)</td>
</tr>
<tr>
<td>Abnormal pulmonary function</td>
</tr>
<tr>
<td>Acute myocardial infarction</td>
</tr>
<tr>
<td>Congestive heart failure (&lt; 1 mo)</td>
</tr>
<tr>
<td>History of inflammatory bowel disease</td>
</tr>
<tr>
<td>Medical patient at bed rest</td>
</tr>
<tr>
<td>3 Points</td>
</tr>
<tr>
<td>Stroke (&lt; 1 mo)</td>
</tr>
<tr>
<td>Family history of VTE</td>
</tr>
<tr>
<td>Hip, pelvis, or leg fracture</td>
</tr>
<tr>
<td>Factor V Leiden</td>
</tr>
<tr>
<td>Acute spinal cord injury (&lt; 1 mo)</td>
</tr>
<tr>
<td>5 Points</td>
</tr>
<tr>
<td>Elective arthroplasty</td>
</tr>
<tr>
<td>Prothrombin 20210A</td>
</tr>
<tr>
<td>Lupus anticoagulant</td>
</tr>
<tr>
<td>Anticardiolipin antibodies</td>
</tr>
<tr>
<td>Elevated serum homocysteine</td>
</tr>
<tr>
<td>Heparin-induced thrombocytopenia</td>
</tr>
<tr>
<td>Other congenital or acquired</td>
</tr>
<tr>
<td>Other congenital or acquired</td>
</tr>
<tr>
<td>Other congenital or acquired</td>
</tr>
<tr>
<td>Elevated serum homocysteine</td>
</tr>
</tbody>
</table>

Figure 3: ACCP 9th edition classification of VTE risk categories (1)

<table>
<thead>
<tr>
<th>Table 8—Risk Stratification for VTE in General, Abdominal-Pelvic, Bariatric, Vascular, and Plastic and Reconstructive Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients Undergoing Major General, Thoracic, or Vascular Surgery</td>
</tr>
<tr>
<td>ATIVTE Risk Category</td>
</tr>
<tr>
<td>Roger Score</td>
</tr>
<tr>
<td>Very Low</td>
</tr>
<tr>
<td>Low</td>
</tr>
<tr>
<td>Moderate</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>High</td>
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<td></td>
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</tbody>
</table>

This is the second patient this month to develop a PE on this surgical service and you wonder if this was preventable. You begin reviewing the patient’s chart for a likely cause. You discover that the patient’s subcutaneous heparin was held when the patient went to the interventional radiology suite to have a percutaneous drain placed two days ago. You thought the team had restarted the patient’s VTE prophylaxis after the procedure but nobody did. The patient had been 48 hours without blood thinners prior to developing the PE.

Be sure to discuss the following: In a quality improvement scenario, what would the aim be here? What would you measure to assess the situation? Identify one change that might be worth testing?
Considerations:
- Individuals present should be divided into equal groups.
- They should be provided with 15 minutes to develop a comprehensive plan to address the higher than expected incidence of VTE and then another 15 minutes to discuss their individual group plans in a larger group setting.
- They should be sure to identify the different stakeholders and the anticipated team members that would be involved to lead this effort.
- They should identify what interventions will be pursued.
- They should specify a timeframe in which these interventions will be implemented.
- They should specify an outcome measure and what degree of improvement will be sought during the specified time interval.
- They should discuss how education will be implemented for their new proposed changes.
- They should discuss how to implement a system to monitor results and ensure continued compliance and improvement and reassessment over time.

d. Discussion
A very frequently used strategy to address quality improvement issues is a simple four-step Plan-Do-Check (or Study)-Act (or Adjust) (PDCA or PDSA) cycle:

Plan
- Establish the objectives and processes necessary to deliver results in accordance with target goals.
- How many of our cases were receiving ACCP guideline-direct DVT/PE prophylaxis? Or what was our range of compliance?
- Filter results by groups. Examine data to see if there are groups who have better or worse success than others, are they doing anything differently?
- Assess available resources for potential effort to improve.
- Decide on approach (such as revised paper documentation or computer entry order).
- Many groups will recommend the implementation of an order set or risk stratification system to streamline and organize care. It is important that the order sets be mandatory, simple to use and not labor intensive for this strategy to be successful and useful.
- Identify DVT/PE reduction as an organizational priority and set performance goals for your hospital.
- For any project to be successful, the key stakeholder groups need to be identified and involved in the conception, design, implementation and follow up of any project.
- Assemble a multidisciplinary team to include physicians, nursing, pharmacy, administrators, IT, executives.

Do
- Disseminate information about appropriate DVT/PE prophylaxis rates.
- Implement mandatory risk stratification, implement electronic or paper order sets.
- Provide resources necessary to implement change (in other words, IT tech support for EMR order set changes).
**Practice-Based Learning and Improvement and Clinical Quality Improvement Measures**

- Mandate compliance to your VTE prophylaxis protocol and empower staff for accountability.
- Evaluate patients on admission and daily for appropriate DVT/PE prophylaxis.
- Promote highest level of patient activity tolerated, evaluating daily for potential to advance activity level.
- Make sure team members communicate with each other when DVT prophylaxis is suspended for whatever reason, and make sure to readdress at AM rounds whether restarting or continuing to hold more appropriate based on clinical scenario.
- Provide education and feedback to all stakeholders including patients and families.
- Implement best practices learned from others (See IX. Suggestions for Good Clinical Practice).
- Collect data.

**Check/Study**

- Conduct data analysis and performance reports.
- Assess results and determine if goals were met.
- Identify barriers to compliance and/or implementation.
- Communicate performance to leadership, staff and team. Highlight successes, identify problems early.

**Act/Adjust**

- Routinely review and analyze your hospital’s DVT/PE rates and outcomes and compare with internal and external benchmarks.
- Reassess to determine if reaching target goals.
- This is a cycle and any issues identified here would lead back into the Plan part of the cycle and the process repeats.

**e. Conclusions**

VTE is an important postoperative potentially preventable complication which causes significant morbidity and increased risk of mortality to the patient. It is additionally associated with increased LOS and costs of hospitalization and is being increasingly used as a quality measure for hospitals with negative financial reimbursement implications.

Even with perfect compliance with thromboprophylaxis, some patients will still develop VTE. Therefore, the goal is to reduce the risk for potentially preventable VTE and we should strive for 100% compliance with tailoring appropriate thromboprophylactic measures for differently risk-stratified groups of patients.

In many institutions, including our own, once a higher than expected incidence of a given complication (in this scenario VTE) was identified a multi-disciplinary and collaborative initiative was established to address the issue. The collaborative worked to identify the scope of the problem, identify best-practices used at other institutions or other successful models, and extrapolate key initiatives that could be implemented within our hospital system. In this scenario this involved education and collaboration for the patient, nurses, physicians and other health care providers regarding the risks, costs, and best practices in thromboprophylaxis. Additionally, it involved the addition of a mandatory risk assessment tied to the electronic medical record for every patient. To ensure compliance, reasons specifying contraindications to VTE prophylaxis must be entered if pharmacologic VTE prophylaxis is not entered or sought. Additionally, there are safe guards from the pharmacist to ensure appropriate dosing based on patient’s body weight and manufacturer guidelines. There also had to be coordination with social work/care coordination for those patients who required ongoing thromboprophylaxis on an outpatient basis, such as surgical oncology patients. Results are continually tracked and addressed through Morbidity and Mortality conferences, grand rounds, and ACS NSQIP-generated reports so that there is continued feedback for the process. This allows for promotion of sustainability and provides ample opportunities for reassessment and redirection where necessary if quality measures are not meeting goals. Our post implementation results are as follows:

Quality data from your institution can be reviewed for any number of complications. ACS NSQIP provides a standardized reporting scheme, which can allow for comparisons between institutional and national data and benchmarks. Ultimately, for any project to be successful, input and collaboration and the consensus that said complication is an institutional priority from all stakeholders is essential. Specific goals and timeframes should be established. Strategies should be individualized to a hospital's budget and available resources. A mechanism for surveillance of outcomes and reassessment of strategies should be incorporated into all quality improvement initiatives.
f. Suggestions for Good Clinical Practice

The following are general considerations for good clinical practice and apply to thromboprophylaxis in all surgical groups and are derived from the VTE guidelines in nonorthopedic surgical patients from the ACCP 9th Edition VTE guidelines.

It may be advisable for every institution to have a formal, written policy for preventing VTE in surgical patients.

Adherence with IPC often is less than optimal, therefore should be monitored actively. Portable, battery-powered devices capable of recording and reporting proper wear time may facilitate monitoring. Efforts should be made to achieve at least 18h of use daily.

Proper fit and adherence with elastic stockings is necessary to ensure efficacy. The correct pressure at the ankle level for primary prophylaxis is an18–23 mm Hg, which is lower than for therapeutic stockings used to treat post-thrombotic syndrome (30–40 mm Hg). Based on indirect evidence from patients with stroke, we favor thigh-high elastic stockings over calf-high stockings.

Relative contraindications to IPC and elastic stockings include dermatitis, skin breakdown, or ulceration; peripheral vascular disease; lower-extremity bypass procedure; and lower-extremity trauma with plaster cast. Unilateral compression in an unaffected limb should not be used as the sole means of prophylaxis.

In the overwhelming majority of trials that demonstrated efficacy, LDUH and LMWH were given 2 h preoperatively, although LMWH appears to be effective and is possibly associated with a lower risk of bleeding when the first dose is given 12 hours preoperatively.

When using pharmacologic prophylaxis, we suggest following the manufacturer’s recommendations for dosing. It may be prudent to consult with a pharmacist regarding dosing in bariatric surgery patients and other patients who are obese who may require higher doses of LDUH and LMWH.

RECOMMENDED READING


2. Urinary Tract Infection (Whipple with Epidural)

OBJECTIVES

At the end of this section, the learner should be able to:

- Identify the appropriate uses and indications for indwelling urinary catheters based on CDC guidelines.
- Appreciate that data within the literature supports early removal of indwelling urinary catheters in multiple conditions previously thought to necessitate prolonged urinary drainage (for example, patients with epidurals or following low pelvic surgery).
- Understand that the length of time an indwelling catheter is in place directly correlates with the risk of CAUTI.

Consider the following clinical scenario:

You are the intern on the surgical oncology service and are taking care of a 65-year-old female who is postoperative day five from a Whipple procedure for pancreatic adenocarcinoma. The patient has had a relatively unremarkable postoperative course, but this morning the nurse calls you and states your patient has a fever of 38.7°C. You go to examine the patient. She has an epidural in place which was capped by the Pain Service earlier today. There is no erythema surrounding the entrance site. The patient’s incision is clean and dry, also without any signs of cellulitis or surgical site infection. The patient still has a foley catheter in place. Your chief resident told the team to keep the foley as...
long as the patient had her epidural. You decide to do a fever workup with blood and urine cultures and chest X ray. Later that evening you get a call from the lab that the patient’s urine culture is growing gam negative rods. Your team starts the patient on antibiotics for a catheter-associated UTI.

**A. Background**

Indwelling urinary catheters (IUCs) account for 80% of nosocomial urinary tract infections (UTIs) and are a leading cause of morbidity in acute care settings. Catheter-associated bacteria is further estimated to directly cause 13% of deaths related to nosocomial infections in the United States. A single UTI can cost upward of $12,000 and can prolong hospitalization by an average of 2.5 days. These astounding numbers are especially true in surgical patients, in whom IUCs are frequently placed during the perioperative period. The standardized ACS/NSQIP UTI definition is listed in Table 1.

In 2005, the Surgical Care Improvement Project (SCIP) was launched with the goal of a 25% reduction in surgical complications by the year 2010. SCIP utilizes evidence-based medicine along with a multi-disciplinary approach to establish surgical practice guidelines for reducing postoperative complications. In 2009, SCIP Inf-9 was added to these guidelines, recommending that all IUCs placed at the time of a surgical procedure be removed by postoperative day two (POD 2). To meet compliance with SCIP Inf-9 guidelines, a patient must have their IUC removed on or before POD2 or meet exemption criteria. Patients can be deemed exempt from SCIP Inf-9 if there is appropriate documentation from a physician stating both the necessity and justification of leaving the catheter in place (Table 2).

**B. Clinical-Based Application**

A single-institution case-control study investigated the correlation between SCIP Inf-9 compliance and rate of postoperative UTI as well as the association between UTI rate and SCIP Inf-9 exemption status. The study showed increased SCIP Inf-9 compliance over time. As time moved forward, nurses and surgical staff became aware of the new guideline and were trained on the importance of timely and well-documented postoperative removal of IUCs. During this same time frame, however, the postoperative UTI rate showed little improvement. The majority of postoperative patients who developed UTI were deemed SCIP Inf-9 exempt by their surgeon, and thus, their IUCs were not removed within 48 hours following an operation. Although SCIP Inf-9 compliance rates...

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**Table 1: ACS/NSQIP Standardized Definition of Urinary Tract Infection (UTI)**

<table>
<thead>
<tr>
<th>Definition</th>
<th>An infection in the urinary tract (kidneys, ureters, bladder, and urethra).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criteria:</td>
<td>Must be noted within 30 days after the principal operative procedure AND patient must meet ONE of the following A OR B below:</td>
</tr>
<tr>
<td>A:</td>
<td>ONE of the following six criteria:</td>
</tr>
<tr>
<td></td>
<td>• fever (&gt;38°C or 100.4°F)</td>
</tr>
<tr>
<td></td>
<td>• urgency</td>
</tr>
<tr>
<td></td>
<td>• frequency</td>
</tr>
<tr>
<td></td>
<td>• dysuria</td>
</tr>
<tr>
<td></td>
<td>• suprapubic tenderness</td>
</tr>
<tr>
<td></td>
<td>• costovertebral angle pain or tenderness</td>
</tr>
<tr>
<td>AND</td>
<td>A urine culture of &gt; 100,000 colonies/ml urine with no more than two species of organisms</td>
</tr>
<tr>
<td>OR</td>
<td>TWO of the following six criteria:</td>
</tr>
<tr>
<td></td>
<td>• fever (&gt;38°C or 100.4°F)</td>
</tr>
<tr>
<td></td>
<td>• urgency</td>
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<tr>
<td></td>
<td>• frequency</td>
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<td>• dysuria</td>
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<td></td>
<td>• suprapubic tenderness</td>
</tr>
<tr>
<td></td>
<td>• costovertebral angle pain or tenderness</td>
</tr>
<tr>
<td>AND</td>
<td>At least one of the following:</td>
</tr>
<tr>
<td></td>
<td>• Dipstick test positive for leukocyte esterase and/or nitrate</td>
</tr>
<tr>
<td></td>
<td>• Pyuria (&gt;10 WBCs/mm3 or &gt; 3 WBC/hpf of unspun urine)</td>
</tr>
<tr>
<td></td>
<td>• Organisms seen on Gram stain of unspun urine</td>
</tr>
<tr>
<td></td>
<td>• Two urine cultures with repeated isolation of the same uropathogen with &gt;100,000 colonies/ml urine in non-voided specimen</td>
</tr>
<tr>
<td></td>
<td>• Urine culture with &lt; 100,000 colonies/ml urine of single uropathogen in patient being treated with appropriate antimicrobial therapy</td>
</tr>
<tr>
<td></td>
<td>• Physician’s diagnosis</td>
</tr>
<tr>
<td></td>
<td>• Physician institutes appropriate antimicrobial therapy</td>
</tr>
</tbody>
</table>
between the two groups were not statistically different, when compared with the control group, the UTI case group had an exemption rate, which was more than three times higher. In fact, more than 70% of the patients who developed postoperative UTIs were theoretically exempt from SCIP Inf-9.

When a patient’s IUC remains greater than 48 hours postoperatively (in other words, noncompliant), but is then deemed SCIP Inf-9 exempt by their surgeon, the chart is marked as compliant by a reviewer. This creates a false sense of improved patient care without true improvement in our practice. Consequently, there has been little change in patient outcomes. The odds of postoperative UTI were nearly eight-times higher among the group of patients who were exempt when compared with the nonexempt group alone. It can be argued that surgeons are missing out on a critical opportunity to potentially prevent UTIs in a majority of postoperative patients.

The most common exemption criterion cited was the presence of an epidural catheter. More than one-quarter of catheter-associated UTIs were in patients whose catheters were maintained secondary to epidural analgesia. Less than 8% of control patients were deemed exempt for this reason. The appropriate duration for maintaining IUCs in patients with epidural analgesia remains controversial. Urinary retention among postoperative patients with epidural analgesia has been reported to be as high as 23% to 29%. Conversely, one series which focused specifically on colorectal surgery patients reported a 10% urinary retention rate among patients with thoracic epidural analgesia, compared with 1% for patients receiving parenteral opioids. Because the rate of urinary retention among patients with epidural analgesia is debatable, many physicians elect to leave in IUCs as long as the patient has an epidural. It has been documented that lumbar epidurals are more likely to lead to urinary retention, however one randomized controlled trial reports that early removal (POD#1) of IUCs in patients with thoracic epidurals is associated with a significantly lower UTI rate, and, in fact, it does not lead to a higher rate of re-catheterization.

Quality Improvement Pearl—Quality improvement requires multidisciplinary team work. In order to address the specific issue of UTI in patients who require epidural analgesia a multidisciplinary team should be convened including pharmacy, nursing, anesthesiologist from the OR and anesthesiologists from the pain service, and surgeons.

The other reasons for SCIP Inf-9 exemption within our review included low pelvic dissection, critical illness, preoperative indwelling IUC, and other reasons related to monitoring urine output. Maintaining postoperative IUCs for the purposes of monitoring renal function and fluid balances in critically-ill patients, as well as following urologic procedures, is justified. However, prolonged IUC following nonurologic cases of low pelvic surgery remains debatable. A trial investigating removal of IUCs on POD#1 versus POD#5 following rectal resection concluded that

### Table 2: SCIP Inf-9 Guidelines

<table>
<thead>
<tr>
<th>Expectation</th>
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<tbody>
<tr>
<td><strong>SCIP Inf-9:</strong> Urinary catheter removed on Postoperative Day 1 (POD 1) or Postoperative Day 2 (POD 2) with the day of Anesthesia End Date being day zero (POD 0)</td>
</tr>
<tr>
<td><strong>Includes:</strong> All selected surgical patients with a catheter which was in place peri-operatively and remains in place immediately post-operatively.</td>
</tr>
<tr>
<td><strong>Excludes:</strong></td>
</tr>
<tr>
<td>- Laparoscopic, gynecological, perineal procedures</td>
</tr>
<tr>
<td>- Procedures requiring general or spinal anesthesia that occurred within 3 days (4 days for CABG or other cardiac surgery) prior to or after the procedure of interest</td>
</tr>
<tr>
<td>- Length of stay less than 2 days</td>
</tr>
<tr>
<td>- Patient who have and indwelling catheter (urethral or suprapubic) or intermittent catheterization prior to admission or prior to surgery</td>
</tr>
<tr>
<td>- Documentation by an MD or PA of a reason for not removing the catheter postoperatively</td>
</tr>
<tr>
<td>- Patients with documented preoperative infection</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Documentation Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Documentation that the urinary catheter was removed on POD 1 or POD 2.</td>
</tr>
<tr>
<td>-OR-</td>
</tr>
<tr>
<td>Reason for not removing the catheter postoperatively is documented clearly in the medical record.</td>
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</table>

**IF the catheter is removed by POD 2, the measure will PASS**

**IF the catheter is not removed by POD 2, and a medical reason for leaving it in is not documented, the measure will FAIL.**
prolonged IUC should only be reserved for resection of low rectal carcinoma; otherwise urinary catheterization should be discontinued on the first day after an operation.\textsuperscript{19,20} In addition to being deemed exempt from SCIP Inf-9, patients within the study who developed postoperative UTIs were more likely to be older females. There is evidence within the literature which states 83\% of bacteremias secondary to nosocomial UTIs and 95\% of deaths attributed to complications of UTIs occurred in patients older than fifty years.\textsuperscript{6} Additionally, patients who underwent pancreatic surgery were also more likely to develop UTIs. This is likely attributed to the fact that a majority of our pancreatic surgery patients received epidurals for postoperative analgesia. This data further supports the notion that surgeons especially need to keep in mind patient-specific demographics and risk factors when deciding whether or not to delay removal of IUCs following a surgical procedure.

The risk for UTI increases 5\% to 10\% per day of bladder catheterization, and the acquisition of UTI associated with an IUC has been linked to a threefold greater risk of mortality in hospitalized patients.\textsuperscript{6,20} Thus, some surgeons propose that all IUCs be removed on POD\#1, and exceptions should be reserved for situations like urologic surgery or sedated and critically-ill patients. Furthermore, many suggest that epidural analgesia no longer be allowed as a SCIP Inf-9 exemption criterion, and thus maintaining IUCs beyond 48-hours for this reason alone would result in the case being deemed noncompliant. The decreased flexibility of SCIP Inf-9 exemption criteria would encourage surgeons to think about patient-specific risk factors and the true necessity and accompanying risk of prolonged IUCs following an operation.

C. Discussion

Based upon the results of the aforementioned study, one institution has developed an Indwelling Urinary Catheter Protocol (Figure 1) and a Urinary Retention Protocol (Figure 2). A daily nursing checklist was also created based on CDC guidelines for appropriate usage of IUCs (Figure 3). These protocols and checklists are being

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{indwelling_catheter_protocol}
\caption{Indwelling Urinary Catheter (IUC) Protocol}
\end{figure}
implemented within electronic postoperative order sets as an effort to truly change our institutional practices and limit the ability for individual physicians to exempt their patients from important quality measures such as SCIP Inf-9. Postoperative order sets within electronic medical records automatically instruct the nurse to remove the IUC on POD#1. If the surgeon wishes to continue the IUC, they must opt-out of this option and document an appropriate reason for exemption. Integrating technology of the electronic medical record with process improvement measures such as SCIP should be a tool which is utilized to implement quality measures within the health care system.

Development of new protocols, even when used for quality improvement, is not easy and does not happen overnight. Below we outline the success of the nurse-driven protocol using the PDSA cycle:

**Plan**
- Review institutional ACS NSQIP CAUTI data.
- Review institutional SCIP compliance rates.
- Review patient charts of those who developed CAUTI in the postoperative period.
- Identify common underlying themes across patients who developed CAUTI.

**Do**
- Present your data to important stakeholders: residents, attending surgeons, nursing staff, anesthesia staff.
- Engage those with particular interest and get their buy-in for a quality improvement initiative surrounding postoperative CAUTI.
The Quality In-Training Initiative: An ACS NSQIP Collaborative

SECTION IV

Practice-Based Learning and Improvement and Clinical Quality Improvement Measures

- Develop a test of change (in this case, a nurse-driven protocol for foley catheter removal in postoperative patients) and discuss potential logistical challenges with key players.

Study

- Implement your test of change.
- Collect data (compliance with protocol, specific barriers noted during implementation, and most importantly outcomes including CAUTI, urinary retention, need for catheter re-insertion).
- Modify your protocol as necessary based on results of specific tests of change. Start small, and realize that your protocol will not be perfect on the first try. It will change multiple times during your testing phases.
- Share successes with team members and other stakeholders with invested interest.

Act

- Routinely review and analyze your hospital’s CAUTI rates and outcomes and compare with internal and external benchmarks.
- Reassess to determine if reaching target goals.
- This is a cycle and any issues identified here would lead back into the Plan part of the cycle and the process repeats.
- In the case of the nurse-driven protocol, once initial glitches were address and an initial four-month pilot period was performed on a single surgical floor, the protocol was introduced and implemented on other surgical floors in the hospital.
- Successes of the protocol were shared with hospital administration, and the protocol was then implemented on medical (nonsurgical) units.
- Over the past 24 months, the protocol has now become a system-wide process improvement tool for decreasing CAUTI rates, not just in surgical patients, but in all patients within a single health care system.
- Success with such protocols does not happen overnight. It takes time and flexibility to modify your methods and processes as you go along and realize what works and what doesn’t, all the time keeping in mind that you are doing this with the single goal of improving the care of your patients.

Figure 3:

Nursing Checklist
To be completed DAILY on all General Surgery Patients* with an Indwelling Urinary Catheter

1. If the patient is POD#1 and has an epidural catheter for pain control, wait until NOON on POD#1 to do the following checklist.

2. For all other patients (POD#1 without epidural, or ALL patients POD#2 or later) do the following at daily at 6am

CDC-approved Appropriate Uses of Indwelling Urinary Catheters
Check all that apply:

☐ Precise measurement of urinary output in specific patient populations (Chemically sedated/paralyzed, orders for strict I&O in patients unable to provide measureable urinary output)
☐ Perioperative uses, anticipated prolonged duration of surgery, receiving large volumes in surgery, need for intraoperative monitoring in surgery
☐ Genitourinary, urological, bladder, colorectal or gynecological surgery requires an MD order for removal (Check with physician daily)
☐ Continuous bladder irrigation
☐ Patient requires prolonged immobilization (e.g., potentially unstable thoracic or lumbar spine, multiple traumatic injuries such as pelvic/hip fractures)
☐ End of life care/Palliative care (comfort measures only)
☐ Urinary incontinence in patients with stage III or IV pressure ulcer on the sacral/gluteus/trochanteric areas

⇒ IF ANY OF ABOVE APPLY/CHECKED DO NOT REMOVE CATHETER

⇒ IF NONE APPLY/CHECKED, REMOVE THE CATHETER AND DOCUMENT IN CHART

IUC Removed? ☐ YES (Time:______) ☐ NO

Comments: ______________________________________________________
__________________________________________________________________
D. Conclusion

Patients who are deemed exempt from SCIP Inf-9 are at significantly higher risk of UTI than those who remain compliant with SCIP guidelines. Data within the literature support the clinical importance of SCIP Inf-9 in preventing catheter-associated UTIs and offer justifiable reasons for why SCIP Inf-9 exemption should be constrained, beginning with elimination of exemptions such as epidural analgesia. Finally, inclusion of exempt cases within the overall compliance ratings will continue to result in an ongoing lack of correlation between this important quality initiative and the outcome measure of postoperative UTI.

E. Best Practice Recommendations

Below are the CDC guidelines for appropriate use of indwelling urinary catheters:

1. Precise measurement of urinary output in specific patient populations (chemically sedated/paralyzed, orders for strict I &O in patients unable to provide measurable urinary output).

2. Perioperative uses, anticipated prolonged duration of a surgical procedure, receiving large volumes in a surgical procedure, need for intraoperative monitoring in a surgical procedure.

3. Genitourinary, urological, bladder, colorectal or gynecological surgery requires an MD order for removal (check with physician daily).

4. Continuous bladder irrigation.

5. Patient requires prolonged immobilization (for example, potentially unstable thoracic or lumbar spine, multiple traumatic injuries such as pelvic/hip fractures).

6. End of life care/Palliative care (comfort measures only).

7. Urinary incontinence in patients with stage III or IV pressure ulcer on the sacral/gluteus/trochanteric areas.

RECOMMENDED READING


3. Surgical Site Infections (SSI)

OBJECTIVES

At the end of this section, the learner should be able to:

- Understand the important to review the entire process of a patient during their perioperative period in order to identify systemic lapses that put them at increased risk for surgical site infection

- Understand the importance to implement multiple, ‘bundled’ improvements with continual feedback to maintain and improve quality

Surgical site infections (SSI) are one of the most common postoperative complications. They can complicate 1% to 2% of all surgical admissions. This has risen to become one of most common health care associated infection at 20-31% of all health care associated infections. SSIs can increase hospitals stay by seven to 14 extra days and can increase costs by more than $25K depending on the type of procedure.

SSIs are infections involving the skin, soft tissue, or deeper tissues around a surgical site. In the past, different definitions of surgical site infections have affected the overall rates of wound infections. In recent years, organizations such as the CDC and later ACS NSQIP have developed standardized definitions of wound infections to help maintain a standard across institutions. Although these definitions may over report or under report certain infections, the key to these definitions is to allow consistent rates across time and institutions.
With the increasing pressure to improve nationwide quality, multiple initiatives have been developed to compare SSI rates across hospitals. Programs such as ACS NSQIP have developed risk-adjusted methodologies using patient and procedure specific data to compute the expected SSI rate. Hospitals can then be ranked based on their observed versus expected ratio of SSIs.

Using this information, hospitals are able to compare their rates with similar hospitals with similar cases and patient populations as a basis for quality improvement projects. There have been a plethora of studies investigating postoperative SSIs in order to reduce the number of occurrences. Table 1 outlines some of the category 1 evidence completed by the CDC, to help prevent SSIs. Many of these have been incorporated into the Surgical Care Improvement Project Bratzler 2006.9

Despite all of the data available to reduce SSI rates, there are still many hospitals that have higher observed than expected outcomes for SSIs. A hospital in that situation would likely want to initiate a quality improvement project in order to reduce their rate. Several techniques have been adopted from the manufacturing industry to assist with this process. The best known of these techniques is the root cause analysis. Other techniques, such as Lean or Six Sigma, can provide more comprehensive analysis to prevent infections. These techniques carefully analyze the entire process using a team-based approach. It is not uncommon to discover lapses in the system that result in failures to implement some of these protective measures to prevent wound infection.

### ACS/NSQIP Standardized Definition of Surgical Site Infections

**Definition:**

1. A **superficial incisional SSI** is an infection that involves only skin and subcutaneous tissue of the surgical incision.
2. A **deep incisional SSI** is an infection that involves deep tissues of the surgical incision.
3. An **organ space SSI** is an infection that involves any part of the anatomy (e.g., organs or spaces), other than the incision, which was opened or manipulated during an operation.

**Criteria:**

**For superficial incisional SSI:**
An infection that occurs within 30 days after the principle operative procedure **AND** the infection involves only skin or subcutaneous tissue of the incision **AND** at least **ONE** of the following:

- A. Purulent drainage with or without laboratory confirmation, from the superficial incision
- B. Organisms isolated from an aseptically obtained culture of the fluid or tissue from the superficial incision
- C. At least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat **AND** superficial incision is deliberately opened by the surgeon, unless incision is culture-negative or the physician documented NO infection and does not further treat the patient
- D. Diagnosis of superficial incisional SSI by the surgeon or attending physician

**For deep incisional SSI:**
An infection that occurs within 30 days after the principle operative procedure **AND** involves deep soft tissues **AND** at least **ONE** of the following:

- A. Purulent drainage from the deep incision but not from the organ space component of the surgical site
- B. A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms: fever (>38 degrees Celsius), localized pain or tenderness, unless the site is culture negative
- C. An abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination
- D. Diagnosis of a deep incisional SSI by a surgeon or attending physician

**For organ space incisional SSI:**
An infection that occurs within 30 days after the principle operative procedure **AND** involves any of the anatomy (e.g., organs or spaces), other than the incision, which was opened or manipulated during the operation **AND** at least **ONE** of the following:

- A. Purulent drainage from a drain that is placed through a stab wound into the organ/space
- B. Organisms isolated from an aseptically obtained culture or fluid or tissue in the organ/space
- C. An abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiographic examination
- D. Diagnosis of an organ/space SSI by a surgeon or attending physician
TABLE 1: Category I evidence to prevent SSI, adopted from Mangram et al.
*These items are required by Occupational Safety and Health Administration (OSHA)

Recommendations from the Guideline for Prevention of Surgical Site Infection
- Treat all infections before elective operations and postpone elective surgery in patients with remote infections until they have resolved
- Do not shave patients in advance
- If hair removal is necessary, use electric clippers
- Control blood serum glucose levels in all diabetics
- Have patients quit using tobacco prior to operations
- Have patients use an antiseptic the night before the planned operation
- Scrub patients with appropriate antiseptic agent
- Keep surgeons’ nails short
- Have surgeons scrub hands prior to surgery
- Surgeons should not operate when sick with a transmissible infection
- Administer appropriate prophylactic antimicrobials when indicated
- Keep operating room doors closed when possible
- Clean operating room between cases
- Sterilize instruments between cases
- Avoid flash sterilization
- Wear a surgical mask*
- Cover hair on head*
- Wear sterile gloves*
- Used sterile gowns and drapes
- Maintain adequate hemostasis and eradicate dead space when possible
- Delay primary closure for heavily contaminated cases
- Use sterile dressings for 24-48 hours postoperatively and wash hands during dressing changes
- Use closed suction drains when necessary
- Use CDC definition for SSI
- Record SSI on a surgeon and institution basis that is appropriately risk stratified

A process would begin with a hospital receiving a report with an observed to expected ratio > 1 for SSIs. As a result, the surgical practice would meet to discuss these results with the perioperative team. A root cause analysis may help determine where opportunities exist for process improvement. For example, the data may show that only half of the patients received preoperative antibiotics prior to incision. A root cause analysis may find that antibiotics were ordered correctly by the surgical team; however, because of the way the orders were released by the nursing team in the preoperative area, the antibiotics would sometimes not get to the patient in time before incision. The root cause analysis might also find that the newer floor staff changed the sterile wound dressings within 24 hours of the surgery. These examples of system-wide problems are important because they are not only common, but represent how discrepancies exist between orders and their implementation. By incorporating members of every part of the process, systemic failures can be identified and corrected.

While root cause analyses and process improvement methodologies are good for initiating change, these changes must be monitored to ensure that results persist. SSI rates should be monitored. Monthly or biweekly data can help the surgical team identify deficiencies in a timely fashion. Review of individual cases allows for identification of breaks in standard processes that may contribute to infections. Monitoring rates of compliance with different aspects of the process, such as percentage of patients receiving perioperative antibiotics within an hour before incision, can help to keep teams on track to reduce SSI rates.

Seven large hospitals recently collaborated to reduce 30-day postoperative wound infection rates after surgery. A literature review was performed to identify factors thought to contribute to SSI. Each institution developed a bundle for SSI prevention. Every bundle was tailored to the institution and its culture. For example, dosing and redosing of perioperative antibiotics, skin disinfectant the night before an operation, and using new instruments for wound closure were all implemented. Once targeted areas were identified, a bundled approach was used in each institution so that multiple areas could be improved simultaneously. The bundles included a continuous feedback loop so that progress could be monitored and tracked even after the project had ended. The project demonstrated a decrease in SSIs across the institution, with continuous monitoring to maintain a higher level of excellence.

The comprehensive unit-based safety program (CUSP) is another recent innovation to effect quality data changes through regularly scheduled team-based data review and collaboration. CUSPs have been demonstrated to further reduce SSI rates. The basic concept behind CUSP is to have a team-based approach to implement several quality changes simultaneously. While time intensive, these methods have shown remarkable success at reducing SSI rates and should be considered for any institution that would want to improve surgical site infections.

SSIs are a common and serious complication arising from surgical procedures. While many studies have demonstrated ways to reduce their rates, every surgical practice would want to improve surgical site infections.
team needs to continually reexamine their rates of SSIs and review their surgical process to ensure that they are maintaining an excellent level of care. By doing this, we can deliver better, more affordable care to all of our patients.

Recommended Reading


4. Readmissions

OBJECTIVES

At the end of this section, the learner should be able to:

- Identify procedural-based risk factors for unplanned hospital readmission following surgical procedures
- Recognize that postoperative complications drive the risk for unplanned readmissions
- Understand current policy within health care reform based on hospital readmissions

Consider the following clinical scenario:

You are a PGY3 resident on a general surgery service that focuses mostly on GI surgery. Many of your patients get bowel resections and new ostomies. You have noticed that while on service, many of these patients seem to be coming back to the hospital within a week of discharge and are presenting with high ostomy output, dehydration, and acute kidney injury.

A. Background/Healthcare Policy

From 2003 to 2004, 19.5% of all Medicare beneficiaries who were discharged from a hospital were readmitted within 30 days leading to a cost of $17.4 billion. In June of 2009, the Centers for Medicare and Medicaid Services (CMS) began publishing 30-day readmission data for selected medical diseases and hospital readmissions quickly became an important metric for measuring quality of care. Furthermore, in March of 2010, the Patient Protection and Affordable Care Act was signed into law and within it, Section 3025 brought substance to holding hospitals accountable for 30-day hospital readmissions. The policy will be implemented via reimbursement reduction based on an adjustment factor determined by an institution’s expected versus observed 30-day readmission rate. Section 3025 started the focus on readmissions for selected medical diseases, but left the door open for CMS to extend this readmission policy to surgical procedures in fiscal year 2015.

On October 1, 2012, based on Section 3025 of the Affordable Care Act, CMS officially enacted penalties against more than 1,400 hospitals for “excessive” readmission rates. The scheduled penalties escalate in future years and apply to broader classes of treatment diagnosis codes. For example CMS has confirmed it will begin monitoring readmissions for vascular surgery procedures. This places an intense focus on decreasing unnecessary surgical readmissions. These penalties are just the beginning of what is likely to be a developing trend of pay for performance in health care reform.

B. Clinical-Based Application

A retrospective study using institutional ACS NSQIP data analyzed outcomes of 1,442 general surgery patients. The overall readmission rate was 11.3%. Those who underwent a procedure that required an inpatient stay in the hospital were much more likely to be readmitted within 30 days when compared with patients who underwent an outpatient procedure. Patients with a history of insulin dependent diabetes, disseminated cancer, dyspnea, preoperative ventilator, a 10% weight loss in the prior 30 days, preoperative steroid use, and/or patients undergoing a pancreatic resection, colectomy, or liver resection were also at increased risk for readmission.

Most importantly, however, was the finding that patients who suffered one or more complications in the postoperative period were more than 4-times more likely to be readmitted than patients who did not experience a
### Table 1: ACS/NSQIP Standardized Definition of Readmissions

| Definition: | Patients who were discharged from their acute hospital stay for their principal operative procedure, and subsequently readmitted as an inpatient to an acute care hospital setting. |
| Criteria: | 1. **Was there a readmission for any reason within 30 days of the principal operative procedure?**<br>Report any readmission (to the same or another hospital), for any reason, within 30 days after the principal operative procedure. The readmission has to be classified as an “inpatient” stay by the readmitting hospital, or reported by the patient/family as such.<br>**Answer “Yes” or “No”**<br>• If “Yes”, enter date of readmission, if known (mm/dd/yyyy) or select ‘Unknown’<br>• If “Yes”, enter information Source: Medical Record, Patient/Family Report, Other<br> 2. **Was this readmission unplanned at the time of the principal operative procedure?**<br>**Answer “Yes” or “No”**<br> 3. **Was this readmission likely related to the principal operative procedure?**<br>**Answer: “Yes” or “No”**<br>• Select “Yes” if the readmission (to the same or another hospital) was for a postoperative occurrence likely related to the principal operative procedure within 30 days after the principal operative procedure. “Yes” is the default answer unless it is definitively indicated that the readmission is not related to the principal operative procedure.<br>• If likely related, choose the primary suspected reason (postoperative occurrence) or enter ICD code, or if code unknown please describe the reason for the readmission. Choosing one of these occurrences does not indicate that the NSQIP criteria for the occurrence were met; it merely indicates that this diagnosis was given as a reason for readmission.<br>  - Superficial Incisional SSI<br>  - Deep Incisional SSI<br>  - Organ/Space SSI<br>  - Wound Disruption<br>  - Pneumonia<br>  - Intraoperative OR Postoperative Unplanned Intubation<br>  - Pulmonary Embolism<br>  - On Ventilator > 48 Hours<br>  - Progressive Renal Insufficiency<br>  - Acute Renal Failure<br>  - Urinary Tract Infection (UTI)<br>  - Stroke/CVA<br>  - Intraoperative OR Postoperative Cardiac Arrest Requiring CPR<br>  - Intraoperative OR Postoperative Myocardial Infarction<br>  - Transfusion Intra/Postop (RBC within the First 72 Hrs of Surgery Start Time)<br>  - Ven Thrombosis Requiring Therapy<br>  - Sepsis<br>  - Septic Shock<br>  - Other: ICD Code________<br>• Beginning January 1, 2014 sites will have the option of using ICD-9 or ICD-10 Codes for this field.<br>• If the readmission is unrelated, choose the primary suspected reason (postoperative occurrence) or enter ICD code, or if code unknown please describe the reason for the readmission. Choosing one of these occurrences does not indicate that the NSQIP criteria for the occurrence were met; it merely indicates that this diagnosis was given as a reason for readmission.<br>  - Superficial Incisional SSI<br>  - Deep Incisional SSI<br>  - Organ/Space SSI<br>  - Wound Disruption<br>  - Pneumonia<br>  - Intraoperative OR Postoperative Unplanned Intubation<br>  - Pulmonary Embolism<br>  - On Ventilator > 48 Hours<br>  - Progressive Renal Insufficiency<br>  - Acute Renal Failure<br>  - Urinary Tract Infection (UTI)<br>  - Stroke/CVA<br>  - Intraoperative OR Postoperative Cardiac Arrest Requiring CPR<br>  - Intraoperative OR Postoperative Myocardial Infarction<br>  - Transfusion Intra/Postop (RBC within the First 72 Hrs of Surgery Start Time)<br>  - Ven Thrombosis Requiring Therapy<br>  - Sepsis<br>  - Septic Shock<br>  - Other: ICD Code________<br>• Beginning January 1, 2014 sites will have the option of using ICD-9 or ICD-10 Codes for this field.
postoperative complication. The impact of complications on readmission was dose dependent, meaning that as the number of complications a patient experienced increased the likelihood of readmission increased. Table 1 demonstrates that patients who suffered a surgical site infection complication (SSI), postoperative pulmonary complication (PPC), urinary tract infection (UTI), postoperative transfusion within 72 hours of an operation, or sepsis/shock had a two to six times higher chance of readmission when compared with a patient who did not suffer the same complication.

Additional studies have investigated the risk factors for hospital readmission following surgical procedures. A recent study identified 230,864 patients discharged after general, upper gastrointestinal (GI), small and large intestine, hepatopancreatobiliary (HPB), vascular, and thoracic surgery using the 2011 ACS NSQIP data. The median patient age was 56 years; 43% were male, and median American Society of Anesthesiologists (ASA) class was two (general surgery: two; upper GI: three; small and large intestine: two; HPB: three; vascular: three; thoracic: three; P < 0.001). The median LOS was one day (general surgery: zero; upper GI: two; small and large intestine: five; HPB: six; vascular: two; thoracic: four; P < 0.001). Overall the 30-day readmission rate was 7.8% (general surgery: 5%; upper GI: 6.9%; small and large intestine: 12.6%; HPB: 15.8%; vascular: 11.9%; thoracic: 11.1%; P < 0.001). Factors strongly associated with readmission included ASA class, albumin less than 3.5, diabetes, inpatient complications, nonelective surgery, discharge to a facility, and the LOS (all P < 0.001). On multivariate analysis, ASA class and the LOS remained most strongly associated with readmission. The authors go on to point out that factors associated with readmission might include the following: (1) preadmission factors, (2) health care factors, and (3) postdischarge factors (Table 2).

C. Discussion

Readmissions are a hard target for quality improvement in surgical procedures as the nature of the problem is poorly understood. However, certain steps in the process of patient care that might influence readmission rates do make for an attractive target for resident initiated quality improvement project. For example, quality improvement projects that target the prevention of postoperative complications will likely reduce the rate of hospital readmissions. Furthermore, improving

Table 1: Odds Ratio for Readmission Following Specific Postoperative Complication

<table>
<thead>
<tr>
<th>Complication Type</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vascular</td>
<td>6.36</td>
<td>2.84-14.25</td>
</tr>
<tr>
<td>UTI</td>
<td>5.08</td>
<td>2.62-9.86</td>
</tr>
<tr>
<td>Sepsis/ Shock</td>
<td>4.73</td>
<td>3.03-7.37</td>
</tr>
<tr>
<td>Wound</td>
<td>3.52</td>
<td>2.40-5.17</td>
</tr>
<tr>
<td>PPC</td>
<td>3.45</td>
<td>2.08-5.71</td>
</tr>
<tr>
<td>Renal</td>
<td>3.19</td>
<td>1.38-7.35</td>
</tr>
<tr>
<td>Transfusion</td>
<td>1.98</td>
<td>1.35-2.90</td>
</tr>
</tbody>
</table>

UTI, Urinary Tract Infection; PPC, postoperative pulmonary complication

Table 2: Proposed Conceptual Model for the Causes of Readmission

<table>
<thead>
<tr>
<th>Biologic Factors</th>
<th>Health Care Factors</th>
<th>Social Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease process</td>
<td>“Quality”</td>
<td>Discharge setting</td>
</tr>
<tr>
<td>Demographics</td>
<td>Appropriate indication</td>
<td>Socioeconomic status</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>Preoperative planning</td>
<td>Informal caregivers</td>
</tr>
<tr>
<td></td>
<td>Surgeon performance</td>
<td>Social support</td>
</tr>
<tr>
<td></td>
<td>Anesthesia</td>
<td>Health beliefs</td>
</tr>
<tr>
<td></td>
<td>Critical care</td>
<td>Health care self-efficacy</td>
</tr>
<tr>
<td></td>
<td>Postoperative care</td>
<td>Health care social norms</td>
</tr>
<tr>
<td></td>
<td>Nursing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infection control</td>
<td></td>
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<tr>
<td></td>
<td>Allied health</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social work</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discharge planning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Home health services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Outpatient follow-up</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Care coordination</td>
<td></td>
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</tbody>
</table>

*The ACS-NSQIP only addresses italicized factors.
the patient experience across the surgical continuum through enhanced communication may reduce the need for readmission. Targeting the preoperative visit as an opportunity for enhanced education regarding the recovery process may be a good target for a resident initiated quality improvement project to reduce the likelihood of readmission.

Alternatively, the discharge document might be a good project for a resident intervention. Some of the ideas are detailed below:

Preoperative ideas

- For patients presenting for elective surgery, use the preoperative visit to educate patients about ways you will prevent postoperative complications while they are in the hospital (in other words, tell them they will have a foley catheter which you will plan to take out on POD#1; give them their incentive spirometer at their preoperative visit and teach them how to use it and tell them to practice pulmonary toilet at home in the days leading up to an operation; educate patients about DVT prophylaxis and that they will be getting chemoprophylaxis (Heparin, Lovenox, and so on) and mechanical prophylaxis (SCDs, early ambulation, and so on). Make sure to emphasize the importance of compliance.

- Start the discussion about what to anticipate after hospital discharge.

Postoperative (predischage) ideas

- Start your discharge planning early! Do not wait for the patient to be one day prior to discharge to think about their needs once they get home. If you anticipate the need for home health, initiate the process on postoperative day zero (or even preop, as discussed above).

- Continue to encourage the patients to remain engaged in their postoperative care and inform them they can have an active part in helping to prevent postoperative complications (early ambulation, showers, compliance with prophylaxis, and so on).

- Continue to educate the patient about what to expect after they get home and what their potential risks might be and how to recognize a problem early (dehydration, pain control, infection, and so on).

Postoperative (postdischarge) ideas

- Many residents find calling their patients the day or two after discharge has a large impact on not only patient satisfaction, but also on preventing trips to the ER which may lead to hospital readmission. A simple 10-minute phone call to answer questions may prevent an hour-long consult and subsequent readmission to your service a few days later.

- Other residents are discovering the utility of infusion centers within their institution. If you feel a patient is becoming dehydrated, either by phone conversation or by clinic visit, utilize outpatient resources to address the problem. While reflexively sending a patient to the ER is never wrong, try and be aware of other options that may be available to help solve the problem.

Let’s revisit the clinical scenario from the beginning of this section. If the case was an elective one in which you knew ahead of time the patient was going to have an ostomy, you could develop a QI project in which you start educating patients about ostomies at their preoperative appointment. You could even arrange for the ostomy nurse to be present at the visit, and prepare handouts for the patient to study in the days leading up to a surgical procedure. If the procedure is urgent/ emergent, or an elective one in which an ostomy was not anticipated, you could develop an inpatient ostomy education project involving the surgical team and ostomy nurses. Furthermore, you could call patients shortly after discharge to check on their ostomy output and if you are concerned they are becoming dehydrated, you could utilize a transfusion center for a fluid bolus and potentially prevent a trip to the ER.

As will all QI projects, you would need to start by reviewing your institutional data on readmissions following the creation of an ostomy. Then perform a chart review and try and determine where the common threads appear. Once you have identified your potential areas for improvement, pick ONE area as your target for improvement. Start a discussion with your key stakeholders (your attending surgeons who do the cases, your ostomy nurses, and your department quality expert). Develop a simple test of change and then track your data. Remember to be flexible, and that you will not see success overnight. Finally, when you do have success, share it with your team members; this will foster continued enthusiasm and assist in the adoption of new preocesses.
Practice-Based Learning and Improvement and Clinical Quality Improvement Measures

D. Conclusions

The significance of readmission data cannot be overstated. First, the current example provides a common profile of a patient who is at high risk for readmission to the hospital after a complex general surgical procedure. Second, it also underscores the importance of postoperative complications as drivers of 30-day readmission. Finally, in addition to increasing the risk for 30-day readmission, postoperative complications increase overall hospital costs and hospital length of stay. Understanding the data not only enables physicians to have the ability to identify patients who are at risk for hospital readmission, but also creates the opportunity for quality improvement initiatives that actively target at-risk populations to decrease the risk of readmission. In doing so, not only will the requirements within new health care reform be fulfilled, but patient care will also improve.

Understanding the current health care policy surrounding readmissions is important, but so is the dialogue surrounding the issue. Simply being aware and discussing readmissions among co-residents and other members of the surgical team is a good place to start. Increased awareness will lead to the ability to recognize areas for improvement of processes within your own institution that may help to decrease readmission rates. Ultimately, focusing on one small task such as medication reconciliation or postoperative patient education will be key for a resident to feel as though they can apply QI to such a large issue as hospital readmissions. As with everything else in QI, start small, don’t expect success overnight, and be willing to embrace flexibility during your tests of change.

RECOMMENDED READING


5. Pneumonia

Please refer to the ACS NSQIP Pneumonia Best Practices Guidelines when considering a QI project to decrease rates of postoperative pneumonia. Visit www.acsnsqip.org.
### ACS/NSQIP Standardized Definition of Pneumonia

<table>
<thead>
<tr>
<th>Variable Name: Pneumonia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition:</strong></td>
</tr>
<tr>
<td><strong>Criteria:</strong></td>
</tr>
</tbody>
</table>

**A. Radiology:**

**ONE** definitive chest radiological exam (x-ray or CT)* with at least **ONE** of the following:

- New or progressive and persistent infiltrate
- Consolidation or opacity
- Cavitation

*Note: In patients with underlying pulmonary or cardiac disease (e.g. respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), **two or more** serial chest radiological exams (x-ray or CT) are required. **The two exams should both confirm the diagnosis or the first exam should serve as a baseline exam which allows the second exam to establish the definitive new diagnosis.** Postoperatively, serial radiological exams should be taken no less than 12 hours apart, but not more than 7 days apart. In contrast, a preoperative x-ray used as a baseline must have been obtained within 30 days of the principal operative procedure or at the time the patient is being considered a candidate for surgery.

For postop events, the occurrence should be assigned on the date the patient first met all of the criteria of the definition.

**EXAMPLE:**

The patient you are reviewing has a history of COPD, a baseline preoperative chest x-ray was taken on May 25th and the patient underwent surgery on June 10th. On POD #4, the patient developed a temperature of 101.5 and the WBC returned at 13.5. On POD #5, a chest x-ray was ordered and revealed a new infiltrate in the left lower lobe. On POD #6, the patient began coughing up green sputum and auscultation revealed crackles. The patient meets the criteria to assign the postop occurrence of pneumonia on POD #6, as this is when the patient met all of the criteria of the definition.

**B. Signs/Symptoms/Laboratory:**

**SCENARIO #1**

At least **ONE** of the following:

- Fever (>38°C or >100.4°F) with no other recognized cause
- Leukopenia (<4000 WBC/mm³) or leukocytosis (≥12,000 WBC/mm³)
- For adults ≥ 70 years old, altered mental status with no other recognized cause

**AND**

At least **ONE** of the following:

- 5% Bronchoalveolar lavage (BAL) -obtained cells contain intracellular bacteria on direct microscopic exam (e.g., Gram stain)
- Positive growth in blood culture not related to another source of infection
- Positive growth in culture of pleural fluid
- Positive quantitative culture from minimally contaminated lower respiratory tract (LRT) specimen (e.g., BAL or protected specimen brushing)

**OR**

**SCENARIO #2**

At least **ONE** of the following:

- Fever (>38°C or >100.4°F) with no other recognized cause
- Leukopenia (<4000 WBC/mm³) or leukocytosis (≥12,000 WBC/mm³)
- For adults ≥ 70 years old, altered mental status with no other recognized cause

**AND**

At least **TWO** of the following:

- New onset of purulent sputum, or change in character of sputum, or increased respiratory secretions, or increased suctioning requirements
- New onset or worsening cough, or dyspnea, or tachypnea
- Rales (crackles) or rhonchi
- Worsening gas exchange (e.g., PaO2/FiO2 ≤ 240), increased oxygen requirements, or increased ventilator demand
6. Renal Failure

Please refer to the ACS NSQIP Renal Failure best practice guideline when considering a QI project to decrease rates of postoperative renal failure. Visit www.acsnsqip.org.

### ACS/NSQIP Standardized Definition of Renal Failure (post-operative)

<table>
<thead>
<tr>
<th>Definition</th>
<th>Progressive Renal Insufficiency: the reduced capacity of the kidney(s) to perform its function in comparison to the preoperative state.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acute Renal Failure Requiring Dialysis: A clinical condition associated with significant decline of kidney function in comparison to the preoperative state.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Progressive Renal Insufficiency OR Acute Renal Failure Requiring Dialysis must be noted within 30 days after the principal operative procedure AND the following criteria, A OR B below, reporting the most severe level:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Progressive Renal Insufficiency: A rise in creatinine of &gt;2 mg/dl from preoperative value, but with no requirement for dialysis.</td>
</tr>
<tr>
<td>OR</td>
<td>B. Acute Renal Failure Requiring Dialysis: In a patient who did not require dialysis preoperatively (within the 2 week timeframe prior to surgery), worsening of renal dysfunction postoperatively requiring dialysis. Note scenario B is the most severe.</td>
</tr>
</tbody>
</table>

7. Geriatric

Please refer to the ACS NSQIP Geriatric Care best practice guideline when considering a QI project to improve the quality of care provided to geriatric patients. Visit www.acsnsqip.org.
Creating an Efficient System for Patient Care

OBJECTIVES

At the end of this section, the learner should be able to:

• Understand the difference between practice-based learning and improvement and systems-based practice

• Provide concrete examples of systems issues that influence surgical outcomes

• Develop a plan to improve a systems issue in the delivery of surgical care

The Accreditation Council on Graduate Medical Education (ACGME) Program Requirements for Graduate Medical Education in Surgery articulate the expectations for each of the six core competencies, including systems-based practice.1 “Residents must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care.” The expectation is that surgical residents will:

• Work effectively in various health care delivery settings and systems;

• Coordinate patient care within the health care system;

• Incorporate considerations of cost awareness and risk-benefit analysis in patient and/or population-based care as appropriate;

• Advocate for quality patient care and optimal patient care systems;

• Work in interprofessional teams to enhance patient safety and improve patient care quality;

• Participate in identifying system errors; and implementing potential systems solutions;

• Practice high quality, cost effective patient care;

• Demonstrate knowledge of risk-benefit analysis;

• Demonstrate an understanding of the role of different specialists and other health care professionals to overall patient management.

Program directors and surgical educators have struggled to distinguish amongst the competencies in problem-based learning and improvement and systems-based practice. To address the confusion, a metaphor was developed for the two concepts likening practice-based learning and improvement to “a mirror,” and systems-based practice to “a village.” The idea comes from the fact that self-reflection is the key to continuous personal improvement. In other words, like looking in a mirror. Similarly, as high quality care takes teamwork where individuals work effectively together in an interdependent way, the systems-based practice competence alludes to the fact that it takes a village to provide optimal outcomes.

Systems-based practice is now better defined by two practice domains: coordination of care (CC) and improvement of care (IC). In the domain of coordination of care, the resident is expected to move from an understanding of the resources available for coordinating patient care, including social workers, visiting nurses, and physical and occupational therapists, to effectively coordinating the activities of fellow residents, nurses, social workers and other health care professionals to assure that the patient can be safely discharged to the appropriate environment with whatever support is required. In the latter domain of improvement of care, the resident moves from an understanding of how hospital and health care systems can impact the delivery of care to his/her patients and how the proper use of protocols and guidelines for patient care are beneficial. The resident appreciates that unfavorable outcomes are more often due to breakdowns in various delivery systems, rather than errors performed by individuals. Further maturity enables the resident to recognize specific system failures and be willing to report observations and offer suggestions for change by working on performance improvement teams and contributing to the development of standardized policies and procedures that improve the quality and safety of patient care.

Understanding the Complexities of “Systems”

The Oxford World Dictionary defines a “system” as a “group or combination of interrelated, interdependent, or interactive elements forming a collective entity.” From day one as an intern, the surgical resident is introduced to the concept of a system. He/she is assigned to a specific team or service. Multiple specialty services exist within the surgical department and multiple departments within the organization. Numerous support services that impact our ability to provide high quality and safe care to surgical patients also exist (anesthesia, nursing, social services, laboratory medicine, diagnostic radiology, and so on). The hospital administrative leadership, and ultimately the Board of Directors, is responsible to assure that all of the...
needs of individual departments and services are met in order for them to fulfill their obligations to provide a safe environment for the delivery of high quality care and to allow patients to move or flow through the “system” seamlessly.

In the strictest sense, the hospital is a series of Microsystems that cannot function independently, but must be led by individuals who are sensitive to the needs of other departments and services. Failure to be responsive to these needs will compromise patient outcomes and contribute to potentially preventable morbidity and mortality in many patients. System failures are felt to be responsible for the overwhelming majority of avoidable adverse events that lead to serious complications which result in organ system dysfunction, sepsis, returns to the OR, prolonged length of stay, readmissions, and unfortunately, death in many situations. 6,7,8

Clearly, health care is under the microscope of the public, managed care organizations and regulatory agencies, and anything less than the delivery of care that is “safe, effective, patient centered, timely, efficient, and equitable” is not tolerated. Our ultimate goal as health care providers is to try to achieve the same level of success as has been achieved in high risk, non-health-related fields, by studying and adopting similar “high-reliability” principles as defined by Weick and Sutcliff. 9,10 The five high-reliability principles discussed include the following: preoccupation with failure, resistance of simplification, sensitivity to operations, commitment to resilience, and deference to expertise. 10

**Practical Applications of the Concepts of Systems-Based Practice**

In order to illustrate the competency of systems-based practice, we have chosen to discuss three areas that surgical residents deal with on a regular basis: operating room availability, emergency department crowding and discharge planning. Each one represents a systematic issue that serves as a frequent source of frustration amongst housestaff and faculty. The factors contributing to these issues and the barriers (strategic, cultural, structural, and technical) that compromise their effective resolution will be discussed. 11 Although certain components of the problem are too large for a resident guided project, each issue has several potential steps that can be targeted for improvement. As such, resident quality improvement projects could be designed to address individual small pieces of the problem to effect change.

**A. OPERATING ROOM AVAILABILITY**

The operating room is the workshop where the surgeon uses his/her technical skills and surgical judgment in order to perform the procedure that is required in a given patient. It is clear that the skill of the surgeon does not guarantee a successful outcome and there are many factors over and above the disease process that can compromise the outcome of the case. It is not the intent of this section to discuss all of these elements that must work in harmony to afford a safe and efficient procedure. However, they do impact on operating room availability to the degree that they contribute to the actual length of the case relative to the time that had been allotted when the schedule was made.

An exciting approach to addressing variation in the flow of patients in the operating room and its impact on operating room efficiency involves the use of methodologies that have been traditionally utilized in other industries. Smith et al. applied the principles of variability methodology to address “natural” and “artificial” variation that influenced the operational and financial performance of their organization. 12 Although the scheduling of elective cases is a “nonrandom variable,” unplanned intraoperative events contribute to “random variability” and can significantly disrupt the operating room schedule. It is the responsibility of the operating room leadership to assure that “nonrandom variables” such as the availability of antibiotics, specific instrumentation and staffing do not contribute to unnecessary prolongation of the surgical procedure.

Many different but interrelated factors contribute to operating room availability. In the end, it is a function of supply (total number of operating rooms available at any given time) and demand (the number of patients who require surgical intervention). In addition, the scheduling of elective cases must be realistic and take into consideration other factors that will be described below:

1. **Nature and size of the organization.** Any organization that is a tertiary care center with full service capacity, including trauma management, and has an active emergency room that receives transfers from affiliated organizations within its network, including nursing homes, has the added burden of integrating emergent and urgent cases into the operating room schedule. If this is compounded by a busy elective schedule, the availability of OR’s to accommodate emergency cases will be further challenged and may result in significant delays that may compromise the outcome of the patient.
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2. **Number of operating rooms.** The number of operating rooms in a given institution may vary over time as investments are made to accommodate demand. In an organization with a satisfactory balance between the supply and demand, this harmony may be compromised by the aggressive recruitment of busy surgeons in an attempt to optimize the utilization of the OR’s and enhance revenue for the organization. Although this may seem to have a positive impact initially, in the absence of the ability to add additional operating rooms or to develop fair and equitable access patients, surgeons and support staff will be compromised.

3. **Delays in room turnover between cases.** Many factors can contribute to the time interval between when a given patient is “wheeled out” to when the next patient is “wheeled in.” Accepted time targets are set by the OR leadership. Meeting these targets is generally a challenge and is a frequent cause of agitation and disharmony over the course of a given day. Common factors that impede flow include a lack of availability of nursing and support staff and availability of specialty instrumentation for a particular case. Also, sequential cases may or may not be performed by the same surgeon, potentially having an impact on the time between cases. It is imperative that the operating room manager tracks the progress of each case in order to alert a subsequent surgeon that a case may be finishing ahead of schedule so that he/she is available when the room is open. Unfortunately, it is not a guarantee that when the same surgeon follows himself/herself that the time between cases is decreased. Some surgeons have a knack of “disappearing” between cases. It is the responsibility of the surgical chairman to deal with individuals who manifest patterns of unfavorable behavior such as this. Generally speaking, the same individual who tends to “disappear” between cases may often be late for first case starts.

4. **Specialty specific room designations.** It is not uncommon that specific operating rooms are allotted to specialty services and are so equipped with the technology that these specialties demand. Such rooms are generally not available for emergent or urgent cases in other specialties. In addition, when they must be used, the specialty nurses that are assigned to these rooms may or may not be familiar with the equipment that is required for the emergency case.

5. **Surgeon specific issues.** There are many surgeon specific issues that can compromise operating room availability. The judgment and skill of the surgeon and his/her ability to realistically estimate the length of the procedure and the potential for unforeseen complications is critical. Careful and detailed communication with the anesthesiologist and nursing staff regarding unique patient characteristics and particular needs prior to the initiation of the operation, and again at the “time out” is “mandatory,” but unfortunately, often performed in a perfunctory and inadequate way. Many surgeons have competing responsibilities (teaching, office hours, ER call) that may compromise their ability to be available at the time of operating room availability. Surgeons who perform both elective and acute care/trauma cases are often placed in a position that may compromise themselves, and their patients especially if they are “on call” on the same days in which they have elective cases scheduled.

6. **Scheduling patterns.** Scheduling patterns that are based upon surgeon preference and history without consideration for the needs of other services may lead to unexpected delays in transferring patients into the appropriate environment at the completion of the operation. The surgical intensive care unit and step down unit may be utilized by several different services. The elective schedule should take this into consideration and may require adjustment of block time so that a bottleneck is not created on certain days.

7. **Misuse of the inpatient operating rooms.** Ideally, the hospital-based operating rooms use should be limited to inpatients or select ambulatory cases who do not meet the institutional criteria to be done in an ambulatory setting. Coexisting patient-specific factors such as age, BMI, co-morbid organ system dysfunction, or special monitoring needs may dictate that the surgical procedure be performed in the main OR to provide a level of safety that may not exist in the ambulatory setting should a problem arise. Whenever possible, ambulatory cases should be done in an ambulatory setting, so that the main operating rooms are available to address the demand for emergency cases. Getting busy surgeons with a balance of inpatient and outpatient cases who are used to operating on certain days to modify their schedule and utilize an off-site ambulatory setting can be challenging, but is mandatory in order to optimize efficiency.
8. **Team dynamics.** In the end, one cannot lose site of the fact that the patient’s well-being must be the central focus of everything that we do. Coordinating all of the factors listed above is a challenge. Getting through a busy schedule on any given day without undue stress requires that each member of the team appreciate the demands of the other. Mutual respect and the willingness of each “player” to function as a team member doesn’t necessarily make an available OR suddenly appear, but it certainly can alleviate much of the stress and unprofessional behavior that compromises OR efficiency and staff satisfaction.

9. **Leadership.** There are many human factors at play in the operating room setting. At times a mal-alignment of incentives can lead to inefficiencies in patient flow resulting in delay of care. Effective leadership can ensure the proper staffing and influence the culture through incentives to improve harmony and efficiency in patient flow. Absent the appropriate leadership, competing interests between team members will distort the efficiency. Residents often notice when delays occur yet they frequently do not have input on the operating room operations committee or leadership team.

In order to be sure that there is a balance between supply and demand, it is imperative that appropriate monitoring be performed on a regular basis and the results reviewed in the appropriate setting. The composition of the monitoring committee and its leadership may vary but must include representative leadership from surgery, anesthesia and nursing, and, ideally, a surgical chief resident. Standard monitoring metrics include both surgeon specific and service specific data. First case delays, turnover time (“wheels out”/“wheels in”), delays due to availability of space in the PACU or SICU, cancellations, actual versus estimated duration of the case, delays due to lack of OR availability (particularly in cases that are urgent or emergent), delays due to surgeon unavailability delays due to lack of required specialty equipment or specialty nurses and percent utilization of block time by surgeon and specialty represent the majority of metrics that are available to evaluate the efficient and safe use of the operating room. The ability to gather and evaluate the above metrics will vary but clearly, this is an area where administrative support of the appropriate IT systems are mandatory.

There are many potential remedies in dealing with the various issues identified above that can minimize the mismatch between operating room availability and access requirements.

1. Continued monitoring of the various metrics described above can lead to recommendations to the administration regarding additional staffing (nursing, environmental, transport) and instrumentation.

2. Expanding capacitance by adding additional operating rooms is generally not well received by administration, nor should it be the starting point for discussion, but at times is mandatory.

3. Careful assessment of block time utilization and the increasing or decreasing requirements of surgeons in practice, as well as the recruitment of additional busy surgeons with established practices, is an ongoing process that needs to be continually monitored and adjusted.

4. Matching the complexity of the case with appropriate staffing and the availability of ancillary services, such as the blood bank and pathology, is vital. Generally, the most complex cases should be scheduled earlier in the day when these services are fully staffed.

5. Inpatient surgery should not compete with ambulatory cases and whenever possible, the main operating rooms should be limited to inpatients or ambulatory patients with specific risk factors requiring the support of the inpatient setting.

6. There must be a defined policy for prioritization of emergent and urgent cases. A mutually agreeable arbiter who will facilitate the discussion and make the final decision is required. This may be the senior anesthesiologist on call, the admitting surgeon, an OR nurse manager or the medical director of perioperative services.

7. “Smoothing the operating schedule” to optimize overall flow is an effective way to control “artificial variation” (in other words, scheduling of elective surgery) that may contribute to an imbalance in the schedule on different days of the week. The beneficial outcomes as reported by Smith et al included an increase in surgical volume (4%) and surgical minutes (5), a decrease in overtime staffing (27%), a decrease in staff turnover (41%), and a decrease in elective schedule same-day changes (70%). At the same time, they reported an increase in net operating income (38%). The ability to bring about this kind of change is a tremendous challenge for an organization. It can only be achieved when those who will be impacted by change are brought together as an interdisciplinary team, under the
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direction of a trusted and respected leader, and are shown how everyone involved will ultimately benefit.

B. EMERGENCY DEPARTMENT CROWDING

In 2005, the Academy of Emergency Medicine (AAEM) released a Position Statement on Emergency Department Crowding.\textsuperscript{13} It described a “serious nationwide problem with multiple causes,” emphasizing the overall decrease in total hospital and health systems’ capacity to meet increasing demands of patients that present to our emergency rooms. The “failure of multiple hospital systems to address patient access to health care” was noted. In a subsequent statement the following year, the phrase “hospital capacity failure” was utilized to express the same concept.\textsuperscript{14} The principle of supply (number of available inpatient beds or open operating rooms) and demand (the number of patients requiring admission or emergency surgery) is as relevant here as it was above. One of the suggested solutions was “changing elective surgery scheduling to accommodate the resource demands for emergency department patients.” Clearly, the interdependence of these two departments highlights the fact that correcting serious issues that involve patient flow cannot be done by focusing on independent services, but requires the careful assessment of the overall process of flow. Corrective actions in one area can have significant beneficial effects in another. The prevalence and negative impact of emergency department crowding was highlighted by Pines et al.\textsuperscript{15} in a relatively recent survey that was conducted to assess perceptions regarding the extent of this problem among medical directors/chairs of emergency departments in the Commonwealth of Pennsylvania. A total of 83 (86/104) agreed that that crowding was a problem; 98\% (102/104) agreed that patient satisfaction was compromised and 79\% (84/106) that quality of care suffered. Although the numbers may vary somewhat in other surveys, everyone agrees that ED crowding is a major problem that is primarily due to issues that are not necessarily under the direct control of the emergency department itself. Accordingly, correction of the problem necessitates a careful assessment of patient flow throughout the organization. Corrective actions that increase the available inpatient bed capacitance will also favorably impact on OR availability, and allow access for emergent or urgent cases that are admitted through the ED.

Examples of the potential negative impact of overcrowding on the quality of the care delivered in the emergency room include:

1. Deterioration of patient status while in the emergency room due to a delay in assessment and initiation of treatment may be as simple as obtaining timely laboratory and diagnostic imaging results or the administration of antibiotics, or more complex, such as handling a critically ill or traumatized patient who needs immediate resuscitation and transfer to an appropriate setting for definitive lifesaving treatment.

2. Patient frustration from excessive wait times resulting in patients leaving the ED without being assessed.

3. Significant patient and family frustration from what may be a significant delay in being seen, treated or kept informed of changes in status as new information is available.

4. Significant compromise of physician, nursing, and support staff satisfaction from the excessive workload and the added personal concern regarding the inability to deliver the quality of care that they feel the patient deserves.

5. Surgical attendings and residents can be added to the list of frustrated health care providers when called to see a patient with an acute surgical crisis. Few emergency rooms are adequately equipped to resuscitate hypotensive patients and provide intravenous monitoring in preparation for emergency surgery. Transferring the patient to the SICU or continuing resuscitation in the operating room prior to initiating the procedure is often necessary in such cases. Unfortunately, unless the operating room is adequately prepared to address these kinds of patients in a timely fashion, regardless of the time when they arrive, patient outcomes will be compromised. A common sequence of questions often asked in a surgical M&M conference for many of these critically ill patients who are admitted through the emergency room includes: What time did the patient arrive in the emergency room and what was the hemodynamic status? What resuscitation was provided in the ED and what was the response? What time did the patient get into the operating room?

There are many reasons for overcrowding of emergency departments. The number of patients entering emergency rooms continues to increase and is expected to increase further, as the total number of insured citizens rises in association with the implementation of the Affordable
Interestingly, many ED directors have noted that the increase in volume that has been observed in recent years is not limited to those without health insurance. Indeed, many of the patients who enter emergency rooms do have private physicians. However, access to these physicians may be difficult due to the time of day or day of the week when their issue develops.

1. Although it is easy to blame emergency room capacitance as a limiting factor, this is not felt to be as significant as many would like to assert. The argument that we simply need more emergency rooms beds is not dissimilar to the argument that we need more operating rooms. Rather, it is the lack of available inpatient beds that is felt to be the main culprit in compromising the flow of patients requiring admission from the emergency room.

2. There is generally little, if any, administrative support for expanding the size of the emergency room or the number of operating rooms without exhausting other system-related problems that impact on flow and efficiency.

3. However, it is often necessary to increase staffing in the emergency room with additional physicians, physician extenders, nurses and other support personnel in order to assure that the patients are not compromised during peak periods.

4. Many of the patients who enter the emergency room require consultations from members of other services, including surgery. The timely availability of such consultants is necessary, and delays in consultation can often contribute to delays in initiating treatment or in assuring discharge with appropriate follow-up.

5. Increasing emergency room volume can easily challenge the ability of the laboratory or diagnostic radiology to meet demands. Delays in obtaining diagnostic information that will impact the disposition of the patient are not uncommon.

Given the fact that emergency department crowding is so common, it is not surprising that it has received significant attention. Many “high-impact solutions” have been offered by the American College of Physicians in a Task Force Report on Boarding.

Some of these are focused directly within the emergency department and may include:

- Enhanced staffing (physicians, physician extenders, nurses, and support personnel)
- Realigning staffing with peak patient volume intervals using queuing methodologies
- Streamlining the admission process,
- “Fast tracking.” The latter involves triaging patients with less urgent or nonurgent conditions to a defined area within the ER where they can be more efficiently evaluated and discharged.

However, the key is acknowledging that the issue is a system-wide problem and will require a concerted effort on the part of many individuals to effectively increase patient flow and to generate available hospital beds and operating rooms when they are needed the most. This involves a hospital-wide initiative that focuses on controlling inpatient length of stay, facilitating timely discharge, and creative operating room scheduling (“smoothing the OR schedule”) as described above. The ability to affect and sustain meaningful improvements is dependent on respected and trusted leadership (administrative, departmental, medical and nursing staff) to create an environment that fosters patient safety and quality; appropriate and timely communication; and individuals with the knowledge and experience to guide the organization by utilizing “robust process improvement techniques” as are described elsewhere in the curriculum.

Summary

As the primary providers for care of surgical patients, residents are quite familiar with many of the issues that are described above. They recognize the difficulty in “getting the patient through the system” or “getting the patient from the ER into the OR.” They often develop creative ways in order to overcome the inefficiencies that they encounter. While many of these “workarounds” are seemingly effective in addressing a particular issue at a particular point in time, they are not solutions to the problems that exist. It is imperative that residents appreciate that they are patient advocates, as well as caregivers, and that faculty and the departmental leadership expect them to come forward with observations without feeling intimidated. By participating in workgroups and performance improvement teams they will be able to embrace the concepts of systems-based practice that are discussed above. In doing so, they will become significant contributors in the process of assuring quality and safety for our patients.
C. DISCHARGE PLANNING

OBJECTIVES

At the end of this section, the learner should be able to:

- Determine and document preoperative assessment of patient risk factors and how this might impact postoperative hospital discharge planning.
- Understand the value and necessity of appropriate transitions of care from the inpatient hospitalization to the outpatient environment.
- Consider the use of new technologies and how they can be utilized for appropriate postoperative follow-up.

The length of a patient’s hospital stay is a fundamental factor in the increasingly important and complex interplay between the quality of health care delivery, medical costs, and hospital readmissions. One unintended consequence of the recent push to limit readmissions would be for providers to keep patients in the hospital for a longer period of time with the intent of lowering the risk of readmission. The inpatient environment bolsters the intensity of care, and indeed longer hospital stays have been associated in some cases with a lower incidence of adverse outcomes leading to readmissions. However, the hospital is also an exceptionally expensive care delivery environment. In 2010, the average daily hospital charge per patient exceeded $7,000 and the total national bill for hospital charges for 39 million patients exceeded $1.28 trillion. In addition, longer lengths of stay have been associated with higher rates of hospital acquired infections and other deleterious conditions. The objective of decreasing medical costs, or at least reducing their outsized rate of increase, would seem to be well-served by reducing hospital length of stay (LOS) as well as unplanned readmissions. In 2010 for example, the average LOS was 4.7 days. If this could be reduced by just 0.1 days, to an LOS of 4.6 days, the savings would exceed $27 billion. However a shorter LOS might lead to higher hospital readmission rates unless the quality of hospital discharge decision making is improved.

A recent study explored the criteria that surgeons preferentially value in their discharge decision-making process. All surgical faculty and residents at a single academic institution were surveyed about the relative importance of specific criteria regularly used to make a discharge decision. Respondents reported significantly less reliance on common laboratory tests and patient demographics when making discharge decisions than on vital signs, perioperative factors, and functional criteria. Surgeon-specific factors that influenced discharge criteria preferences included years of clinical education and gender. The study further identified subtle variations in preferences for specific criteria based on clinical education, gender, and race. The study concluded that surgeons use a wide-range of clinical data when making discharge decisions and further understanding the nature of these preferences may suggest novel ways of presenting discharge-relevant information to the clinical decision-makers in order to optimize discharge outcomes.

One way to address the problem of overspending on health care is to increase the value of health care delivery using health information technology to enhance the quality of information presented to providers and to provide decision support tools that help with complex decision making. The Agency for Healthcare Research and Quality (AHRQ) has recently funded a program entitled Project RED (re-engineered discharge) which focuses on patient education as a means to facilitate successful hospital discharge (Table 1). In a randomized trial by Jack and colleagues, a nurse discharge advocate worked with patients during their hospital stay to arrange follow-up appointments, confirm medication reconciliation, and conduct patient education using an individualized instruction booklet that was then sent to their primary care provider. A clinical pharmacist called patients 2 to 4 days after discharge to reinforce the discharge plan and review medications. Participants in the intervention group (n = 370) had a lower rate of hospital utilization than those receiving usual care (n = 368) (0.314 versus 0.451 visit per person per month; incidence rate ratio, 0.695 [95% CI, 0.515 to 0.937]; P = 0.009). The intervention was most effective among participants with hospital utilization in the six months before index admission (P = 0.014).

Table 1: ProjectRED Discharge Checklist

1. Reconcile medications
2. Reconcile discharge plan with national guidelines
3. Make followup appointments
4. Follow up on outstanding tests
5. Arrange postdischarge services
6. Create a written discharge plan
7. Inform patient what to do if problem arises
8. Educate patient
9. Assess patient understanding
10. Send discharge summary to primary care physician
11. Reinforce the discharge plan via telephone
Other studies have assessed the utility of our clinical decision making tools meant to assist physicians in making a discharge decision. In an effort to improve discharge communication and improve patient outcomes, a recent study performed a cluster-randomized trial to assess the value of discharge software embedded within computerized physician order entry (CPOE). In summary, the CPOE software facilitated communication at the time of hospital discharge to patients, pharmacists and community physicians. While the software did not statistically reduce the rates of hospital readmission, ER visits, or adverse patient events, both patients and physicians perceived to have a more positive discharge experience than those patients who underwent a discharge without the software.

In summary, the transition from an inpatient hospital stay to outpatient care (whether that means home, a nursing facility, or rehabilitation), is a vulnerable time for all patients. The risks of poor communication between physicians, patients, hospital personnel, primary care physicians, and patient family members are high. The communication is often delayed, ineffective or inaccurate, and the result is often an adverse event for the patient. As surgeons who wish to improve the value of patient care, we must not only focus on hospital costs associated with faulty discharge planning, but also on the direct impact it might have on our patients.

**RECOMMENDED READING**


Graduate medical education has embraced the issues of cost and value. There is growing recognition that practice patterns are formed early, and that the training period is the time to influence physicians to practice high value cost-conscious care.\textsuperscript{10} The High Value Care (HVC) curriculum jointly developed by the American College of Physicians (ACP) and the Alliance for Academic Internal Medicine (AAIM) addresses these issues but is not specific to surgical procedures.\textsuperscript{11, 12}

Whereas prevention and screening are key components of high value care for trainees in medical specialties, surgical residents have a unique challenge in making value-based decisions on the appropriateness of a surgical or procedural intervention, and in the context of continual surgical innovation and an ever-expanding array of technology. These include new diagnostic tests, devices, implants and prosthesis that are very costly and for which adequate evaluation in terms of effectiveness has not yet occurred. In addition, surgeons face a set of barriers to high value care that may be different than other physicians, such as the fact that the cost of surgical interventions and their inevitable complications usually surpasses the cost of provision of care in medical settings.

**Frameworks for value improvement:** The following frameworks (Table 1) provide a basic approach to considering value when recommending a treatment plan for a given patient. As residents, you should apply these principles to the care that you provide (or are asked to provide) and ask questions when decision-making seems irrational.

**Diagnostic Testing:** The most basic and expensive services that residents often control is the use of laboratory and imaging studies. Residents should be trained to achieve more accurate and efficient diagnoses and improved patient outcomes by avoiding the harms associated with unnecessary testing and

### Table 1. Two Frameworks for Value-based Decision-Making

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<thead>
<tr>
<th>1. High Value Care (HVC) Curriculum from ACP-AAIM\textsuperscript{11}</th>
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<tr>
<td>• Step one: Understand the benefits, harms, and relative costs of the interventions that you are considering</td>
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<tr>
<td>• Step two: Decrease or eliminate the use of interventions that provide no benefits and/or may be harmful</td>
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<td>• Step three: Choose interventions and care settings that maximize benefits, minimize harms, and reduce costs (using comparative-effectiveness and cost-effectiveness data)</td>
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<td>• Step four: Customize a care plan with the patient that incorporates their values and addresses their concerns</td>
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<td>• Step five: Identify system level opportunities to improve outcomes, minimize harms, and reduce health care waste</td>
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<th>2. VALUE Mnemonic\textsuperscript{13}</th>
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<tr>
<td>V= Validation and Variability: Assess whether data validates an approach; Understand variability in patient cohorts, tests, and treatments</td>
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<tr>
<td>A= Affordability and Access: Understand patients’ finances, including insurance and out of pocket cost issues; ensure that at-risk patient populations are given appropriate access to care</td>
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<tr>
<td>L= Long-term and Less Side Effects: Consider long-term effects of tests and procedures, including downstream benefits, harms, and costs; Weigh possible side-effects of drugs and procedures and their impact on value</td>
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<tr>
<td>U= Utility and Usability: Consider the utility of interventions, including whether they lead to desired outcomes for the patient; assess usability—the patient’s willingness and ability to adhere to a plan</td>
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<tr>
<td>E= Effectiveness and Errors: Understand the difference between efficacy (works within a controlled setting) and effectiveness (how something works in the real world); Weigh the risk of errors and adverse events when making decisions</td>
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diagnostic delay. Content in this area will focus on understanding guidelines related to the Choosing Wisely® lists of diagnostic tests endorsed by the American College of Surgeons (for example, avoiding routine use of preoperative chest radiography for patients with unremarkable history and physical exam). See Appendix 2. Content will also include the use of clinically validated decision support tools such as those for diagnosis of deep vein thrombosis.15, 16

Technology Assessment: As surgeons we are driven to incorporate new technologies and procedures into practice to advance our specialty. The evidence base for new surgical innovations is often not very robust because new surgical techniques require continual improvisation and updating, including with new technologies and instrumentation, and are complicated by surgical learning curves and often a lack of agreed-upon outcomes of a surgical procedure.17 While new techniques like robotic surgery offer promise, they often lack the same rigorous evaluation as drug treatments, and therefore open themselves to criticism that the costs may not be worth the benefits.18

We must develop an improved approach to the evaluation of surgical techniques and devices. Recently, the IDEAL framework has been proposed as a methodology for evaluating new surgical innovations. The mnemonic IDEAL describes the stages of innovation: idea, development, exploration, assessment, and long-term study.17-22 The ultimate goal is better evidence about the value of new technologies and techniques, but with the understanding that the process is different than for drugs and other treatments. Fried suggests that, when faced with the dilemma of whether to adopt a new idea or technique, the surgeon should ask four basic questions: (a) Does this innovation fulfill a clinical need? (b) Does it add value to the existing options? (c) Is it financially viable? and (d) Can it be adopted by the average surgeon with relative ease?23

Appropriateness of Surgical Procedures: The appropriateness of surgical procedures is another concept that impacts on the delivery of high value, cost-conscious care.24 Unwarranted variations occur when interventions are either overused or underused. Various methods provide some guidance for providing the right treatment to the right patient at the right time. The decision whether to operate is always made between the surgeon and the patient, but better use of guidelines, appropriateness criteria,25-27 and decision-aids,28-30 can improve these personalized decisions.

Barriers: Barriers exist to the surgeon’s interest in considering the value of the care provided especially when the quality of care they deliver is exceptional. Some obstacles include a lack of knowledge of costs, discomfort with diagnostic uncertainty, time pressures, and patient expectations that more care is better.11 Additional barriers are that may affect surgeons include: misaligned financial incentives that reward the volume of procedures instead of their value and the implicit assumption that a procedure is indicated when a patient is referred to a surgeon, rather than the more neutral assumption that the surgeon is being called upon to evaluate the appropriateness of an operation for the patient. A lack of guidelines and poor data on the actual benefits and harms of surgical interventions may further cloud the judgment of value. Furthermore, defensive medicine may be even more prominent in surgical fields where the risk of facing a malpractice suit is considerably higher (even though few lawsuits actually lead to payment).31, 32 Finally, surgeons all too commonly face the patient or the family at a time when there is a serious illness or an important health decision to be made, and family or patients demand testing (and occasionally operations) that do not improve the outcome.

Conclusion: As residents, now is the time to start considering the value of the care you are providing and develop your thoughts on the surgeon’s role in determining how to provide the best care for each individual patient that you treat. Consider the services that you provide across the continuum of the patient experience, recognizing that the treatment that you provide will likely affect your patients’ lives long after you complete your training. Ultimately remember that as physicians we want to provide good health, not just good health care.33
Creating an Efficient System for Patient Care

RECOMMENDED READING


## Summary of Key Resources

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<td>ACP-AAIM High Value Care Curriculum&lt;br&gt;• Six free PowerPoints with useful slides &amp; graphics&lt;br&gt;• First PowerPoint has slides on U.S. health care costs, and framework for value improvement&lt;br&gt;• Requires free registration</td>
</tr>
<tr>
<td><a href="http://hvc.acponline.org/curriculum.html">http://hvc.acponline.org/curriculum.html</a></td>
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<td><strong>2. Choosing Wisely</strong></td>
<td>Choosing Wisely campaign&lt;br&gt;Medical society lists, with references&lt;br&gt;Surgery Choosing Wisely Master List&lt;br&gt;Collated lists from any medical society with surgically-relevant items</td>
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<td><a href="http://www.choosingwisely.org">http://www.choosingwisely.org</a></td>
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<td><strong>3. Appropriateness &amp; Decision-Aids</strong></td>
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<td><strong>Further Exploration: Additional topics &amp; materials</strong></td>
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<td>Porter, 2010&lt;sup&gt;8&lt;/sup&gt;</td>
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<td><a href="http://www.ideal-collaboration.net/framework">http://www.ideal-collaboration.net/framework</a>&lt;sup&gt;19&lt;/sup&gt;</td>
<td>Surgical Technology Assessment &amp; Innovation&lt;br&gt;IDEAL Framework: Website &amp; resources on methodology of surgical innovation</td>
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<tr>
<td>McCulloch, Ergina, Cook, 2013&lt;sup&gt;17, 20, 21&lt;/sup&gt;</td>
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Next Generation

The Practical Quality Improvement Manual is a place to start in the process of educating surgeons about quality improvement. The content is high yield but not exhaustive. Using a multitude of examples we have attempted to address the key questions—What is quality? What is quality improvement? How do I do a quality improvement project? How do I really do a quality improvement project?—in order to address an unmet need for practical information. The manual highlights the critical ingredients of culture, teamwork, leadership, and data in the quality improvement process. We limited the content for this first version due to time constraints. Subsequent generations of the manual will include more information on leadership and additional core measures including but not limited to: wrong-site surgery, retained foreign body, acute kidney injury; tools and technology used in the delivery of quality care; additional systems issues specific to the delivery of surgical care including but not limited to surgical consultation, and the dissemination of best practice guidelines. We are also in the process of developing an assessment module to determine the residents’ competence in quality improvement science and a course for interested faculty and residents to learn about quality of care science and how to teach it to others. Please share any comments or concerns about this manual by e-mailing them to aaansqip@gmail.com
FOR PROGRAM DIRECTORS OR RESIDENTS IN QI LEADERSHIP ROLES

Example of an Approach to Implementation of QI Educational Program from an Early QITI Adopter

PEARLS FROM AN EARLY ADOPTER

- For best resident buy-in for QI, they need credible data to show that a problem actually exists - this may require QITI reports run by team, not resident, or for time frames which are longer than initially desired.

- As the “troops on the ground,” residents already have many different areas that they want improved, and have ideas on how to do this. If buy-in to your QI process (whichever one you choose, e.g., Lean, Root Cause Analysis, Six Sigma) is needed, running one of these pre-existing areas for improvement through your process and analyzing how their pre-conceived solution would fit is a good introduction to QI before running and using a QITI report.

- When your program begins QI projects, pick simple projects that require collaborations with only 1-2 other specialties / departments at the most (if any at all).

- Keep in mind “measureables” to discretely evaluate improvements resulting from your project. QI projects can be done for improvement in areas of Professionalism and Interpersonal Communication (as opposed to Patient Care, which is the most common). Surveys about attitudes of health care team members / communication / adherence to protocols can be used for these “measureables.”

- Although engaged faculty champions for projects are important for getting resources and removing inter-departmental roadblocks, an engaged resident champion is much more important to the actual completion of projects. They must “drink the Kool-Aid.”

Background and Setting:

Our hospital maintains a university-affiliated, community-based surgery residency program that graduates three chief residents per year. We have been participating in the ACS NSQIP database for more than 10 years, and for the past three years have had a research resident working on quality improvement research / projects, many times utilizing ACS NSQIP data. Despite this experience, however, we have not had a widespread or in depth use of ACS NSQIP for the training of all residents in the program.

This has changed with the introduction of QITI reports, which provides an opportunity for quality analysis that is meaningful to the residents.

Barriers to Effective Utilization of the QITI:

We have several barriers to the use of the resident specific reports that result from limited resources. With only one ACS NSQIP SCR for a hospital with a multi-specialty reporting program, on average, each resident will only have 30 cases abstracted each year. This creates an n-value, which is too low to run a meaningful QITI report for each resident. As such, we have adopted running reports based on the surgical team (three currently). While this does not create as much individual “ownership” of the report for the residents, it is somewhat personal. When broken down by specialty, the complications and issues are immediately relatable to every resident. We find that the chief residents take these reports most seriously, as they understand that they had a significant amount of influence in reducing or causing the complications while in charge of the services.

Even with team-based reporting, as complication rates are low in absolute rates, we found that we had to run reports for a minimum of six to 12 month periods to generate acceptable n-values. This is important, as low n-values generate skepticism amongst the residents as to the validity of the complication rates.

Targeted QI Educational Program:

In order to engage our housestaff we implemented the following process:

In a one- to two-hour block of protected time, with all residents in attendance, we review the reports together in a systematic fashion. Minimal preparation is required: generating a QITI report and reviewing it to pre-identify target problems in case the residents do not generate enough spontaneously. The following three steps summarize the action plan for the session:

1. Run a QITI report that is either based on team or resident caring for the patient.

2. Decide upon a target problem after review of QITI report with residents (for example, Urinary Tract Infections [UTI]).

3. Delegate different levels of responsibility of investigation to different team members from PGY-1 to PGY 5 level. We recommend:
Appendix 1

PGY-1:

- Identify the medical / physiological reasons that put a patient (in general) at risk of developing the complication. (**medical knowledge, patient care**)

- This should include consideration of patient co-morbidities / history, recent condition, factors that occurred during hospitalization (including procedure, such as catheterizations). Relevant literature search via pubmed, medline, or ovid is encouraged (and can be done in real time via smart phone).

PGY-2 and PGY-3

- Focus on nonphysiological reasons for complication that may be currently present in the health system (**systems based practice, practice based learning**)

Some examples:

- Staffing / Scheduling / time of day / fatigue
- Competency assessment (including orientation/ training)
- Supervision
- Equipment failure or availability
- User error
- Availability of accurate data
- Proper use of data
- Communication factors: attending to attending, resident to resident, nurse to nurse, nurse to residents, staff to patient, etc.
- Transition of care
- Patient and family education
- Patient identification,

Be aggressive in looking for system errors previously identified in other health care models, not only in surgery.

PGY-4/5 Level:

- Based on information given by junior team members, lead an assessment for the increase in complication rate, focusing on potential areas of vulnerability identified by junior residents. (**systems-based practice, practice-based learning**)

- Develop strategies and/or new policy to achieve a “near certain prevention” status for the adverse event.

The results from the analysis can be used as the springboard for future quality improvement projects. As the initial data suggesting a quality issue was generated using ACS NSQIP, monitoring of progress / demonstrating clinical effect can easily be done by running subsequent ACS NSQIP / QITI reports in the future.

The additional work done by residents to complete the quality improvement touch all core competencies (including medical knowledge and patient care needed to initially develop the project):

- Interviews with other caregivers regarding their individual views on management and prevention of such adverse events. The interview process should be comprehensive, including attending physicians, nurse management, nurses, pharmacy, residents in other programs, various therapists (respiratory, physical, and so on), and any other person who cares directly for the patient and could possibly impact on development of this adverse event. Other perspectives on policy / system change identified by residents will improve multi-disciplinary “buy-in,” compliance, and outcomes. (**interpersonal skills and communication, professionalism**)

- Working with management, performance improvement department, nursing management to implement new policy. (**systems based practice**)

- Retesting the policy to determine if outcomes improve. If more events occur re-perform analysis with an effort at closing new loopholes. (**practice based learning**)

We have used outcomes other than clinical event rates to analyze for improvement including: cost, length of stay, patient satisfaction, and so on. Similarly, process measures have been used for smaller projects to allow residents to see progress more quickly. (**practice based learning, systems based practice**)
FOR PROGRAM DIRECTORS OR RESIDENT LEADERS IN QUALITY IMPROVEMENT/VALUE-BASED CARE

Examples of Educational Sessions on High-Value, Cost-Conscious Care for Surgeons

Three Learning Activities for Surgical Trainees

What follows are descriptions of three key topics that are relevant for surgical trainees. Each topic includes a learning objective and description of an educational activity. The key is to make any discussion and actions locally relevant. Efforts to teach quality improvement to surgical trainees have recognized the importance of this strategy and engaged residents, surgical faculty, hospital administrators and process-improvement teams in the curriculum. A similar strategy should be employed to teach any of the topics herein. Additional strategies include utilizing competition and case-based storytelling to increase engagement on high value, cost-conscious decision-making.

1. Overview and Framework for High-Value Decision-Making

Like quality improvement efforts, value-based decision-making may best be understood using concrete examples. Nevertheless, an overview of the problem of health care costs, and a framework for value improvement may be useful for the surgical trainee.

Objective: Trainees should understand the problem of U.S. health care costs, and be familiar with a framework for improving medical decisions based on value.

Activity: Value: What, Why, and How?
- Share a few PowerPoint slides on U.S. health care costs. These can be obtained for free from Presentation #1 of the ACP-AAIM HVC curriculum website.
- Review a framework for value-based decision-making (same PowerPoint resource).
- Step one: Understand the benefits, harms, and relative costs of the interventions that you are considering.
- Step two: Decrease or eliminate the use of interventions that provide no benefits and/or may be harmful
- Step three: Choose interventions and care settings that maximize benefits, minimize harms, and reduce costs (using comparative-effectiveness and cost-effectiveness data)
- Step four: Customize a care plan with the patient that incorporates their values and addresses their concerns
- Step five: Identify system-level opportunities to improve outcomes, minimize harms, and reduce health care waste

Discussion Questions:
1. Can you think of clinical case scenarios where harms and costs of an intervention may outweigh the benefits?
2. Have you ever used comparative-effectiveness or cost-effectiveness data to make decisions? If so, how? What are the barriers to doing so?
3. What are some system-level opportunities to reduce health care waste or costs and minimize harms?

2. Choosing Wisely Campaign

Dozens of medical societies have created lists of potentially unnecessary health care interventions. The lists are meant to spark conversation between patients and their physicians, with the recognition that every decision is personalized. The American College of Surgeons and the Commission on Cancer published lists simultaneously in September 2013.

Objective: Trainees should be familiar with the Choosing Wisely lists and their relevance to clinical practice.

Activity: Your own Choosing Wisely list
- Review the “Surgery Choosing Wisely Master List, February 2014,” which includes surgically relevant items from all medical societies.
Appendix 2

- Create your own top 5 Choosing Wisely list, with the following criteria:
  - Commonly ordered or performed by you
  - Carries some risk of harm
  - If avoided, would improve health and reduce costs

- Discussion Questions:
  1. What are barriers to avoiding the services on your list?
  2. What are some ways you might overcome those barriers?

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**Surgery Choosing Wisely, February 2014**

**American Academy of Hospice and Palliative Medicine**

Don’t recommend percutaneous feeding tubes in patients with advanced dementia; instead, offer oral assisted feeding.

Don’t delay palliative care for a patient with serious illness who has physical, psychological, social or spiritual distress because they are pursuing disease-directed treatment.

Don’t leave an implantable cardioverter-defibrillator (ICD) activated when it is inconsistent with the patient/family goals of care.

Don’t use topical lorazepam (Ativan), diphenhydramine (Benadryl), haloperidol (Haldol) (“ABH”) gel for nausea.

**American Academy of Neurology**

Don’t recommend CEA for asymptomatic carotid stenosis unless the complication rate is low (<3%).

**American Academy of Pediatrics**

Computed tomography (CT) scans are not necessary in the immediate evaluation of minor head injuries; clinical observation/Pediatric Emergency Care Applied Research Network (PECARN) criteria should be used to determine whether imaging is indicated.

**American Academy of Pediatrics**

Computed tomography (CT) scans are not necessary in the routine evaluation of abdominal pain.

**American College of Cardiology**

Don’t perform stress cardiac imaging or advanced non-invasive imaging as a pre-operative assessment in patients scheduled to undergo low-risk non cardiac surgery.

**American College of Chest Physicians and American Thoracic Society**

Don’t perform chest computed tomography (CT angiography) to evaluate for possible pulmonary embolism in patients with a low clinical probability and negative results of a highly sensitive D-dimer assay.
Surgery Choosing Wisely, February 2014 (continued)

**American College of Emergency Physicians**

Avoid computed tomography (CT) scans of the head in emergency department patients with minor head injury who are at low risk based on validated decision rules.

**American College of Physicians**

In patients with low pretest probability of venous thromboembolism (VTE), obtain a high-sensitive D-dimer measurement as the initial diagnostic test; don’t obtain imaging studies as the initial diagnostic test.

Don’t obtain preoperative chest radiography in the absence of a clinical suspicion for intrathoracic pathology.

**American College of Radiology**

Don’t image for suspected pulmonary embolism (PE) without moderate or high pre-test probability of PE

Avoid admission or preoperative chest x-rays for ambulatory patients with unremarkable history and physical exam.

Don’t recommend follow-up imaging for clinically inconsequential adnexal cysts.

**American College of Surgeons**

Don’t perform axillary lymph node dissection for clinical stages I and II breast cancer with clinically negative lymph nodes without attempting sentinel node biopsy.

Avoid the routine use of “whole-body” diagnostic computed tomography (CT) scanning in patients with minor or single system trauma.

Avoid colorectal cancer screening tests on asymptomatic patients with a life expectancy of less than 10 years and no family or personal history of colorectal neoplasia.

Avoid admission or preoperative chest x-rays for ambulatory patients with unremarkable history and physical exam.

Don’t do computed tomography (CT) for the evaluation of suspected appendicitis in children until after ultrasound has been considered as an option.

**American Gastroenterological Association**

Do not repeat colorectal cancer screening (by any method) for 10 years after a high-quality colonoscopy is negative in average-risk individuals.

For a patient with functional abdominal pain syndrome (as per ROME III criteria) computed tomography (CT) scans should not be repeated unless there is a major change in clinical findings or symptoms.

**American Geriatrics Society**

Don’t use antimicrobials to treat bacteriuria in older adults unless specific urinary tract symptoms are present.

**American Society for Clinical Pathology**

Avoid routine preoperative testing for low risk surgeries without a clinical indication.

Don’t use bleeding time test to guide patient care.

**American Society of Anesthesiologists**
### Appendix 2

#### Surgery Choosing Wisely, February 2014 (continued)

Don’t obtain baseline laboratory studies in patients without significant systemic disease (ASA I or II) undergoing low-risk surgery - specifically complete blood count, basic or comprehensive metabolic panel, coagulation studies when blood loss (or fluid shifts) is/are expected to be minimal.

Don’t obtain baseline diagnostic cardiac testing (trans-thoracic/esophageal echocardiography - TTE/TEE) or cardiac stress testing in asymptomatic stable patients with known cardiac disease (e.g., CAD, valvular disease) undergoing low or moderate risk non-cardiac surgery.

Don’t use pulmonary artery catheters (PACs) routinely for cardiac surgery in patients with a low risk of hemodynamic complications (especially with the concomitant use of alternative diagnostic tools (e.g., TEE).

Don’t administer packed red blood cells (PRBCs) in a young healthy patient without ongoing blood loss and hemoglobin of ≥6 g/dL unless symptomatic or hemodynamically unstable.

Don’t routinely administer colloid (dextran, hydroxyethyl starches, albumin) for volume resuscitation without appropriate indications.

**American Society of Clinical Oncology**

Don’t use cancer-directed therapy for solid tumor patients with the following characteristics: low performance status (3 or 4), no benefit from prior evidence-based interventions, not eligible for a clinical trial, and no strong evidence supporting the clinical value of further anti-cancer treatment.

Don’t perform PET, CT, and radionuclide bone scans in the staging of early breast cancer at low risk for metastasis.

Don’t perform surveillance testing (biomarkers) or imaging (PET, CT, and radionuclide bone scans) for asymptomatic individuals who have been treated for breast cancer with curative intent.

Avoid using PET or PET-CT scanning as part of routine follow-up care to monitor for a cancer recurrence in asymptomatic patients who have finished initial treatment to eliminate the cancer unless there is high-level evidence that such imaging will change the outcome.

**American Society of Echocardiography**

Avoid echocardiograms for preoperative/perioperative assessment of patients with no history or symptoms of heart disease.

**American Society of Hematology**

Don’t transfuse more than the minimum number of red blood cell (RBC) units necessary to relieve symptoms of anemia or to return a patient to a safe hemoglobin range (7 to 8 g/dL in stable, non-cardiac in-patients).

Don’t test for thrombophilia in adult patients with venous thromboembolism (VTE) occurring in the setting of major transient risk factors (surgery, trauma or prolonged immobility).

Don’t use inferior vena cava (IVC) filters routinely in patients with acute VTE.

**American Society of Nephrology**

Avoid nonsteroidal anti-inflammatory drugs (NSAIDS) in individuals with hypertension or heart failure or CKD of all causes, including diabetes.

Don’t place peripherally inserted central catheters (PICC) in stage III-V CKD patients without consulting nephrology.

**American Society of Nuclear Cardiology**

Don’t perform cardiac imaging as a pre-operative assessment in patients scheduled to undergo low- or intermediate-risk non-cardiac surgery.
Surgery Choosing Wisely, February 2014 (continued)

**Commission on Cancer**

Don’t perform surgery to remove a breast lump for suspicious findings unless needle biopsy cannot be done.

Don’t initiate surveillance testing after cancer treatment without providing the patient a survivorship care plan.

Don’t use surgery as the initial treatment without considering pre-surgical (neoadjuvant) systemic and/or radiation for cancer types and stage where it is effective at improving local cancer control, quality of life or survival.

Don’t perform major abdominal surgery or thoracic surgery without a pathway or standard protocol for postoperative pain control and pneumonia prevention.

Don’t initiate cancer treatment without defining the extent of the cancer (through clinical staging) and discussing with the patient the intent of treatment.

**Critical Care Societies Collaborative**

Don’t order diagnostic tests at regular intervals (such as every day), but rather in response to specific clinical questions.

Don’t transfuse red blood cells in hemodynamically stable, non-bleeding ICU patients with a hemoglobin concentration greater than 7 g/dL.

Don’t use parenteral nutrition in adequately nourished critically ill patients within the first seven days of an ICU stay.

Don’t deeply sedate mechanically ventilated patients without a specific indication and without daily attempts to lighten sedation.

Don’t continue life support for patients at high risk for death or severely impaired functional recovery without offering patients and their families the alternative of care focused entirely on comfort.

**Society for Vascular Medicine**

Don’t do work up for clotting disorder (order hypercoagulable testing) for patients who develop first episode of deep vein thrombosis (DVT) in the setting of a known cause.

Don’t reimage DVT in the absence of a clinical change.

Avoid cardiovascular testing for patients undergoing low-risk surgery.

Refrain from percutaneous or surgical revascularization of peripheral artery stenosis in patients without claudication or critical limb ischemia.

Don’t screen for renal artery stenosis in patients without resistant hypertension and with normal renal function, even if known atherosclerosis is present.

**Society of Cardiovascular Computed Tomography**

Don’t order coronary artery calcium scoring for preoperative evaluation for any surgery, irrespective of patient risk.

**Society of General Internal Medicine**

Don’t perform routine pre-operative testing before low-risk surgical procedures.

Don’t recommend cancer screening in adults with life expectancy of less than 10 years.

Don’t place, or leave in place, peripherally inserted central catheters for patient or provider convenience.
Appendix 2

Surgery Choosing Wisely, February 2014 (continued)

**Society of Cardiovascular Computed Tomography**

Don’t order coronary artery calcium scoring for preoperative evaluation for any surgery, irrespective of patient risk.

**Society of Hospital Medicine - Adult Hospital Medicine**

Don’t place, or leave in place, urinary catheters for incontinence or convenience or monitoring of output for non-critically ill patients (acceptable indications: critical illness, obstruction, hospice, perioperatively for <2 days for urologic procedures; use weights instead to monitor diuresis).

Don’t prescribe medications for stress ulcer prophylaxis to medical inpatients unless at high risk for GI complications.

Avoid transfusions of red blood cells for arbitrary hemoglobin or hematocrit thresholds and in the absence of symptoms of active coronary disease, heart failure or stroke.

Don’t order continuous telemetry monitoring outside of the ICU without using a protocol that governs continuation.

Don’t perform repetitive CBC and chemistry testing in the face of clinical and lab stability.

**Society of Nuclear Medicine and Molecular Imaging**

Don’t use PET/CT for cancer screening in healthy individuals.

**The Society of Thoracic Surgeons**

Patients who have no cardiac history and good functional status do not require preoperative stress testing prior to non-cardiac thoracic surgery.

Don’t initiate routine evaluation of carotid artery disease prior to cardiac surgery in the absence of symptoms or other high-risk criteria.

Don’t perform a routine pre-discharge echocardiogram after cardiac valve replacement surgery.

Patients with suspected or biopsy proven Stage I NSCLC do not require brain imaging prior to definitive care in the absence of neurologic symptoms.

Prior to cardiac surgery, there is no need for pulmonary function testing in the absence of respiratory symptoms.
3. Appropriateness and Decision-Aids

As opposed to strongly indicated care, some care is preference-sensitive in that the patient’s preferences in how they balance potential benefits, risks, harms, and costs are of critical importance.

Objective: Trainees should understand useful tools for improving shared decision-making, including the informed consent process and decision-aids.

Activity: Shared decision-making, from theory to practice

- Pick one of the following decision-aids for review:
  - Appropriateness criteria for bariatric surgery\textsuperscript{16}
  - Frailty index\textsuperscript{17}
  - Breast cancer decision-aids\textsuperscript{18}
  - ACS NSQIP surgical risk calculator\textsuperscript{19}

- Discussion Questions:
  1. Would you use this decision-aid in practice?
  2. What are barriers to using this decision-aid?
  3. What are methods of overcoming those barriers?
Table 1: Recommendations for Evidence Based VTE Prophylaxis

### General and abdominal-pelvic surgery

1. For general and abdominal-pelvic surgery patients at very low risk for VTE (< 0.5%; Rogers score, >7; Caprini score, 0), we recommend that no specific pharmacologic (Grade 1B) or mechanical (Grade 2C) prophylaxis be used other than early ambulation.

2. For general and abdominal-pelvic surgery patients at low risk for VTE (~1.5%; Rogers score, 7-10; Caprini score, 1-2), we suggest mechanical prophylaxis, preferably with intermittent pneumatic compression (IPC), over no prophylaxis (Grade 2C).

3. For general and abdominal-pelvic surgery patients at moderate risk for VTE (~3.0%; Rogers score, >10; Caprini score, 3-4) who are not at high risk for major bleeding complications, we suggest low-molecular-weight heparin (LMWH) (Grade 2B) low-dose unfractionated heparin (LDUH) (Grade 2B), or mechanical prophylaxis, preferably with IPC (Grade 2C), over no prophylaxis.

4. For general and abdominal-pelvic surgery patients at moderate risk for VTE (3.0%; Rogers score, >10; Caprini score, 3-4) who are at high risk for major bleeding complications or those in whom the consequences of bleeding are thought to be particularly severe, we suggest mechanical prophylaxis, preferably with IPC, over no prophylaxis (Grade 2C).

5. For general and abdominal-pelvic surgery patients at high risk for VTE (~6.0%; Caprini score, >=5) who are not at high risk for major bleeding complications, we recommend pharmacologic prophylaxis with LMWH (Grade 1B) or LDUH (Grade 1B) over no prophylaxis. We suggest that mechanical prophylaxis with elastic stockings (ES) or IPC should be added to pharmacologic prophylaxis (Grade 2C).

6. For high risk-VTE risk patients undergoing abdominal or pelvic surgery for cancer who are not otherwise at high risk for major bleeding complications, we recommend extended duration pharmacologic prophylaxis (4 weeks) with LMWH over limited duration prophylaxis (Grade 2C).

7. For high-VTE risk general and abdominal pelvic surgery patients who are at high risk for major bleeding complications or those in whom the consequences of bleeding are thought to be particularly severe, we suggest use of mechanical prophylaxis, preferably with IPC, over no prophylaxis until the risk of bleeding diminishes and pharmacologic prophylaxis may be initiated (Grade 2C).

8. For general and abdominal-pelvic surgery patients at high risk for VTE (6%; Caprini score, >=5) in whom both LMWH and unfractionated heparin are contraindicated or unavailable and who are not at high risk for major bleeding complications, we suggest low-dose aspirin (Grade 2C), fondaparinux (grade 2C), or mechanical prophylaxis, preferably with IPC (Grade 2C), over no prophylaxis.

9. For general and abdominal-pelvic surgery patients, we suggest than an inferior vena cava (IVC) filter should not be used for primary VTE prevention (Grade 2C).

10. For general and abdominal pelvic surgery patients, we suggest that periodic surveillance with venous compression ultrasound (VCU) should not be performed (Grade 2C).

### Cardiac Surgery

1. For cardiac surgery patients with an uncomplicated postoperative course, we suggest use of mechanical prophylaxis, preferably with optimally applied IPC, over either no prophylaxis (Grade 2C) or pharmacologic prophylaxis (Grade 2C).

2. For cardiac surgery patients whose hospital course is prolonged by one or more non-hemorrhagic surgical complications, we suggest adding pharmacologic prophylaxis with LDUH or LMWH to mechanical prophylaxis (grade 2C).
Table 1: Recommendations for Evidence Based VTE Prophylaxis

**Thoracic Surgery**

1. For thoracic surgery patients at moderate risk for VTE who are not at high risk for perioperative bleeding, we suggest LDUH (Grade 2B), LMWH (Grade 2B), or mechanical prophylaxis with optimally applied IPC (Grade 2C) over no prophylaxis.
2. For thoracic surgery patients at high risk for VTE who are not at high risk for perioperative bleeding, we suggest LDUH (Grade 1B) or LMWH (Grade 1B) over no prophylaxis. In addition, we suggest that mechanical prophylaxis with ES or IPC should be added to pharmacologic prophylaxis (Grade 2C).
3. For thoracic surgery patients who are at high risk for major bleeding, we suggest use of mechanical prophylaxis, preferably with optimally applied IPC, over no prophylaxis until the risk of bleeding diminishes and pharmacologic prophylaxis may be initiated (grade 2C).

**Craniotomy Patients**

1. For craniotomy patients, we suggest that mechanical prophylaxis, preferably with IPC be used over no prophylaxis (grade 2C) or pharmacologic prophylaxis (Grade 2C).
2. For craniotomy patients are very high risk for VTE (eg. those undergoing craniotomy for malignant disease), we suggest adding pharmacologic prophylaxis to mechanical prophylaxis once adequate hemostasis is established and the risk of bleeding decreases (grade 2C).

**Spinal Surgery**

1. For patients undergoing spinal surgery, we suggest mechanical prophylaxis, preferably with IPC, over no prophylaxis (Grade 2c), unfractionated heparin (Grade 2C), or LMWH (Grade 2C)
2. For patients undergoing spinal surgery at high risk for VTE (including those with malignant disease or those undergoing surgery with a combined anterior-posterior approach), we suggest adding pharmacologic prophylaxis to mechanical prophylaxis once adequate hemostasis is established and the risk of bleeding decreases (Grade 2C)

**Trauma Surgery**

1. For major trauma patients, we suggest use of LDUH (Grade 2C), LMWH (grade 2C), or mechanical prophylaxis, preferably with IPC (Grade 2C), over no prophylaxis.
2. For major trauma patients at high risk for VTE (including those with acute spinal cord injury, traumatic brain injury, and spinal surgery for trauma), we suggest adding mechanical prophylaxis to pharmacologic prophylaxis (Grade 2C) when not contraindicated by lower extremity injury.
3. For major trauma patients in whom LMWH and LDUH are contraindicated, we suggest mechanical prophylaxis, preferably with IPC, over no prophylaxis (Grade 2C) when not contraindicated by lower-extremity injury. We suggest adding pharmacologic prophylaxis with either LMWH or LDUH when the risk of bleeding diminishes or the contraindication to heparin resolves (Grade 2C).
4. For major trauma patients, we suggest that an IVC filter should not be used for primary VTE prevention (Grade 2C)
5. For major trauma patients, we suggest that periodic surveillance with VCU should not be performed (Grade 2C).
Table 2: Abstract from Guidelines for VTE Prophylaxis

**Background:** This article addresses the treatment of VTE disease.

**Methods:** We generated strong (Grade 1) and weak (Grade 2) recommendations based on high-quality (Grade A), moderate-quality (Grade B), and low-quality (Grade C) evidence.

**Results:** For acute DVT or pulmonary embolism (PE), we recommend initial parenteral anticoagulant therapy (Grade 1B) or anticoagulation with rivaroxaban. We suggest low-molecular-weight heparin (LMWH) or fondaparinux over IV unfractionated heparin (Grade 2C) or subcutaneous unfractionated heparin (Grade 2B). We suggest thrombolytic therapy for PE with hypotension (Grade 2C). For proximal DVT or PE, we recommend treatment of 3 months over shorter periods (Grade 1B). For a first proximal DVT or PE that is provoked by surgery or by a nonsurgical transient risk factor, we recommend 3 months of therapy (Grade 1B; Grade 2B if provoked by a nonsurgical risk factor and low or moderate bleeding risk); that is unprovoked, we suggest extended therapy if bleeding risk is low or moderate (Grade 2B) and recommend 3 months of therapy if bleeding risk is high (Grade 1B); and that is associated with active cancer, we recommend extended therapy (Grade 1B; Grade 2B if high bleeding risk) and suggest LMWH over vitamin K antagonists (Grade 2B). We suggest vitamin K antagonists or LMWH over dabigatran or rivaroxaban (Grade 2B). We suggest compression stockings to prevent the postthrombotic syndrome (Grade 2B). For extensive superficial vein thrombosis, we suggest prophylactic-dose fondaparinux or LMWH over no anticoagulation (Grade 2B), and suggest fondaparinux over LMWH (Grade 2C).

**Conclusion:** Strong recommendations apply to most patients, whereas weak recommendations are sensitive to differences among patients, including their preferences.

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3. Lean


4. The Modern Morbidity and Mortality Conference


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References


2. UTI (Whipple with Epidural)

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SECTION V CREATING AN EFFICIENT SYSTEM FOR PATIENT CARE

1. The Accreditation Council for Graduate Medical Education (ACGME). Program Requirements for Graduate Medical Education in General Surgery. ACGME.org


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C. Discharge Planning


D. Value: Teaching High Value Cost-Conscious Care to Surgical Residents


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High-Value Care Education


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