



Getting Started Kit: Prevent Surgical Site Infections

How-to Guide

100,000 Lives Campaign

We invite you to join a Campaign to make health care safer and more effective — to ensure that hospitals achieve the best possible outcomes for all patients. The Institute for Healthcare Improvement (IHI) and other organizations that share our mission are convinced that a remarkably few proven interventions, implemented on a wide enough scale, can avoid 100,000 deaths between January 2005 and July 2006, and every year thereafter. Complete details, including materials, contact information for experts, and web discussions, are available on the web at <http://www.ihl.org/IHI/Programs/Campaign/>.

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Goal:

Prevent surgical site infections (SSI) by implementing four components of care:

1. Appropriate use of antibiotics;
2. Appropriate hair removal;
3. Maintenance of post operative glucose control*: for major cardiac surgical patients;and
4. Post Operative normothermia* for colorectal surgery patients.

* These components of care are supported by clinical trials and experimental evidence in the specified populations; they may prove valuable for other surgical patients as well.

The Case for Preventing Surgical Site Infections

Surgical site infections are the second most common type of adverse events occurring in hospitalized patients (Brennan. *N Engl J Med.* 1991;324:370-376). Surgical site infections have been shown to increase mortality, readmission rate, length of stay, and cost for patients who incur them. (Kirkland. *Infect Control Hosp Epidemiol.* 1999;20:725). While nationally the rate of surgical site infection averages between two and three percent for clean cases, an estimated 40 to 60 percent of these infections are preventable.

A review of the medical literature shows that the following care components reduce the incidence of surgical site infection: appropriate use of antibiotics; appropriate hair removal; maintenance of post operative glucose control for major cardiac surgery; and post operative normothermia for colorectal surgery. These components, if implemented reliably, can drastically reduce the incidence of surgical site infection, resulting in the nearly complete elimination of preventable surgical site infection.

Where Are We Now?

A medical record review of 34,133 charts performed under the auspices of the Centers for Medicare & Medicaid Services (CMS) demonstrated that there is significant opportunity for improvement in surgical site prevention. (Bratzler. *Arch Surg.* 2005;140:174-182.) In the area of appropriate antibiotic use, the medical record review found the following:

- Appropriate antibiotic selection occurred in 92.6% of cases;
- Antibiotics were given within one hour of incision time to 55.7% of patients;
and
- Prophylactic antibiotics were discontinued within 24 hours of surgery end time for only 40.7% of patients.

General Considerations for Improvement in SSI

Any improvement process should be driven by leadership, with a commitment to providing adequate resources and attention to the initiative. It is also imperative to involve a multidisciplinary team in the surgical site infection improvement process. Successful teams set clear aims for their work, establish baseline measurements of performance, regularly measure and study the results of their work, and test various process and systems changes over a variety of conditions in order to find the ones that lead to improvement in their particular setting.

Preventing Surgical Site Infection: Four Components of Care

1. Appropriate Use of Prophylactic Antibiotics

For the purposes of the 100,000 Lives Campaign, the antibiotic process measures are these:

1. Antibiotics within 1 hour before surgical incision*
2. Prophylactic antibiotic consistent with national guidelines (e.g., CDC)
3. Discontinuation of prophylactic antibiotics within 24 hours after surgery

*Due to the longer infusion time required for vancomycin, it is acceptable to start this antibiotic (e.g., when indicated because of beta-lactam allergy or high prevalence of MRSA) within 2 hours prior to incision.

» What changes can we make that will result in improvement?

Hundreds of hospital teams across the United States have developed and tested process and systems changes that allowed them to improve performance on the antibiotic use measures. Some of these changes are:

- Use preprinted or computerized standing orders specifying antibiotic, timing, dose, and discontinuation.
- Change operating room drug stocks to include only standard doses and standard drugs, reflecting national guidelines.
- Reassign dosing responsibilities to anesthesia or holding area nurse to improve timeliness.
- Use visible reminders/checklists/stickers.
- Involve pharmacy, infection control, and infectious disease staff to ensure appropriate timing, selection, and duration.

Preventing Surgical Site Infection: Four Components of Care

2. Appropriate Hair Removal

For many years, it has been known that the use of razors (shaving) prior to surgery increases the incidence of wound infection when compared to clipping, depilatory use, or no hair removal at all (Seropian. *Am J Surg.* 1971;121:251). However, many teams working on this measure find that the use of razors in their own institutions can range from zero to nearly one hundred percent. We recommend collecting baseline information on this measure in order to determine current practice (see the Measure Information Forms in Appendix A).

» **What changes can we make that will result in improvement?**

Hundreds of hospital teams across the United States have developed and tested process and systems changes that allowed them to improve performance on the appropriate hair removal measure. Some of these changes are:

- Remove all razors from the entire hospital.
- Work with the purchasing department so that razors are no longer purchased by the hospital.
- Use reminders (signs, posters).
- Educate patients not to self-shave preoperatively.

Preventing Surgical Site Infection: Four Components of Care

3. Maintenance of Post Operative Glucose Control* **

Review of medical literature shows that the degree of hyperglycemia in the postoperative period was correlated with the rate of SSI in patients undergoing major cardiac surgery (Latham. *Inf Contr Hosp Epidemiol.* 2001;22:607; Dellinger. *Inf Contr Hosp Epidemiol.* 2001;22:604). Other articles have demonstrated that stringent glucose control in surgical intensive care unit patients reduces mortality (Van den Berghe. *NEJM.* 2001;345:1359).

*NOTE that, for this effort, “glucose control” is defined as serum glucose levels below 200 mg/dl, one collected on each of the first two post operative days.

**NOTE that tight glyceimic control (e.g., using an insulin drip) generally should be performed in an intensive care setting or equivalent.

» **What changes can we make that will result in improvement?**

Hundreds of hospital teams across the United States have developed and tested process and systems changes that allowed them to improve performance on the perioperative glucose control measure. Some of these changes are:

- Implement a glucose control protocol (sliding scale or insulin drip).
- Regularly check preoperative blood glucose levels on all patients.
- Assign responsibility and accountability for blood glucose monitoring and control.

Since the best evidence for glucose control is in the cardiovascular surgery population, it is sensible to focus on this high-risk population first. Tight glucose control is easier and safer to implement and monitor in an ICU setting.

Preventing Surgical Site Infection: Four Components of Care

4. Post Operative Normothermia*

The medical literature indicates that patients undergoing surgery have a decreased risk of surgical site infection if they are not allowed to become hypothermic during the perioperative period (Melling. *Lancet*. 2001;358:876). Anesthesia, anxiety, wet skin preparations, and skin exposure in cold operating rooms can cause patients to become clinically hypothermic during surgery. The relatively limited clinical data are supported by strong theoretical rationale and experimental data. Some experts believe that initial efforts should be directed at colorectal surgery patients until additional clinical studies are performed.

*NOTE that this component of care does not pertain to those patients for whom therapeutic hypothermia is being used (e.g., hypothermic cardioplegia).

» **What changes can we make that will result in improvement?**

Hundreds of hospital teams across the United States have developed and tested process and systems changes that allowed them to improve performance on the normothermia measure. Some of these changes are:

- Use warmed forced-air blankets preoperatively, during surgery and in PACU.
- Use warmed IV fluids.
- Increase the ambient temperature in the operating room.
- Use warming blankets under patients on the operating table.
- Use hats and booties on patients perioperatively.

Using the Model for Improvement

In order to move this work forward, IHI recommends using the Model for Improvement. Developed by Associates in Process Improvement, the Model for Improvement is a simple yet powerful tool for accelerating improvement that has been used successfully by hundreds of health care organizations to improve many different health care processes and outcomes.

The model has two parts:

- Three fundamental questions that guide improvement teams to 1) set clear aims, 2) establish measures that will tell if changes are leading to improvement, and 3) identify changes that are likely to lead to improvement.
- The Plan-Do-Study-Act (PDSA) cycle to conduct small-scale tests of change in real work settings — by planning a test, trying it, observing the results, and acting on what is learned. This is the scientific method, used for action-oriented learning.

Implementation: After testing a change on a small scale, learning from each test, and refining the change through several PDSA cycles, the team can implement the change on a broader scale — for example, for an entire pilot population or on an entire unit.

Spread: After successful implementation of a change or package of changes for a pilot population or an entire unit, the team can spread the changes to other parts of the organization or to other organizations.

You can learn more about the Model for Improvement on www.IHI.org

Forming a Team

No single person can create system-level improvements alone. First, it is crucial to have the active support of leadership in this work. The leadership must make patient safety and quality of care strategic priorities in order for any surgical care improvement team to be successful.

Once leadership has publicly given recognition and support (dollars, person-time) to the program, the improvement team can be quite small. Successful teams have typically included a physician (either surgeon, anesthesiologist, or both); an operating room nurse; and someone from the quality department. Each hospital will have its own methods for selecting a core team. The team should use the Model for Improvement to conduct small-scale, rapid tests of the ideas for improvement over various conditions in a pilot surgical population. The team should also track performance on a set of measures designed to help them see if the changes they are making are leading to improvement, and regularly report these measures back to leadership.

Measurement

See Measure Information Forms for specific information regarding the recommended process and outcomes measures for surgical site infection prevention (Appendix A).

For each process measure, obtain the data via medical record review. We recommend using the sampling schemes described in the Measurement Information Forms. For the antibiotic measures, the measurement scheme for the Campaign is identical to that being used in CMS's current Surgical Infection Prevention program and in JCAHO's current core measure set. Using run charts help make change over time visible to the team and to the leadership.

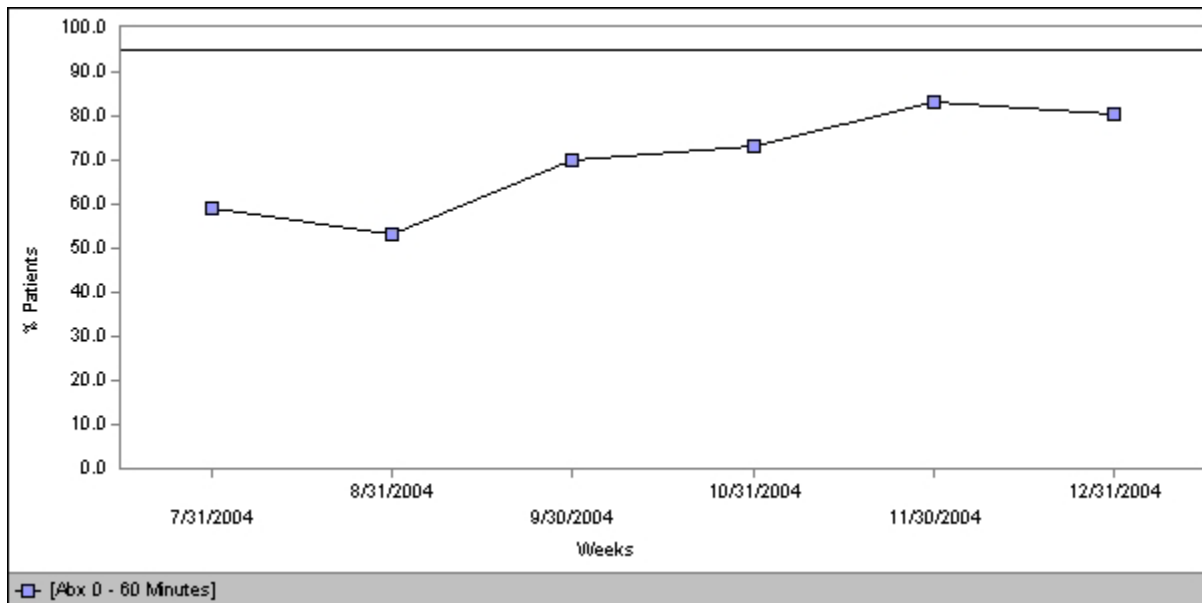
Run Charts

Improvement takes place over time. Determining if improvement has really happened and if it is lasting requires observing patterns over time. Run charts are graphs of data over time and are one of the single most important tools in performance improvement.

Using run charts has a variety of benefits:

- They help improvement teams formulate aims by depicting how well (or poorly) a process is performing.
- They help in determining when changes are truly improvements by displaying a pattern of data that you can observe as you make changes.
- As you work on improvement, they provide information about the value of particular changes.

On-time Prophylactic Antibiotic Administration



First Test of Change

Teams may elect to work on any or all of the four care components: antibiotic use, hair removal, glucose control, and normothermia. A first test of change should involve a very small sample size (typically one patient) and should be described ahead of time in a Plan-Do-Study-Act format so that the team can easily predict what they think will happen, observe the results, learn from them, and continue to the next test.

Example: Appropriate hair removal

The team decides to test removing razors from one operating room for one surgery. They identify a surgeon who supports the avoidance of razors, and let the surgeon know that the razors will be removed. On their PDSA form, they predict that the surgeon will cope well without razors in the room. They then conduct the test. They note that the surgeon becomes frustrated because s/he wishes to use clippers to remove hair and there are no working clippers in the room. The team's study of the data indicates that they should repeat this test, after first making sure there is a set of operable clippers available in the operating room.

Ideally, teams will conduct multiple small tests of change simultaneously across all four components of care. This simultaneous testing usually begins after the first few tests are completed and the team feels comfortable and confident in the process.

Implementation and Spread

For surgical site infection, teams will usually choose to begin their improvement process by working with a “pilot” population. This pilot population may be the hip- and knee-replacement patients, for example, or cardiac operations, or gynecologic procedures, etc. It is possible to include the universe of surgical patients in the pilot population, if that number is small (fewer than 50 cases per month). We recommend including at least 50 cases per month in the pilot population in order to increase the ability to measure and detect improvement.

In order to maximize the reduction in overall hospital mortality related to surgical site infections, however, hospitals must spread improvements begun in a pilot population to the universe of surgical populations. Organizations that successfully spread improvements use an organized, structured method in planning and implementing spread across populations, units, or facilities. You can find information about planning, tracking, and optimizing spread at www.ih.org.

Barriers

Teams working on preventing surgical site infection have learned a great deal about barriers to improvement and how to face them. Some common challenges and solutions are:

1. Lack of support by leadership

Solution: Use opinion leaders (physicians) and data and if possible; a business case for the project may help to win leadership support.

2. Uneven physician acceptance of new practices

Solution: Use physician opinion leaders, review the medical literature, and feed back data on a surgeon-specific level. Remember that physicians may fall anywhere on the “Adoption of Innovations” curve; work first with your early adopters and use their stories to convince the majority.

Appendix A

Measure Information Form:
Percent of Surgical Patients with Timely Prophylactic
Antibiotic Administration

Intervention(s): Reducing Surgical Site Infection

Definition: Percentage of surgical patients with antibiotic administration within 60 minutes prior to surgical incision

Goal: 95% or higher

Matches Existing Measures:

- JCAHO Core Measure SIP-1a
- Surgical Care Improvement Project (SCIP) measure SCIP-1a

CALCULATION DETAILS:

Numerator Definition: Number of selected surgical patients whose prophylactic antibiotics were initiated within 60 minutes prior to surgical incision. (See definition of terms below for which surgeries are included for this measure.)

Note: Cases for which either vancomycin or fluoroquinolone were used as prophylactic antimicrobial: These antibiotics need to be administered within TWO hours of surgery start time. Patients receiving these antibiotics within two hours of surgery start time will count in the numerator.

Numerator Exclusions: Same as denominator exclusions

Denominator Definition: Number of selected surgical patients. (See definition of terms below for which surgeries are included for this measure.)

Denominator Exclusions:

- **Patients who had a principal or admission diagnosis suggestive of preoperative infectious diseases**
- **Patients who received antibiotics within 24 hours prior to arrival (except colon surgery patients taking oral prophylactic antibiotics)**
- Patients who received antibiotics more than 24 hours prior to surgery (except colon surgery patients taking oral prophylactic antibiotics)

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How-to Guide: Prevent Surgical Site Infections

- Colon surgery patients who received oral prophylactic antibiotics only, and who received no antibiotics during stay
- Patients who are less than 18 years of age
- Patients with physician-documented infection prior to surgical procedure
- Patients who had other procedures that required general or spinal anesthesia that occurred within 24 hours prior to this procedure during this hospital stay (during separate surgical episodes)

Measurement Period Length: Monthly

Definition of Terms:

- Selected surgical patient: A patient having had an inpatient surgical procedure of the following type: CABG, cardiac surgery, hip arthroplasty, knee arthroplasty, colon surgery, hysterectomy, and vascular surgery. (For ICD-9-CM Principal Procedure Code or ICD-9-CM Other Procedure Code of selected surgeries, refer to Appendix A, Tables 5.01-5.08 in the JCAHO specifications manual; this information is available online at <http://www.jcaho.org/pms/core+measures/appendixa.pdf>.)

Calculate as: (numerator / denominator); as a percentage

Comments:

- If more than one inpatient surgical procedure occurred during the index hospitalization, only the first surgical procedure should be considered for the purposes of this measure.
- For cases involving use of an inflatable cuff or tourniquet to the operative site, the antibiotic should be fully infused prior to inflation of the cuff.
- Start time for administration is easier to track than end time, so use start time to determine administration within 1 hour. Since most antibiotics can be rapidly infused, end time should be close to start time.
- The goal is to have the antibiotic dose fully infused prior to the incision; ideally, infusion is completed between 60 minutes prior to incision (120 minutes in the case of vancomycin or fluoroquinolones when used for cephalosporin allergy).
- Patients for whom antibiotic start time or incision time is not recorded are counted as NOT obtaining prophylactic antibiotics on time (i.e., a zero in the numerator).

COLLECTION STRATEGY:

The primary sources for identifying patients are based on required data elements in administrative data and medical records. A hospital information system may be able to identify the patients from all discharges by sorting based on these elements. Another alternative is to work with the coding or medical records department to identify the patients at the time of coding and prepare a list or set aside records for review.

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After the patients have been identified, manual review of the medical record will be required to look for documentation that this intervention was either provided or contraindicated. If documentation for either cannot be found, the measure should be considered as not being met.

Concurrent review has been used by some hospitals to collect data while patients are still in the hospital and also allows for the identification of missed interventions so that mitigation can occur before discharge.

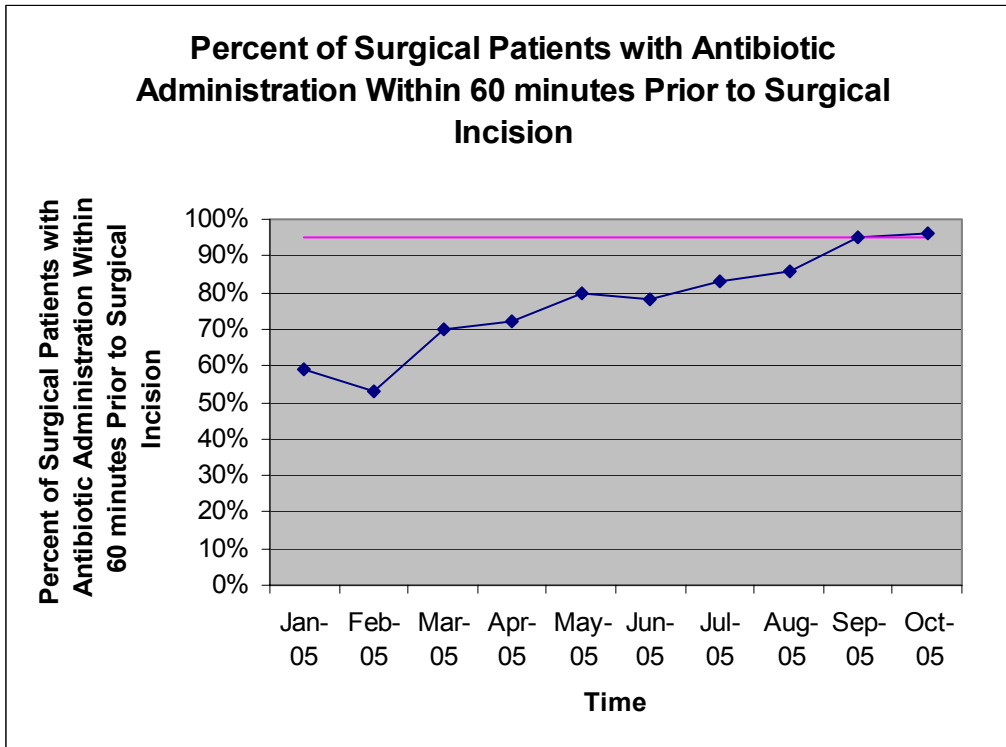
Sampling Strategy:

Hospitals may decide to collect data using sampling if there is a sufficient volume of cases. The following sampling guidelines based on the sampling guidelines from JCAHO Core Measures may be useful:

Pre-exclusion sample size (n) based on pre-exclusion surgical patient population size (N):

Average Monthly Population Size “N”	Minimum required sample “n”
≥ 555	111
140 – 555	20% of population size
28 – 140	28
< 28	No sampling; 100% of population required

SAMPLE GRAPH:



DATA COLLECTION AND ANALYSIS TOOLS

Measure Rate Worksheet
Percent Patients Receiving Timely Prophylactic Antibiotic Administration

1. What is the total number of patients during the previous month who had an inpatient surgical procedure of the following type: CABG, cardiac surgery, hip arthroplasty, knee arthroplasty, colon surgery, hysterectomy, and vascular surgery? (For ICD-9-CM Principal Procedure Code or ICD-9-CM Other Procedure Code of selected surgeries, refer to Appendix A, Tables 5.01-5.08 in the JCAHO specifications manual; this information is available online at <http://www.jcaho.org/pms/core+measures/appendixa.pdf>.) ____
2. What is the total number of patients who had principal diagnosis codes suggestive of preoperative infectious disease? (For ICD-9-CM Principal Diagnosis Code of selected diagnoses, refer to Appendix A, Tables 5.09 in the JCAHO specifications manual; this information is available online at <http://www.jcaho.org/pms/core+measures/appendixa.pdf>.) ____
3. Subtract the total from #2 above from the total for #1 above and enter here. ____
4. What is the total number of patients in #3 above whose age was < 18 years on admission? ____
5. Subtract the total to #4 above from the total to #3 above and enter here. ____
6. What is the total number of patients in #5 above who had an admission diagnosis of infection? ____
7. Subtract the total for #6 above from the total for #5 above and enter here. ____
8. What is the total number of patients in #7 above who had physician documentation of being treated for an infection prior to anesthesia? ____
9. Subtract the total for #8 above from the total for #7 above and enter here. ____
10. What is the total number of patients excluding colon surgery patients taking oral antibiotics who received antibiotics within 24 hours prior to arrival? ____
11. Subtract the total for #10 above from the total for #9 above and enter here. ____
12. What is the total number of patients who were not given antibiotics at any time from arrival through the first 48 hours after surgery end time? ____
13. Subtract the total for #12 above from the total for #11 above and enter here. ____

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This is the denominator for the measure.

14. What is the total number of patients in #13 above whose prophylactic antimicrobial consisted of vancomycin or fluoroquinolones? ____
15. What is the number of patients in #14 above whose antibiotic was administered within 0 to 120 minutes of surgical incision time? _____
16. What is the total number of patients in #13 above whose prophylactic antimicrobial did not consist of vancomycin or fluoroquinolones? _____
17. What is the number of patients in #16 above whose antibiotic was administered within 0 to 60 minutes of surgical incision time? _____
18. Add the results from # 15 and from #17 above. _____

This is the numerator for the measure.

Measure Information Form:
Percent of Surgical Patients with Appropriate Selection of Prophylactic Antibiotic

Intervention(s): Reducing Surgical Site Infection

Definition: Percent of surgical patients receiving prophylactic antibiotic consistent with JCAHO / CMS guidelines

Goal: 95% or higher

Matches Existing Measures:

- JCAHO Core Measure SIP-2a
- Surgical Care Improvement Project (SCIP) measure SCIP-2a

CALCULATION DETAILS:

Numerator Definition: Number of selected surgical patients receiving prophylactic antibiotics consistent with the JCAHO / CMS guidelines recommended for their specific surgical procedure. (See definition of terms below for which surgeries are included for this measure.)

Numerator Exclusions: Same as denominator exclusions

Denominator Definition: Number of selected surgical patients. (See definition of terms below for which surgeries are included for this measure.)

Denominator Exclusions:

- Patients who had a principal or admission diagnosis suggestive of preoperative infectious diseases
- Patients who were receiving antibiotics within 24 hours prior to arrival (except colon surgery patients taking oral prophylactic antibiotics)
- Patients who were receiving antibiotics more than 24 hours prior to surgery (except colon surgery patients taking oral prophylactic antibiotics)
- Patients who did not receive any antibiotics before or during surgery, or within 24 hours after surgery end time (i.e., patient did not receive prophylactic antibiotics)
- Patients who did not receive any antibiotics during this hospitalization
- Patients who are less than 18 years of age
- Patients with physician-documented infection prior to surgical procedure

Measurement Period Length: Monthly

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Definition of Terms:

- Selected surgical patient: A patient having had an inpatient surgical procedure of the following type: CABG, cardiac surgery, hip arthroplasty, knee arthroplasty, colon surgery, hysterectomy, and vascular surgery. (For ICD-9-CM Principal Procedure Code or ICD-9-CM Other Procedure Code of selected surgeries, refer to Appendix A, Tables 5.01-5.08 in the JCAHO specifications manual; this information is available online at <http://www.jcaho.org/pms/core+measures/appendixa.pdf>.)
- Appropriate antibiotics consistent with JCAHO / CMS guidelines: The following table describes the JCAHO guidelines, and should be used for the purposes of this measure. More detailed information may be found online at <http://www.jcaho.org/pms/core+measures/2zgsip2.pdf>.

Surgical Procedure	Approved Antibiotics
Cardiac or Vascular	Cefazolin, Cefuroxime or Cefamandole If β -lactam allergy: Vancomycin* or Clindamycin*
Hip/Knee Arthroplasty	Cefazolin or Cefuroxime If β -lactam allergy: Vancomycin* or Clindamycin*
Colon	Oral: after effective mechanical bowel preparation, Neomycin Sulfate + Erythromycin Base OR Neomycin Sulfate + Metronidazole Administered for 18 hours preoperatively Parenteral: Cefotetan, Cefoxitin or Cefmetazole OR Cefazolin + Metronidazole If β -lactam allergy: Clindamycin + Gentamicin, or Clindamycin + Ciprofloxacin**, or Clindamycin + Aztreonam OR Metronidazole with Gentamicin, or Metronidazole + Ciprofloxacin**
Hysterectomy	Cefotetan, Cefazolin, Cefoxitin, or Cefuroxime If β -lactam allergy: Clindamycin + Gentamicin, or Clindamycin + Ciprofloxacin**, or Clindamycin + Aztreonam OR Metronidazole + Gentamicin, or Metronidazole + Ciprofloxacin** OR Clindamycin monotherapy
Special Considerations	*For cardiac, orthopedic, and vascular surgery, if the patient is allergic to β -lactam antibiotics, Vancomycin or Clindamycin are acceptable substitutes.

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	** Levofloxacin 750 mg given once may be substituted for Ciprofloxacin.
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Calculate as: (numerator / denominator); as a percentage

Comments:

- If more than one inpatient surgical procedure occurred during the index hospitalization, only the first surgical procedure should be considered for the purposes of this measure.

COLLECTION STRATEGY:

The primary sources for identifying patients are based on required data elements in administrative data and medical records. A hospital information system may be able to identify the patients from all discharges by sorting based on these elements. Another alternative is to work with the coding or medical records department to identify the patients at the time of coding and prepare a list or set aside records for review.

After the patients have been identified, manual review of the medical record will be required to look for documentation that this intervention was either provided or contraindicated. If documentation for either cannot be found, the measure should be considered as not being met.

Concurrent review has been used by some hospitals to collect data while patients are still in the hospital and also allows for the identification of missed interventions so that mitigation can occur before discharge.

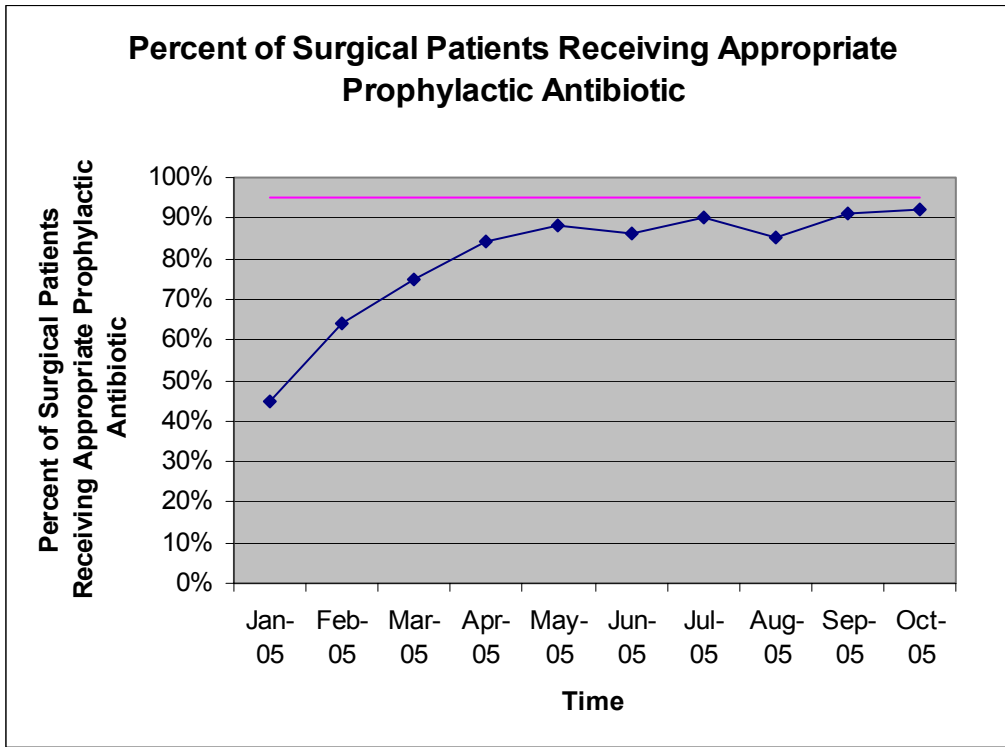
Sampling Strategy:

Hospitals may decide to collect data using sampling if there is a sufficient volume of cases. The following sampling guidelines based on the sampling guidelines from JCAHO Core Measures may be useful:

Pre-exclusion sample size (n) based on pre-exclusion surgical patient population size (N):

Average Monthly Population Size “N”	Minimum required sample “n”
≥ 555	111
140 – 555	20% of population size
28 – 140	28
< 28	No sampling; 100% of population required

SAMPLE GRAPH:



DATA COLLECTION AND ANALYSIS TOOLS

Measure Rate Worksheet
Percent of Surgical Patients with Appropriate Selection of Prophylactic Antibiotic
(JCAHO/CMS SIP-2)

1. What is the total number of patients during the previous month who had an inpatient surgical procedure of the following type: CABG, cardiac surgery, hip arthroplasty, knee arthroplasty, colon surgery, hysterectomy, and vascular surgery? (For ICD-9-CM Principal Procedure Code or ICD-9-CM Other Procedure Code of selected surgeries, refer to Appendix A, Tables 5.01-5.08 in the JCAHO specifications manual; this information is available online at <http://www.jcaho.org/pms/core+measures/appendixa.pdf>.) ____
2. What is the total number of patients who had principal diagnosis codes suggestive of preoperative infectious disease? (For ICD-9-CM Principal Diagnosis Code of selected diagnoses, refer to Appendix A, Tables 5.09 in the JCAHO specifications manual; this information is available online at <http://www.jcaho.org/pms/core+measures/appendixa.pdf>.) ____
3. Subtract the total from #2 above from the total for #1 above and enter here. ____
4. What is the total number of patients in #3 above whose age was < 18 years on admission? ____
5. Subtract the total to #4 above from the total to #3 above and enter here. ____
6. What is the total number of patients in #5 above who had an admission diagnosis of infection? ____
7. Subtract the total for #6 above from the total for #5 above and enter here. ____
8. What is the total number of patients in #7 above who had physician documentation of being treated for an infection prior to anesthesia? ____
9. Subtract the total for #8 above from the total for #7 above and enter here. ____
10. What is the total number of patients, excluding colon surgery patients taking oral Neomycin Sulfate + Erythromycin Base or oral Neomycin Sulfate + Metronidazole, who received antibiotics within 24 hours prior to arrival? ____
11. Subtract the total for #10 above from the total for #9 above and enter here. ____
12. What is the total number of patients, excluding colon surgery patients taking oral Neomycin Sulfate + Erythromycin Base or oral Neomycin Sulfate + Metronidazole, who were not given antibiotics at any time from arrival through the first 48 hours after surgery end time? ____

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How-to Guide: Prevent Surgical Site Infections

13. Subtract the total for #12 above from the total for #11 above and enter here. ____
14. What is the total number of patients whose antibiotics are not included in Table 2.1, Appendix C of the JCAHO Specification Manual for National Hospital Quality Measures, 2005? ____ (Appendix C can be found online at <http://www.jcaho.org/pms/core+measures/appendixc.pdf>)
15. Subtract the total for #14 above from the total from #13 above and enter here. ____
16. What is the total number of patients whose antibiotics were not prophylactic antibiotics (i.e, antibiotics that were not administered prior to surgery, during surgery, or within 24 hours after surgery end time to prevent the incidence of operative wound infections)? ____
17. Subtract the total for #16 above from the total for #15 above and enter here. ____
18. What is the total number of patients, other than colon surgery patients receiving oral or parenteral antibiotics, who received antibiotics via a route other than intravenous? ____
19. Subtract the total for #18 above from the total for # 17 above and enter here. ____

This is the denominator for the measure.

20. What is the total number of patients in #20 who received prophylactic antibiotics appropriate for their surgery type and allergy status as defined in the Antibiotic Selection Regimen for Surgery in the JCAHO Specification Manual for National Hospital Quality Measures, 2005? (The Antibiotic Selection Regimen for Surgery can be found online at <http://www.jcaho.org/pms/core+measures/2zgsip2.pdf>) ____

This is the numerator for the measure.

Measure Information Form:
**Percent of Surgical Patients with Appropriate Prophylactic
Antibiotic Discontinuation**

Intervention: Reducing Surgical Site Infection

Definition: Percent of surgical patients whose prophylactic antibiotics were discontinued within 24 hours after surgery end time

Goal: 95% or higher

Matches Existing Measures:

- JCAHO Core Measure SIP-3a
- Surgical Care Improvement Project (SCIP) measure SCIP-3a

CALCULATION DETAILS:

Numerator Definition: Number of selected surgical patients whose prophylactic antibiotics were discontinued within 24 hours after surgery end time. (See definition of terms below for which surgeries are included for this measure.)

Numerator Exclusions: Same as denominator exclusions

Denominator Definition: Number of selected surgical patients with no evidence of prior infection. (See definition of terms below for which surgeries are included for this measure.)

Denominator Exclusions:

- Patients who had a principal or admission diagnosis suggestive of preoperative infectious diseases
- Patients who were receiving antibiotics at the time of admission (except colon surgery patients taking oral prophylactic antibiotics)
- Patients who were receiving antibiotics more than 24 hours prior to surgery (except colon surgery patients taking oral prophylactic antibiotics)
- Patients who did not receive any antibiotics before or during surgery, or within 24 hours after surgery end time (i.e. patient did not receive prophylactic antibiotics)
- Patients who were diagnosed with and treated for infections within two days after surgery date
- Patients who did not receive any antibiotics during this hospitalization
- Patients less than 18 years of age
- Patients with physician documented infection prior to surgical procedure of interest

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- Patients who had other surgical procedures performed during this admission after the first procedure

Measurement Period Length: Monthly

Definition of Terms:

- Prophylactic antibiotics: Antibiotics given solely for the purpose of prevention of surgical infection (i.e., not those being given therapeutically for treatment of active infections)
- Selected surgical patient: A patient having had an inpatient surgical procedure of the following type: CABG, cardiac surgery, hip arthroplasty, knee arthroplasty, colon surgery, hysterectomy, and vascular surgery. (For ICD-9-CM Principal Procedure Code or ICD-9-CM Other Procedure Code of selected surgeries, refer to Appendix A, Tables 5.01-5.08 in the JCAHO specifications manual; this information is available online at <http://www.jcaho.org/pms/core+measures/appendixa.pdf>.)

Calculate as: (numerator / denominator); as a percentage

Comments:

- If more than one inpatient surgical procedure occurred during the index hospitalization, only the first surgical procedure should be considered for the purposes of this measure.
- Available evidence indicates that the discontinuation of prophylactic antimicrobials at 24 hours is appropriate for all patients, regardless of the presence of postoperative drains or tubes.

COLLECTION STRATEGY:

The primary sources for identifying patients are based on required data elements in administrative data and medical records. A hospital information system may be able to identify the patients from all discharges by sorting based on these elements. Another alternative is to work with the coding or medical records department to identify the patients at the time of coding and prepare a list or set aside records for review.

After the patients have been identified, manual review of the medical record will be required to look for documentation that this intervention was either provided or contraindicated. If documentation for either cannot be found, the measure should be considered as not being met.

Concurrent review has been used by some hospitals to collect data while patients are still in the hospital and also allows for the identification of missed interventions so that mitigation can occur before discharge.

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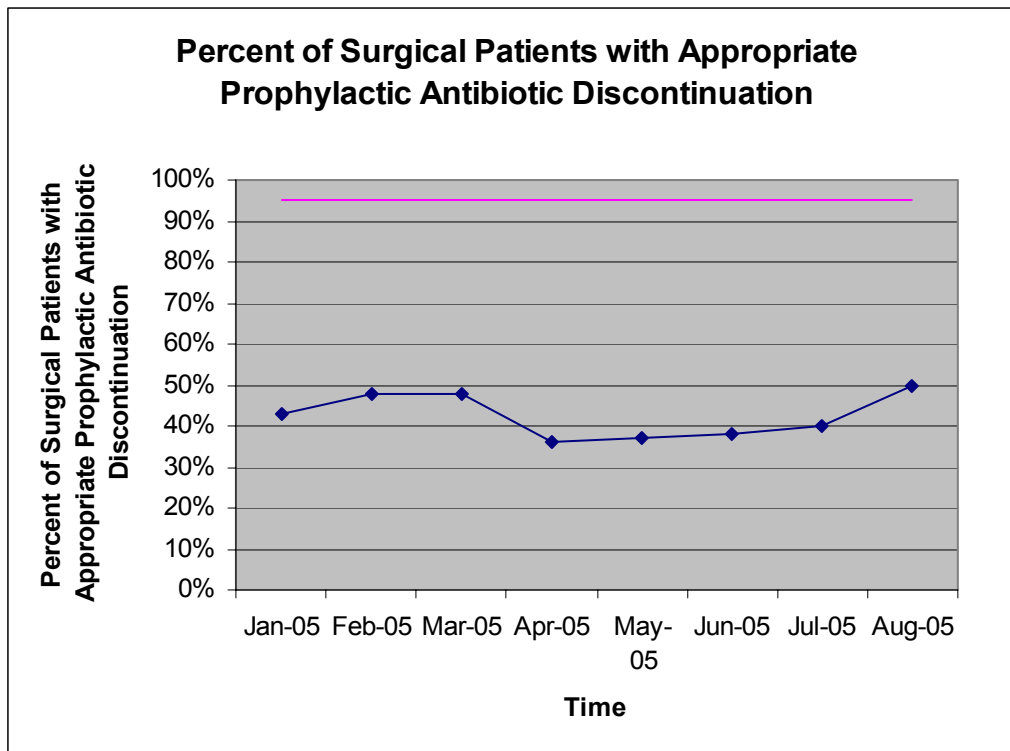
Sampling Strategy:

Hospitals may decide to collect data using sampling if there is a sufficient volume of cases. The following sampling guidelines based on the sampling guidelines from JCAHO Core Measures may be useful:

Pre-exclusion sample size (n) based on pre-exclusion surgical patient population size (N):

Average Monthly Population Size “N”	Minimum required sample “n”
≥ 555	111
140 – 555	20% of population size
28 – 140	28
< 28	No sampling; 100% of population required

SAMPLE GRAPH:



DATA COLLECTION AND ANALYSIS TOOLS

Measure Rate Worksheet
Percent of Surgical Patients with Appropriate Prophylactic Antibiotic
Discontinuation
(JCAHO/CMS SIP-3)

1. What is the total number of patients during the previous month who had an inpatient surgical procedure of the following type: CABG, cardiac surgery, hip arthroplasty, knee arthroplasty, colon surgery, hysterectomy, and vascular surgery? (For ICD-9-CM Principal Procedure Code or ICD-9-CM Other Procedure Code of selected surgeries, refer to Appendix A, Tables 5.01-5.08 in the JCAHO specifications manual; this information is available online at <http://www.jcaho.org/pms/core+measures/appendixa.pdf>.) ____
2. What is the total number of patients who had principal diagnosis codes suggestive of preoperative infectious disease? (For ICD-9-CM Principal Diagnosis Code of selected diagnoses, refer to Appendix A, Tables 5.09 in the JCAHO specifications manual; this information is available online at <http://www.jcaho.org/pms/core+measures/appendixa.pdf>.) ____
3. Subtract the total from #2 above from the total for #1 above and enter here. ____
4. What is the total number of patients in #3 above whose age was < 18 years on admission? ____
5. Subtract the total to #4 above from the total to #3 above and enter here. ____
6. What is the total number of patients in #5 above who had an admission diagnosis of infection? ____
7. Subtract the total for #6 above from the total for #5 above and enter here. ____
8. What is the total number of patients in #7 above who had physician documentation of being treated for an infection prior to anesthesia? ____
9. Subtract the total for #8 above from the total for #7 above and enter here. ____
10. What is the total number of patients excluding colon surgery patients taking oral antibiotics who received antibiotics within 24 hours prior to arrival? ____
11. Subtract the total for #10 above from the total for #9 above and enter here. ____
12. What is the total number of patients who were not given antibiotics at any time from arrival through the first 48 hours after surgery end time? ____
13. Subtract the total for #12 above from the total for #11 above and enter here. ____

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14. What is the total number of patients whose antibiotics are not included in Table 2.1, Appendix C of the JCAHO Specification Manual for National Hospital Quality Measures, 2005? ____ (Appendix C can be found at the following link <http://www.jcaho.org/pms/core+measures/appendixc.pdf>)
15. Subtract the total for #14 above from the total from #13 above and enter here. ____
16. What is the total number of patients whose antibiotics were not prophylactic antibiotics (i.e, antibiotics that were not administered prior to surgery, during surgery, or within 24 hours after surgery end time to prevent the incidence of operative wound infections)? ____
17. Subtract the total for #16 above from the total for #15 above and enter here. ____
18. What is the total number of patients who had other types of surgery in addition to CABG, cardiac surgery, hip arthroplasty, knee arthroplasty, colon surgery, hysterectomy, and vascular surgery? ____
19. Subtract the total for #18 above from the total for #17 above and enter here. ____
20. What is the total number of patients who developed a postoperative infection ≤ 2 days after surgery end date? ____
21. Subtract the total for #20 above from the total for #19 above and enter here. ____

This is the denominator for the measure.

- 22.** What is the total number of patients in #21 whose prophylactic antibiotics were discontinued ≤ 24 hours (1440 minutes) after surgery end time. ____

This is the numerator for the measure.

Measure Information Form:
Percent of Major Cardiac Surgical Patients with Controlled
Post Operative Serum Glucose

Intervention(s): Reducing Surgical Site Infection

Definition: Percent of major cardiac surgical patients with controlled post operative glucose (< 200mg/dL.)

Goal: 95% or higher

Matches Existing Measures:

- Surgical Care Improvement Project (SCIP) measure SCIP-4

CALCULATION DETAILS:

Numerator Definition: Number of major cardiac surgical patients with controlled post operative glucose (< 200 mg/dL)

Numerator Exclusions: Same as denominator exclusions

Denominator Definition: All major cardiac surgical patients

Denominator Exclusions:

- Patients who had a principal or admission diagnosis suggestive of preoperative infectious diseases
- Patients less than 18 years of age
- Patients with physician-documented infection prior to surgical procedure
- Burn or transplant patients

Measurement Period Length: Monthly

Definition of Terms:

- Major cardiac surgical patient: A patient having had an inpatient cardiac surgical procedure. Specific ICD-9-CM codes will be forthcoming as SCIP defines them.
- Controlled post operative glucose: The blood glucose values on postoperative day (POD) one and two drawn closest to 6:00 a.m. (0600)

Calculate as: (numerator / denominator); as a percentage

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Comments:

- If more than one inpatient surgical procedure occurred during the index hospitalization, only the first surgical procedure should be considered for the purposes of this measure.
- Blood glucose values on both POD 1 and 2 must be below 200 mg/dL for the patient to be included in the numerator; an average glucose value of below 200 mg/dL is not sufficient.

COLLECTION STRATEGY:

The primary sources for identifying patients are based on required data elements in administrative data and medical records. A hospital information system may be able to identify the patients from all discharges by sorting based on these elements. Another alternative is to work with the coding or medical records department to identify the patients at the time of coding and prepare a list or set aside records for review.

After the patients have been identified, manual review of the medical record will be required to look for documentation that this intervention was either provided or contraindicated. If documentation for either cannot be found, the measure should be considered as not being met.

Concurrent review has been used by some hospitals to collect data while patients are still in the hospital and also allows for the identification of missed interventions so that mitigation can occur before discharge.

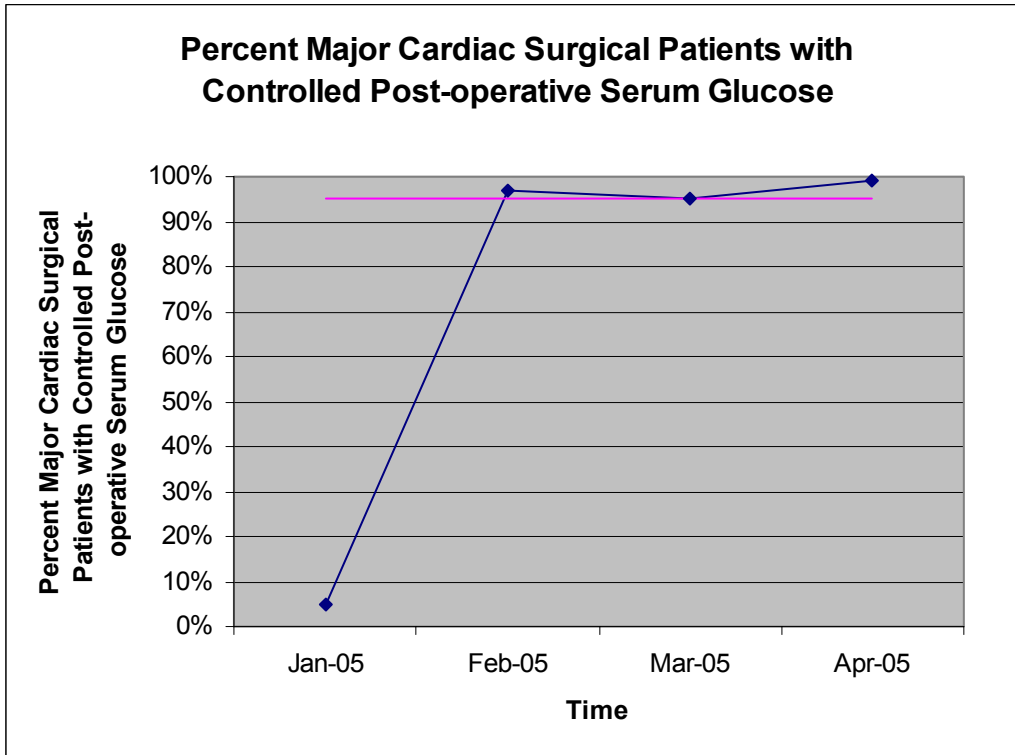
Sampling Strategy:

Hospitals may decide to collect data using sampling if there is a sufficient volume of cases. The following sampling guidelines based on the sampling guidelines from JCAHO Core Measures may be useful:

Pre-exclusion sample size (n) based on pre-exclusion surgical patient population size (N):

Average Monthly Population Size “N”	Minimum required sample “n”
≥ 555	111
140 – 555	20% of population size
28 – 140	28
< 28	No sampling; 100% of population required

SAMPLE GRAPH:



DATA COLLECTION AND ANALYSIS TOOLS

N/A

Measure Information Form: Percent of Surgical Patients with Appropriate Hair Removal

Intervention(s): Reducing Surgical Site Infection

Definition: Percent of selected surgical patients with appropriate surgical site hair removal. No surgical site hair removal, or surgical site hair removal with clippers or depilatory, is considered appropriate. Shaving is considered inappropriate.

Goal: 95% or higher

Matches Existing Measures:

- Surgical Care Improvement Project (SCIP) measure SCIP-17

CALCULATION DETAILS:

Numerator Definition: Number of selected surgical patients with no surgical site hair removal, or surgical site hair removal with clippers or depilatory

Numerator Exclusions: Same as denominator exclusions

Denominator Definition: Number of selected surgical patients

Denominator Exclusions:

- **Patients who had a principal or admission diagnosis suggestive of preoperative infectious diseases**
- Patients less than 18 years of age
- Burn or transplant patients

Measurement Period Length: Monthly

Definition of Terms:

- Selected surgical patient: A patient having had an inpatient surgical procedure which falls within the SCIP included population for their measure (SCIP-17). Specific ICD-9-CM codes will be forthcoming as SCIP defines them. Note that our clinical recommendation is that no surgical patients receive inappropriate hair removal.

Calculate as: (numerator / denominator); as a percentage

Comments:

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- If more than one inpatient surgical procedure occurred during the index hospitalization, only the first surgical procedure should be considered for the purposes of this measure.

COLLECTION STRATEGY:

The primary sources for identifying patients are based on required data elements in administrative data and medical records. A hospital information system may be able to identify the patients from all discharges by sorting based on these elements. Another alternative is to work with the coding or medical records department to identify the patients at the time of coding and prepare a list or set aside records for review.

After the patients have been identified, manual review of the medical record will be required to look for documentation that this intervention was either provided or contraindicated. If documentation for either cannot be found, the measure should be considered as not being met.

Concurrent review has been used by some hospitals to collect data while patients are still in the hospital and also allows for the identification of missed interventions so that mitigation can occur before discharge.

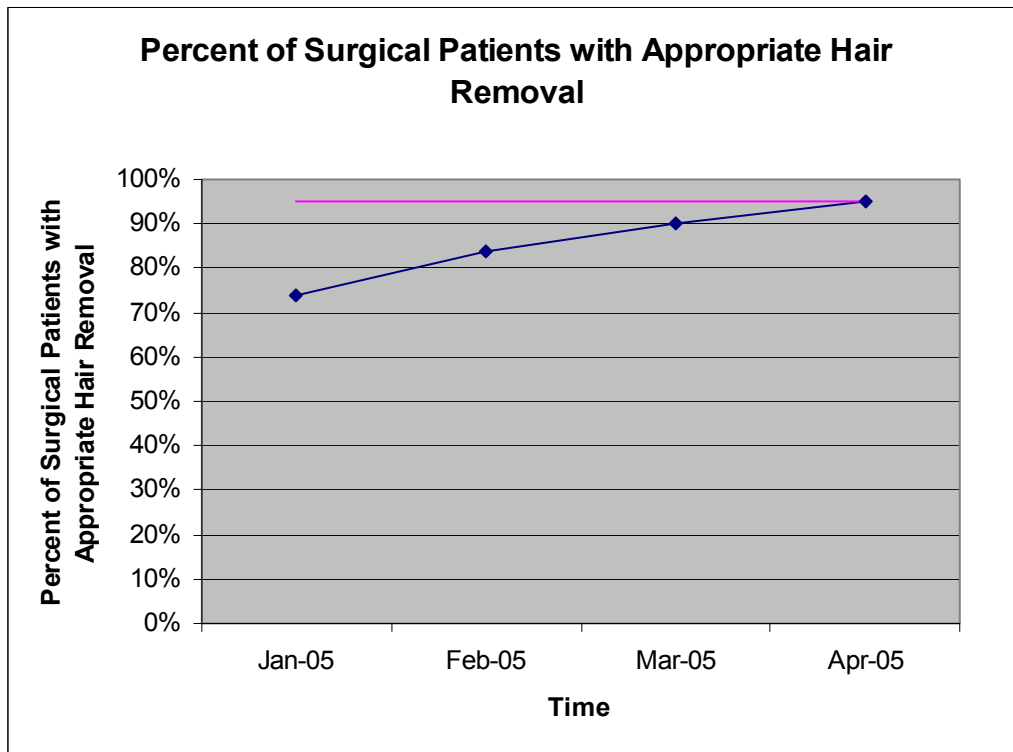
Sampling Strategy:

Hospitals may decide to collect data using sampling if there is a sufficient volume of cases. The following sampling guidelines based on the sampling guidelines from JCAHO Core Measures may be useful:

Pre-exclusion sample size (n) based on pre-exclusion surgical patient population size (N):

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< 28	No sampling; 100% of population required

SAMPLE GRAPH:



DATA COLLECTION AND ANALYSIS TOOLS

N/A

Measure Information Form:
Percent of Colorectal Surgical Patients with Normothermia in
PACU

Intervention(s): Reducing Surgical Site Infection

Definition: Percent of colorectal surgical patients with normothermia (36.0 - 38.0C or 96.80-100.40F) in post-anesthesia care unit (PACU)

Goal: 95% or higher

Matches Existing Measures:

- Surgical Care Improvement Project (SCIP) measure SCIP-18

CALCULATION DETAILS:

Numerator Definition: Number of colorectal surgical patients whose first temperature in PACU were within the range of 36-38 ° C or 96.8-100.4 ° F

Numerator Exclusions: Same as denominator exclusions

Denominator Definition: All colorectal surgical patients

Denominator Exclusions:

- Patients who are less than 18 years of age
- Patients with physician-documented infection prior to surgical procedure
- Burn or transplant patients
- Patients who had a principal or admission diagnosis suggestive of preoperative infectious diseases

Measurement Period Length: Monthly

Definition of Terms:

- Colorectal surgical patient: A patient having had an inpatient colorectal surgical procedure. Specific ICD-9-CM codes will be forthcoming as SCIP defines them.
- Normothermia: Core temperature 36-38 ° C or 96.8-100.4 ° F.

Calculate as: (numerator / denominator); as a percentage

Comments:

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How-to Guide: Prevent Surgical Site Infections

- If more than one inpatient surgical procedure occurred during the index hospitalization, only the first surgical procedure should be considered for the purposes of this measure.

COLLECTION STRATEGY:

The primary sources for identifying patients are based on required data elements in administrative data and medical records. A hospital information system may be able to identify the patients from all discharges by sorting based on these elements. Another alternative is to work with the coding or medical records department to identify the patients at the time of coding and prepare a list or set aside records for review.

After the patients have been identified, manual review of the medical record will be required to look for documentation that this intervention was either provided or contraindicated. If documentation for either cannot be found, the measure should be considered as not being met.

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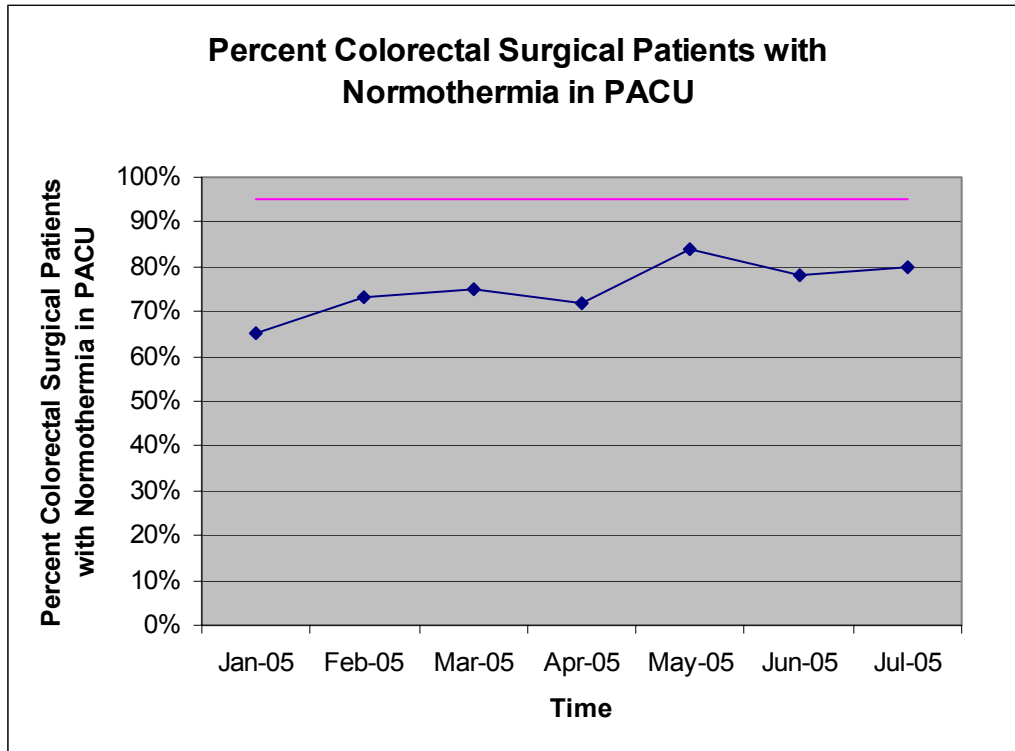
Sampling Strategy:

Hospitals may decide to collect data using sampling if there is a sufficient volume of cases. The following sampling guidelines based on the sampling guidelines from JCAHO Core Measures may be useful:

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< 28	No sampling; 100% of population required

SAMPLE GRAPH:



DATA COLLECTION AND ANALYSIS TOOLS

N/A

Measure Information Form:
Percent of Clean Surgery Patients with Surgical Infection

Intervention(s): Reducing Surgical Site Infection

Definition: Rate of infection in patients undergoing clean surgery

Goal: Reduction of 50%

Matches Existing Measures: N/A

CALCULATION DETAILS:

Numerator Definition: Number of clean surgery patients having a postoperative wound infection

Numerator Exclusions: Same as denominator exclusions

Denominator Definition: Number of clean surgery patients

Denominator Exclusions:

- **Patients who had a principal or admission diagnosis suggestive of preoperative infectious diseases**
- Patients who are less than 18 years of age
- Patients with physician-documented infection prior to surgical procedure

Measurement Period Length: Monthly

Definition of Terms:

- Clean surgery patient: A patient having had a surgery in which the wound is clean, by the NNIS definition: “Uninfected operative wounds in which no inflammation is encountered and respiratory, alimentary, genital, or uninfected urinary tracts are not entered. In addition, clean wounds are primarily closed and, if necessary, drained with closed drainage. Operative incisional wounds that follow nonpenetrating (blunt) trauma should be included in this category if they meet criteria.”
- Postoperative wound infection: A nosocomial infection as defined by NNIS (<http://www.cdc.gov/ncidod/hip/NNIS/NosInfDefinitions.pdf>)

Calculate as: (numerator / denominator); as a percentage

Comments: None

COLLECTION STRATEGY:

The primary sources for identifying patients are based on required data elements in administrative data and medical records. A hospital information system may be able to identify the patients from all discharges by sorting based on these elements. Another alternative is to work with the coding or medical records department to identify the patients at the time of coding and prepare a list or set aside records for review. Concurrent review has been used by some hospitals to collect data while patients are still in the hospital and also allows for the identification of missed interventions so that mitigation can occur before discharge.

Sampling Strategy:

Hospitals may decide to collect data using sampling if there is a sufficient volume of cases. The following sampling guidelines based on the sampling guidelines from JCAHO Core Measures may be useful:

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DATA COLLECTION AND ANALYSIS TOOLS

N/A