The Surgical Complication Prevention Toolkit: 
Your Technical Work Plan for Translating Evidence into Practice

Armstrong Institute for Patient Safety and Quality
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Introduction

Surgical complications take an immeasurable toll on our patients and their families. Estimates suggest that one in four patients suffers from a surgical adverse event. Often we hear that these complications are inevitable – our patients are old, our patients are sick. Yet at least half of adverse surgical events are preventable.1-3

Since 2009, over 1,000 hospitals have joined a national program to eliminate central line-associated bloodstream infections (CLABSI), a hospital-associated infection once perceived as inevitable, in their intensive care units. Their indisputable success shows that engaged teams can transform care when they own a problem, apply proven improvement strategies, and learn from each other.4-6

Surgical teams at the Johns Hopkins Hospital have applied these principles in their perioperative area. They reduced their surgical site infection (SSI) rates by 33 percent.7 For more information about their experience, see Appendix A. Health care quality leaders and your own hospital’s CEO believe that you can make surgical care safer by joining a new national program to scale up this work.

What’s in the toolkit

By implementing this toolkit in your perioperative area, your team leads the national effort to reduce surgical complications. However, this toolkit is not a prescription for success. The authors of this manual do not work in your perioperative area. Only your team understands your obstacles and your opportunities for improvement. The materials presented here provide a structure for your efforts to implement evidence-based practice and protect your patients from surgical complications. Success requires creative energy, persistence, leadership and teamwork.

Using the TRIP model as a framework

This toolkit’s structure is based on a model to Translate Research Into Practice (TRIP), designed to close the gap between evidence-based guidelines and bedside practice. For more information about the TRIP model, please see Appendix B. Briefly, the model is composed of four phases, listed below:

1. Develop an evidence-based intervention
   • Identify interventions associated with improved outcomes
   • Select interventions with the largest benefit and lowest burden
   • Operationalize your intervention
2. Identify barriers to implementation
3. Measure baseline performance
4. Ensure all patients receive the intervention

While the majority of examples in this toolkit address the prevention of SSI in colorectal patients, your team can apply this model to other surgical complications and service lines. The initial focus on colorectal SSI is warranted given the relatively high rate of infections in colorectal patients and the associated increased morbidity, mortality and costs of care.9,10
Phase 1. Develop an Evidence-based Intervention

A major success of the CMS-sponsored Surgical Care Improvement Project (SCIP) was the development of process measures to improve surgical care and reduce SSI. Yet excellent adherence to these process measures has not resulted in reduced infection rates or improved surgical outcomes. Why might that be?

There are likely a few reasons:

- In contrast to the mature evidence for preventing other healthcare acquired infections (HAIs), like central line-associated blood stream infections (CLABSI) and ventilator-associated pneumonia (VAP), evidence for SSI prevention cannot be boiled down into a simple behavioral checklist or ‘bundle’.
- SSIs are complex. There are likely contributing factors in addition to SCIP processes – like appropriate antibiotic dosage by patient weight, appropriate antibiotic re-dosing dependent on antibiotic used and blood loss, or the quality of skin prep – that impact SSI rates.
- For many clinicians, SCIP adherence is an exercise in documentation or ‘checking a box.’ We need to re-engage clinicians with the intention behind SCIP – to improve care for surgical patients.

Identify interventions associated with improved outcomes

Your team has already devoted significant energy and resources to surgical complication reduction. Don’t re-invent the wheel. Your team can build upon your work in three ways:

1. **Start by asking your frontline staff how their next patient will be harmed.**

   Frontline providers understand patient safety risks in their perioperative area. They develop tactics to safeguard their patients against them in their everyday work. We need to tap into frontline providers’ knowledge, and use it to guide our safety improvement efforts. Many of your interventions will be derived from their wisdom. Your team can use the Perioperative Staff Safety Assessment (PSSA) to gather their thoughts. The PSSA asks staff how their next patient will be harmed, how they will develop an SSI, and how these complications can be prevented. For more information about the PSSA, please see the CUSP for Safe Surgery manual.

2. **‘Dig deeper’ into SCIP processes to identify opportunities for improvement.**

   Many organizations have achieved near perfect compliance with the SCIP process measures, yet additional opportunities to improve likely exist. For example, the majority of your patients may receive the right antibiotic at the right time, but may not receive the right dose of antibiotic or the right frequency of antibiotic re-dosing. Other problems, or defects, may exist in normothermia maintenance or the quality of skin preparation. These defects likely contribute to the development of SSIs. Your improvement team can better understand these local defects through auditing of clinical practice. Auditing clinical practice is a feasible strategy to identify defects in your area. These audits can be facilitated by using audit tools such as those contained in Appendix C.

3. **Consider emerging evidence for SSI reduction.**

   The American Society of Health-System Pharmacists, Infectious Diseases Society of America, Society for Healthcare Epidemiology of America, and the Surgical Infection Society are expected to collectively release new SSI prevention guidelines in early 2013. These guidelines include recommendations on antibiotic dosing, re-dosing, weight-based dosing and use of mechanical bowel preparation with oral...
antibiotics for colon surgery. Your team should consider aligning your surgical practice with new recommendations.

**Select interventions with the largest benefit and lowest burden**

After your team has identified defects that may contribute to SSI, you will need to develop interventions to address these defects and prioritize them for implementation. While there is no formula for where to start, your team will want to consider a few factors:

- How strong is the evidence supporting the intervention?
- How much effort is required to gain buy-in for your intervention?
- How many resources are required to change local practice?

Consider opportunities for fast and visible ‘early wins’ to build momentum before focusing on more challenging interventions.

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**The Surgical Complication Prevention Toolkit in practice**

“When we started to address defects in our practice, we started simple, by looking at the right antibiotic at the right time. We got some push-back at first: Some clinicians on the team felt that they had ‘already done SCIP’. But our antibiotic audit data clearly showed that a fair amount of our penicillin-allergic patients weren’t receiving appropriate antibiotic prophylaxis. In the end, it was a good place to start. No one could deny the evidence that patients should receive appropriate antibiotics for SSI prophylaxis, so everyone was motivated to improve once they realized we had a problem.” – CUSP for Safe Surgery Surgeon Champion

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**Operationalize your intervention**

Evidence-based guidelines can be ambiguous and complex. Whenever possible, simplify guidelines into specific behaviors. Make it easier for providers to do the right thing by developing checklists, policies and protocols that clarify inevitable questions about who does what, where, when and how. While there is no single checklist for SSI prevention, your team will need to make your interventions simple and actionable so that clinicians understand how to change their practice.

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**The Surgical Complication Prevention Toolkit in practice**

“Our infection control group recommends dosing clindamycin with gentamicin 5 mg/kg for colorectal surgery patients that are penicillin-allergic. This is nearly double the usual dose of gentamicin used on the wards. Clinicians were concerned that this high dose of gentamicin might be harmful, so frequently they either gave a lower dose or just clindamycin. We decided to operationalize our intervention by focusing on appropriate gentamicin dosing for penicillin-allergic patients.” — Certified Registered Nurse Anesthetist, CUSP for Safe Surgery Team Member
Phase 2. Identify barriers to implementation

Clinicians want to achieve the best possible outcomes for their patients. If patients are not receiving the evidence-based intervention your team identified, you will need to understand the barriers to compliance and the underlying reasons for work-arounds. ¹⁴ Common barriers to reliable use of evidence-based interventions include:

- Clinicians aren’t aware of the evidence-based intervention
- Clinicians don’t agree with the intervention
- Other system-level factors make implementation of the intervention too burdensome

The Barrier Identification and Mitigation (BIM) Tool

Your team can use the Barrier Identification and Mitigation (BIM) tool to identify and address barriers to implementation. (Appendix D)¹⁴ The BIM tool includes a brief user’s guide to walk you through its five-step process:

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<th>Approach</th>
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<td>Assemble the BIM Team</td>
<td>Assemble an interdisciplinary team to identify barriers to guideline compliance</td>
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<tr>
<td>Identify the Barriers</td>
<td>BIM team members work independently to identify barriers in 3 ways:</td>
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<td><strong>Observe the process:</strong> Passively observe clinicians providing care.</td>
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<td><strong>Discuss the process:</strong> Ask clinicians about the intervention.</td>
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<td></td>
<td><strong>Walk the process:</strong> Using either simulation or under real circumstances, try to implement the intervention.</td>
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<tr>
<td>Compile and summarize the barrier</td>
<td>Organize all the information you collected in the previous step.</td>
</tr>
<tr>
<td>information</td>
<td></td>
</tr>
<tr>
<td>Review and prioritize the barriers</td>
<td>Systematically prioritize barriers to determine which one should be tackled first.</td>
</tr>
<tr>
<td>Develop an action plan for each</td>
<td>Now that the team has identified which barriers to target, they can take action to eliminate them.</td>
</tr>
<tr>
<td>targeted barrier</td>
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</table>
The Surgical Complication Prevention Toolkit in practice

“Before rolling out our intervention, we used the BIM tool to uncover barriers that might undermine our work. When we ‘walked the process,’ we found that there was not enough gentamicin in the OR to routinely administer 5mg/kg for an average 70 kg patient. We thought, ‘How can we expect our clinicians to give a medication that is not readily available in adequate quantities?’ We took this information to our pharmacy, and they increased the number of gentamicin vials in our OR stock.” – CUSP for Safe Surgery Nursing Champion

Phase 3. Measure baseline performance
Your team needs to collect baseline process and outcome data to assess current performance and progress towards improving patient care.

Process Measures
Your team will select your own process measures depending upon the intervention you develop. For example, if your team is focusing on antibiotic prophylaxis, your numerator may be number of penicillin-allergic patients receiving 5 mg/kg of gentamicin, and your denominator may be number of penicillin-allergic patients.

You will not need to report process measures to the CUSP for Safe Surgery project team, so use any method you wish to collect this data. It may be helpful to use the auditing tools in Appendix C to periodically evaluate performance. You will likely find this simpler than developing a formal data collection strategy that often requires modifications to existing IT infrastructure.

Outcome Measures
At the outset of this project, your team will collect SSI data as your outcome measure. As you become more comfortable with the improvement methods described here and in the CUSP for Safe Surgery manual, you can expand your technical work to address other surgical complications such as DVT, mislabeled specimens, and postoperative pneumonia. Whichever complication your team addresses, you should use standardized outcome measures and rigorous data collection methods.

Since January 2012, the Centers for Medicare and Medicaid Services have required hospitals performing colon surgery and abdominal hysterectomies to report SSI rates related to those surgeries to its National Healthcare Safety Network (NHSN). Additionally, your hospital may submit SSI data through the American College of Surgeons National Surgical Quality Improvement Project (ACS NSQIP), which has separate participation and reporting requirements.

The CUSP for Safe Surgery project database
If your hospital submits SSI data through NHSN or ACS NSQIP, you can arrange to have your SSI data automatically transferred to the CUSP for Safe Surgery secure database. Your team can use the project database to generate instant SSI reports, including SSI trend lines and benchmarking with other hospitals in your state and other hospitals participating in the CUSP for Safe Surgery project. Note that hospitals transferring NHSN and NSQIP data will not be compared to each other, as data collection methodologies differ for these reporting mechanisms. Your team can also enter SSI data into the project...
database manually, using the same SSI definitions as NHSN and ACS NSQIP. Please see Appendix E for approved SSI definitions.

**Phase 4. Ensure all patients receive the intervention**

Finally, reliably deliver evidence-based care to 100 percent of your patients. Ensure that your evidence-based intervention becomes ‘the way things are done around here.’ This phase poses the biggest challenge. Up until this phase, your quality improvement team has been implementing phases one through three. Phase four will require buy-in and involvement from the whole perioperative team and stakeholders who actually implement your intervention. Your intervention must be tailored to address each perioperative team’s current system, culture, resources, and commitment.\(^{15}\)

**The Four E’s**

Drawing from evidence and experience, clinicians at the Johns Hopkins Hospital developed a “Four E’s” model to help ensure that patients receive the targeted interventions. The model prompts your team to consider staff engagement, local culture, and contextual factors in a phased plan to embed your intervention in existing care processes. The Four E’s represent the four phases of this model:

- **Engage**: Win the hearts and minds of your perioperative teams
- **Educate**: Teach your teams about your intervention
- **Execute**: Implement your plan with purposeful perioperative team participation
- **Evaluate**: Determine how well your intervention has improved care processes and patient outcomes

**Put the Four E’s to Work**

Safety efforts succeed through the investment of key stakeholders, including senior leaders, project team leaders, and frontline staff. Though stakeholders have different perspectives, hopes, and fears, they often have the same questions about their involvement in improvement efforts.

Put the Four E’s model to work by explicitly addressing the questions that your key stakeholders are sure to have:

1. **Engage**: How will SSI reduction make the world a better place?
2. **Educate**: What do we need to do to reduce SSI?
3. **Execute**: How will we reduce SSI in our hospital given local culture and resources?
4. **Evaluate**: How will we know we made a difference?
For more information about the Four E’s model, see Appendix F.

Engage: How will SSI reduction make the world a better place?

Your staff may be overwhelmed by the amount of quality improvement initiatives going on in your hospital. You will need to convince them that this work is not just a “flavor of the month,” but a nation-wide fight against surgical complications.

Share real patient stories

Sharing real stories of patient tragedies and triumphs can galvanize your organization around efforts to improve patient care. Except the surgeon, OR staff rarely have the opportunity to interact with patients outside of the OR. They may feel detached from their patients’ outcomes. Patient stories powerfully reconnect OR staff with their patients and the impact of the care they provide.

Importantly, your team must consider legal restrictions when sharing real patient stories. Contact your legal department or risk management group to align efforts.

Make performance more visible

Often, improvement teams share process and outcome measures with select individuals or improvement groups. Key stakeholders, including frontline staff and senior leadership, are often unaware of local performance. If you were to ask frontline staff and senior leadership what your SSI rate is, would they know the answer? In most cases, they would not.

Give your invested stakeholders feedback by sharing performance on process measures and SSI rates:

- Post a trend line of SSI rates in your perioperative, intensive care, and inpatient units so nurses and physicians can see how SSI rates are changing over time.
- Post the number of days (weeks or months) since your last SSI. Be sure to update it regularly.
- Review data at key meetings or morning reports.

Importantly, feedback will only be meaningful if your clinicians believe in the validity of the measures you have chosen. Be transparent about your data collection methods and any efforts your team has made to address possible biases.

Make performance more meaningful

Typically, improvement teams report process measure data as ‘percent compliance,’ and report outcome data as a ‘rate per 100 cases’. However, converting traditional data into estimates of preventable deaths, excess costs and excess hospital days makes the impact of performance more meaningful to stakeholders. Please see Appendix G for an example of this type of data conversion and make performance feedback more meaningful to stakeholders.

Recognize staff efforts

Financial incentives to engage staff and leaders, while attractive, are often not feasible or sustainable. Staff recognition using non-financial strategies can go a long way toward engaging your colleagues. Some examples include:

- Assign a title for key participants, such as the physician or nurse project leader.
- Encourage team members to present their efforts at important committee or board meetings within your organization.
• Highlight staff efforts in local newsletters, bulletins, or publications.

The Surgical Complication Prevention Toolkit in practice

“We went to our inpatient surgery floor and asked the nurse manager if she knew of any patients who had suffered a difficult hospital course due to SSI. She mentioned a patient who had undergone colorectal surgery due to colon cancer, but who couldn’t resume chemotherapy for months until his infected abdominal wound healed sufficiently. This delay was extremely hard on him and his family. When we took this patient’s story back to our perioperative staff, they were moved. We reinforced that his outcome was the result of system-level problems that could be fixed with their help. People got onboard after that.” Surgical Technician, CUSP for Safe Surgery Team Member

Educate: What is the evidence for SSI reduction?

Your team will need to educate your frontline staff about the evidence behind your intervention. Hold staff in-services to introduce your intervention, and answer questions. Continue to provide in-services until the staff are comfortable with the new information. Your team can use the factsheets in Appendix H and slide sets found on the CUSP for Safe Surgery project website as educational aids. You can also email educational materials directly to your frontline staff.

Ideally, education sessions should be interdisciplinary. That way, each discipline can discuss local practices, barriers and plans. However surgeons may be more receptive to other surgeons. The surgeon champion on your team should reinforce surgeon education efforts. Several education strategies described in the literature focus on changing physician behavior:

• Provide surgeons with educational information packets consisting of research literature, evidence-based reviews, hospital specific data, and national guidelines.
• Introduce educational information at surgical staff meetings or Grand Rounds.
• Utilize informal educational meetings and networks to disseminate information.
• Conduct educational outreach visits involving content experts, such as pharmacists or infection preventionists. Consider engaging a respected surgeon leader at your hospital to help champion the effort even if he or she works in a different service line.

The Surgical Complication Prevention Toolkit in practice

“When we informed our clinical staff that we were focusing on antibiotic prophylaxis, starting with appropriate gentamicin dosing for penicillin-allergic patients, many of our providers raised the concern again that the dose was too high. They thought the correct gentamicin dose would be nephrotoxic. I led in-services, organized by the CUSP team, and showed our surgeons, nurses and anesthesiologists the evidence. Eventually, this education resolved their concerns.”—Hospital Infection Preventionist, CUSP for Safe Surgery Team Member
Execute: What do I need to do?

Frame your intervention in the Science of Safety

Without a doubt, clinicians care deeply about their patients. Yet we are all fallible. No matter how hard we try, we will forget to order an important medication and we will make other mistakes. Patient safety research has demonstrated consistently that blaming individual doctors or nurses will not prevent patient harm. Organizational-level factors, functional work area-related factors, team-related factors, task-related factors, and patient-related factors all have a role in patient outcomes.

Apply principles of safe system design

Every system is perfectly designed to produce the results it delivers. If we want to achieve substantive and sustainable improvements in patient outcomes, we have to change the flawed systems in which clinicians work. We must redesign systems to produce wellness instead of harm. Other industries teach us that there are clear principles of safe system design:

- Standardize care and reduce complexity
- Create independent checks along the continuum of care
- Learn from mistakes when they happen

Consider using briefings and debriefings to incorporate principles of safe design into your intervention. Briefings and debriefings have been linked with reductions in OR delays, procedure and miscommunication-related disruptions, and nursing time spent away from the patient bedside to get equipment and supplies. For more information about briefings and debriefings, please refer to the CUSP for Safe Surgery manual.

The Surgical Complication Prevention Toolkit in practice

“Our anesthesia providers are in charge of administering the right gentamicin dose. To reduce complexity around gentamicin dosing, we installed a weight-based dosing calculator in the electronic ordering system. To create redundancy, our nurses do a double-check of the dose, and review and document it as part of the OR briefing.”—CUSP for Safe Surgery Anesthesia Champion

Account for local culture and resources

Don’t force a square peg into a round hole. Adapt your intervention to the local cultural context. Intervention success is dependent on organizational culture. Unfortunately, your intervention will fail if it is introduced into a perioperative area where staff do not trust one another and cannot work together. While your team needs to adapt to constraints and utilize opportunities, the CUSP for Safe Surgery toolkit will help your team improve safety culture.
The Surgical Complication Prevention Toolkit in practice

“We were very careful and methodical in designing our gentamicin intervention. We got input from our frontline and buy-in from the right people. Even after all of this preparation and hard work, there were some clinicians who refused to give the right gentamicin dose to patients. We expected push back, but had to get creative with our resources to make sure the intervention succeeded within our perioperative culture. We got help from a surgeon that everyone really respected – she offered to personally call and speak with providers anytime they had a concern about the recommended dosing. Funny thing, after everyone found out about her offer, nobody refused to dose gentamicin appropriately again.” – CUSP for Safe Surgery Surgeon Champion

Evaluate: How will we know that we added value?

The final step in the Four E’s model is to evaluate the impact of your interventions. You need to assess whether additional effort and resources are adding value for your staff, your patients and their families.

Evaluation methods can be formal or informal. As a formal evaluation, your team can repeat the process you used in step 3 to recollect process and outcome measures. Then compare your findings to baseline performance. As stated previously, careful data collection and scientifically-sound data analysis are vital components of your project. Without credible data, your team and stakeholders will not know whether your interventions are really working.

As an informal evaluation, ask staff what they think about the new intervention and if they think it works. Ask them to identify additional opportunities to improve. Though staff provide valuable insights into care delivery, informal evaluations cannot replace formal evaluations.

Quality improvement work is difficult and ongoing. Celebrate your successes. Your team has not failed if your evaluation does not demonstrate improvement; but you may want to consider a new strategy or intervention. Through innovation and dedication, you can protect your patients from surgical complications.

Getting Help

We recognize that The Surgical Complication Prevention Toolkit represents a lot of new material. You can access more learning materials, such as recorded project calls and slide sets, on the CUSP for Safe Surgery project website. If you have additional questions, please post them to the CUSP for Safe Surgery project social network or email us at susp@jhmi.edu.
References


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