Colorado Collaborative Experience Project: Surgical Infection Prevention March 2003 - May 2004

Final Report

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Rapid Cycle Process Improvement to Prevent Hospital Surgical Site Infections

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Intervention Tools

References and quality improvement tools are available at www.medqic.org, a CMS developed quality improvement resources website. This site contains resources developed by other Quality Improvement Organizations (QIOs) and hospitals across the nation.

CART, CMS's Abstracting and Reporting Tool, is also available free of charge to all hospitals for tracking progress on Surgical Infection Prevention measures. Contact Sue Bethel at 303.306.4487 or sbethel@coqio.sdps.org for more information.

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Background

Surgical Site Infection (SSI) has been an important topic for infection control professionals in most hospitals across the country. Thirty million operations are performed annually in the U.S. and 780,000 (2.6%) of those result in an SSI. Although guidelines to prevent SSIs have long been established, gaps persist between the current perioperative (defined as 24 hours prior to the operation through 48 hours after the operation ends) patient care and identified best practices. The Colorado Foundation for Medical Care (CFMC), with funding from the Center for Medicare and Medicaid Services (CMS), formed a collaborative faculty team consisting of one Collaborative Chair, two Co-System Leaders, one Coordinator, two Co-Directors and an Improvement Advisor. This faculty team facilitated a collaborative similar to the Breakthrough Series (BTS) Collaborative designed by the Institute for Healthcare Improvement.

The BTS promotes the use of Plan-Do-Study-Act (PDSA) cycles to address the thrust of Quality Improvement (QI) work via the Model for Improvement. This model is centered around the following questions: what are we trying to accomplish?, How will we know that a change is an improvement? and what changes can we make that will result in improvement? The overall collaborative framework and changes were originally established by the national Surgical Infection Prevention (SIP) expert panel.

This interactive collaborative project was offered to select Colorado hospitals with an adequate denominator as an opportunity to work toward decreasing SSIs via a series of process improvement activities. Eighteen hospitals initially volunteered to participate in this collaborative but two hospitals dropped out, leaving 16 hospitals to actively participate to the completion of the collaborative. Their achievements were truly inspirational, and their participation in the project provided a strong foundation for statewide efforts to decrease SSIs.

The Collaborative faculty found that the participants' knowledge, experience and best ideas were brought to the forefront as they gathered information and mobilized quality improvement resources to achieve higher standards of excellence. Based on data collected, tools and protocols created, and testimonials in hospital story boards and presentations, this collaborative has accomplished great outcomes in bringing SIP into the forefront of hospital QI efforts.

Methods

The collaborative faculty offered a series of three learning sessions and an outcomes congress. Each learning session offered lectures covering topics such clinical best practices, quality improvement methodology, and human behavior training. In addition, hospital teams presented their projects orally and in story boards as a means of sharing and soliciting assistance from other teams. The time periods between these events are action periods that provide hospitals the time needed to incorporate cycles to test new changes thought to improve patient care processes. Communication during action periods was facilitated via monthly conference calls and an email list that offered a forum for ongoing sharing of tools, literature, hospital-specific data, etc. Hospitals were also offered one-on-one consultations and support from the collaborative faculty as needed.

Hospital Team Formation
Participating hospitals were urged to form SIP project teams consisting of a quality improvement leader with the authority to allocate the time and resources needed to achieve the team's aim. This person, known as the senior leader, submits the data and is responsible for creating story boards to display team progress at collaborative events. In addition, the team may have a day-to-day leader to manage the team and assure that data are collected and a physician champion to provide the required leadership. Depending on available resources, these roles may be performed by two to four individuals. This core team will carry out all the essential tasks for this collaborative including creating an aim statement, selecting pilot patient populations and indicators, planning and testing changes, collecting and submitting performance data, and representing their respective hospitals on conference calls and at collaborative events.

Selection of Pilot Population and Indicators
In the pre-collaborative preparation phase, each hospital team identified the procedure type(s) in which process changes could be tested. Hospitals were encouraged to select a procedure type that had enough patient volume to ensure a stable sample size while keeping it manageable. Hospitals with small surgical populations chose multiple procedure types to ensure an adequate number of patients.

Hospital quality improvement work in the area of reducing SSIs tends to be coupled with tracking the infection rates, which is the ultimate outcome to measure. However, this collaborative focused mainly on processes that are clinically proven to be associated with reduced infection rate. It was virtually impossible to track an overall infection rate for the collaborative as every participating hospital used a different criteria for defining an SSI and a different window of time for tracking infections. All hospitals were required to work on the first three indicators listed below. These process indicators have been mandated by CMS as part of its 7th Scope of Work (contract cycle August 2002 thru July 2005). The remaining indicators are optional indicators to supplement the intensive work of the collaborative participants.

SIP Process Indicators
1. Prophylactic antibiotic received within one hour prior to surgical incision.
2. Appropriate prophylactic antibiotic consistent with current recommendations.
3. Prophylactic antibiotic discontinued within 24 hours after surgery.
4. Glucose control for cardiac surgery patients. *(Optional)*
5. Glucose control for known diabetes. *(Optional)*
6. Normothermia: patients with temperature greater than 36C. *(Optional)*
7. Perioperative supplemental oxygenation. *(Optional)*

Hospital teams generated ideas for ways to improve processes of care and tested their effectiveness in their pilot populations according to the principles of the Model for Improvement. The tests included 100% of the pilot population and were conducted in focused, short PDSA cycles lasting no longer than a few days. These tests allowed the teams to pilot one idea at a time. Once their changes were deemed successful, they could spread the change to procedures outside their pilot populations.

One goal of the collaborative was to spread the best practices to non-participating hospitals. Collaborative participants went above and beyond the expectations of the collaborative faculty and shared their work with other hospitals in the state not participating in the collaborative. Several of the participants extended the benefit of their experience to all other hospitals in the state via presentations they made at CFMC-sponsored regional meetings. They generously shared their progress, successes, barriers and lessons learned.

Data Collection & Monitoring
Hospital participants aggregated their performance rates on the SIP indicators monthly and submitted reports (quantitative and narrative) to the collaborative email list once every two months. Participants used run charts to assess their monthly progress and determine the impact of their changes. While being incorporated into story boards, these charts were also used to educate team members on achievements as well as on opportunities for improvement. Additionally, the charts served as promotional tools to publicize the SIP collaborative to the rest of the hospital.

CFMC aggregated data on a monthly basis (March 2003 thru May 2004) for all cases in the populations of the participating hospitals. Run charts were plotted for all indicators to identify any trends demonstrating improvement or decline in the overall rates. It is worth noting that the number of hospitals submitting data fluctuated from month to month on some of the indicators partly due to delays in medical chart construction and/or assembly. The current month's data submission, for any given indicator, tended to be less complete and reliable. Similarly, the collaborative data are limited by the amount of data available for the last two months of the collaborative, as several participating hospitals have not submitted data for April and May of 2004. Consequently, one could not judge the impact of the collaborative by merely comparing the first month (baseline) to the last month. Assessing the impact of the collaborative is best achieved via observing trends in the collaborative data and the differences between the performance of the participants and the statewide performance.

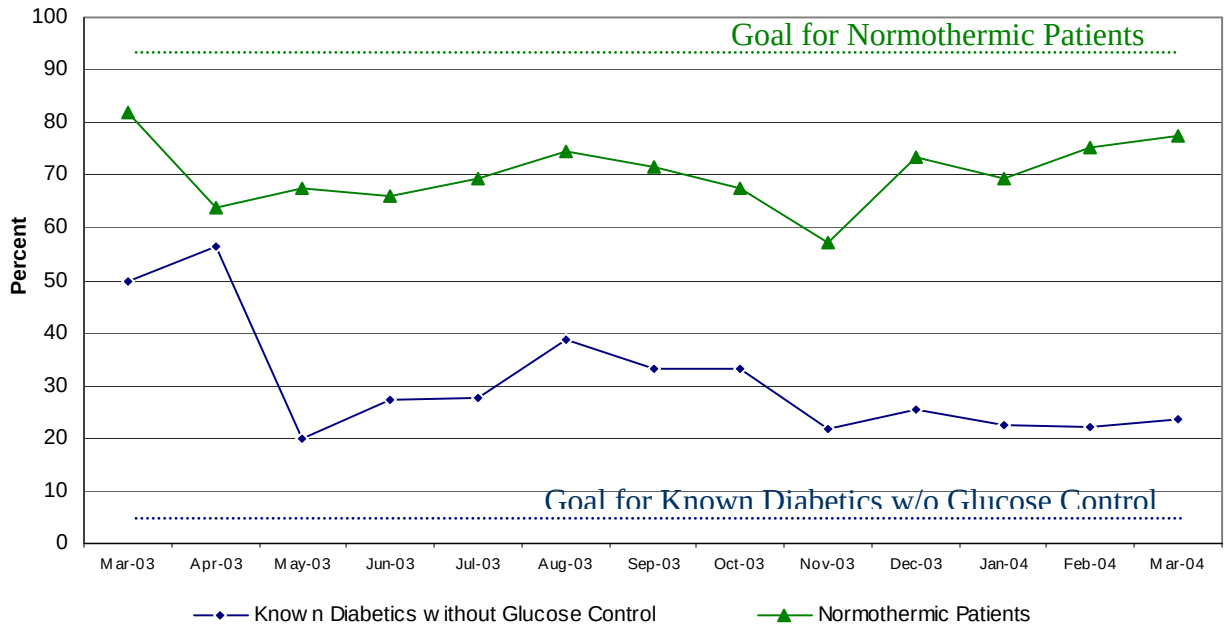
Statewide surveillance data, which are abstracted by the Clinical Data Abstraction Center (CDAC), were used as an independent data source. These data include 125 randomly selected SIP cases per quarter across the state (surgeries performed in participating and non-participating hospitals alike). These data are available for cases discharged as far back as the first quarter of 2002 through the second quarter of 2004. Run charts were created to compare collaborative participants' performance data to statewide surveillance data.

It is necessary to identify the differences between these two sources of data. The collaborative data were collected by each hospital using a variety of tools (depending on what each hospital selected), while the CDAC data were collected using CART exclusively. Due to delays in Medicare claim maturation, CDAC data does not become available for several months after the hospitalizations occur, while collaborative data are more timely and allow for real-time interventions. Collaborative data cover procedure types which were self-selected by the hospitals, whereas statewide surveillance can include any case that is eligible for inclusion in the SIP population. Additionally, most participating hospitals included all patients having the procedure(s) that their team selected for this collaborative, while CDAC data are a small random sample of the eligible population. Regardless, both data sources are subject to a variable number of hospitalizations each month.

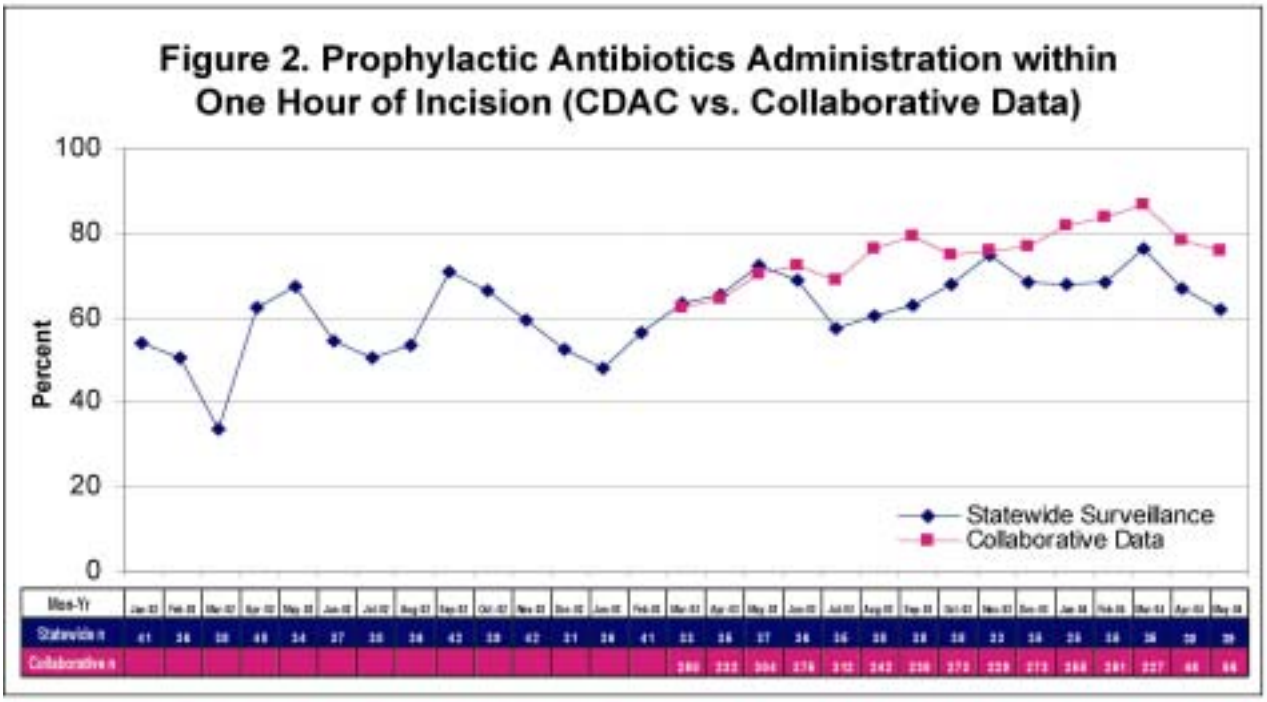
Results

Results are graphically displayed below for the normothermia indicator and the known diabetic patients without glucose control. No graph will be displayed for oxygenation rates, which were maintained at 100% for the duration of the collaborative by all four hospitals working on this indicator. Cardiac patients without glucose control, however, suffered from a low and highly variable sample size per month. Aggregating the data quarterly would provide sufficient data per quarter to allow for a smoother plot. However, the length of the collaborative provides only four quarters of data, which is not adequate for trending. This indicator was only tracked by three hospitals. Alternatively, Figure 1 indicates that improvement was observed in reducing the percentage of known diabetics without glucose control and increasing the percentage of patients who were normothermic. Analysis of data for optional indicators was only done using collaborative data, as these indicators are not collected statewide.

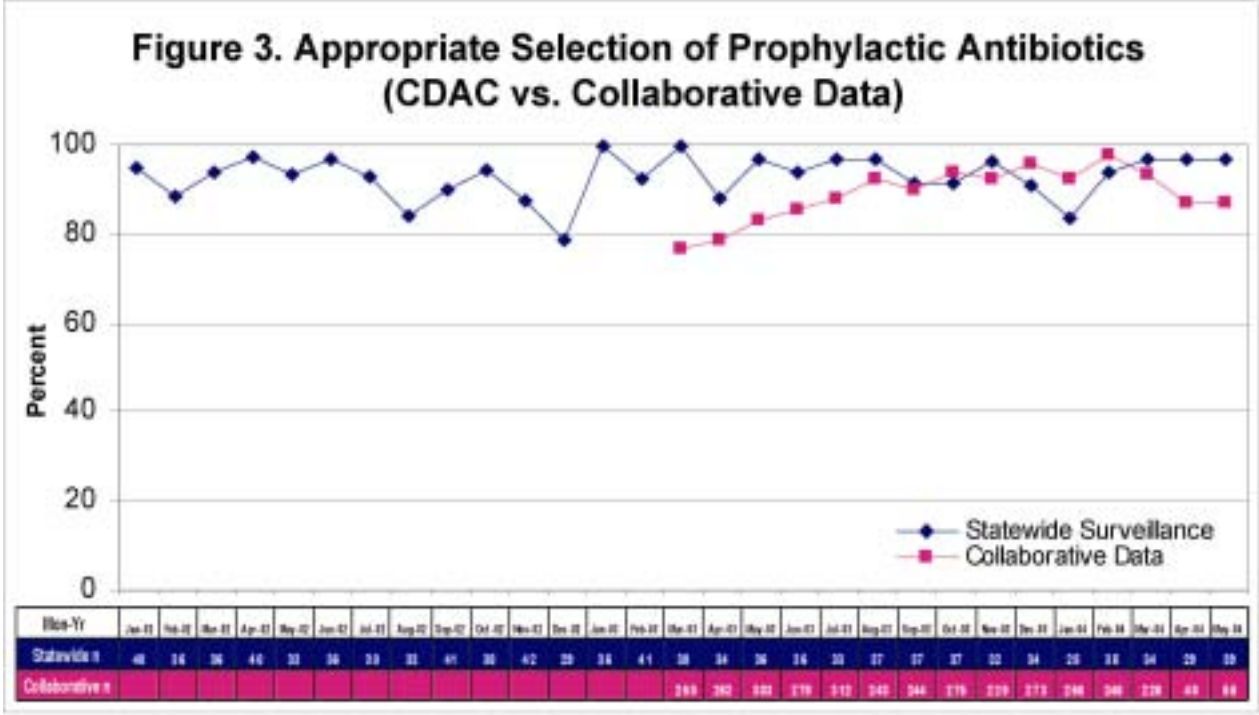
Figure1. Optional Measures



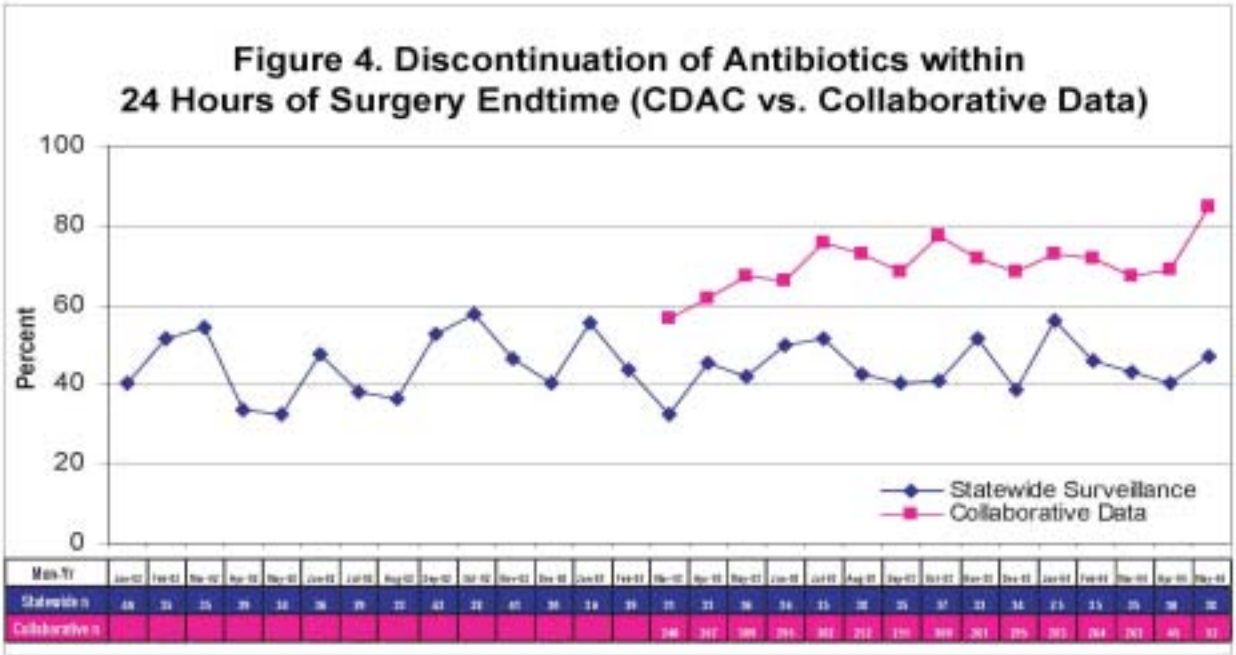
Graphical representation of the performance of collaborative participants on the required measures relating to the use of prophylactic antibiotics indicates high performance and stable processes. Collaborative data depicted in Figure 2 indicate a steady increase in the overall rates for administration of prophylactic antibiotics within one hour of incision. Comparing the rates of the collaborative participants to the statewide surveillance indicates that both performance rates were at the same level in the early months of the collaborative, however, the two performance plots began to diverge in June 2003. Both data lines show improvement in the rates', however, the collaborative data show that participants improved at a faster pace. The last two months of collaborative data show a decline in the collaborative performance rates; however, these rates are only based on a fraction of the participating hospitals' data and are not representative of the performance of the entire group of participants.



Appropriate selection of antibiotics depicted in Figure 3, indicates that collaborative participants experienced a baseline rate that is higher than that of the administration of antibiotics within one hour of incision. However, similar improvement was observed in the rates over the span of the collaborative. The collaborative participating hospitals started out at a lower rate than that of the entire state, however, their continued progress put them at an equal or higher rate than the state in the latter months of the collaborative.



Discontinuation of prophylactic antibiotics started with rates similar to the baseline rate of prophylactic antibiotics within one hour of incision. However, Figure 4 indicates that it experienced modest improvement in the collaborative participant group. Although this was the lowest indicator at baseline and the slowest to improve, the participating hospitals were consistently discontinuing prophylactic antibiotics within 24 hours at a higher rate than the state as a whole.



Discussion

The collaborative offered an opportunity to share resources and apply concerted effort to achieve a common goal. The expectation of data sharing undoubtedly initiated a sense of friendly competition. Hospitals made modifications to their perioperative practices in hope of lowering their surgical site infection rates. Although it is difficult to isolate the effect of the collaborative from confounders in improving the success of infection control processes, the data collected throughout the collaborative indicate that the participating hospitals have indeed observed some improvement in their indicator rates. Improvement varied in magnitude across hospitals, and the level of improvement observed at the individual hospitals was attributed to a variety of factors ranging from team composition and culture, involvement of senior leadership and the structure of the collaborative, to the support they received from the collaborative faculty. It was quite evident that hospitals entered this project with the spirit of the collaborative. They openly shared their successes and barriers with others despite the competitive nature of the healthcare industry.

The larger volume of charts (100% of the cases) reviewed by each hospital is much more representative of each hospital's performance. In addition, hospitals experienced great benefits from involving quality improvement, infectious disease, and Operating Room (OR) staff in data collection. Despite the generally accepted burden of chart abstraction, participants cited having greater understanding of their processes and ways to improve them after closely examining and dissecting their documentation practices. Without the necessary nuisance of chart abstraction, no changes can be made to improve staff acceptance of standardized documentation. In addition, most hospitals moved from retrospective chart review to concurrent data collection after they learned their process and designed appropriate data collection tools to capture their data while eliminating the extra time needed for retrospective chart abstraction.

Hospital teams have identified several common barriers while attempting to redesign their systems. Physician resistance was sited as a great force to overcome. To counteract this problem, hospital teams had to enlist the help and support of their physician champions. Additionally, disseminating evidence-based supportive literature to physicians was another successful tactic in obtaining physician buy-in and acceptance. Occasionally, hospital teams have requested that clinician collaborative faculty come to speak at their grand rounds. Another common barrier identified was lack of process standardization. This problem was resolved with developing standing orders and pre-printed orders. Hospital teams standardized many processes to improve systems, such processes include approving one type of thermometers for measuring body temperature, removing all razors so that surgeons would all use clippers and lower their chances of creating unnecessary skin abrasions. In addition, hospital teams assigned responsibility for administering prophylactic antibiotics and documenting the timing to certain key players such anesthesiologists. Every team developed a system of reminders for their members, such as the use of stickers or stamps to prompt the nurses and surgeons to document the administration of antibiotics. Most importantly, hospital teams have involved pharmacists in designing and implementing a successful process for antibiotics prophylaxis.

The backbone of this collaborative has been unique combination of on-going training and education and the practice of rapid cycle improvement. All hospital teams designed education modules to meet the needs of their employees. Details of the results were regularly disseminated to all members of the team. Story boards of the hospital work were often placed in strategic locations such as employee lounges and conference rooms.

Challenges Hospitals Faced

Barriers	Solutions
Physician Resistance	• Utilize influence of their peers. • Recruit physician champion. • Involve them in the process at the very beginning and disseminate supporting literature articles with references. • Provide specialty-specific, evidence-based literature on best practices. • Speak with physicians one-on-one about concerns and ask their input on ideas for tests of change. • Provide CFMC physician presentation at hospital.
Lack of Process Standardization	• Use pre-printed orders/standing orders. • Calibrate temperature thermometers. • Develop process to ensure clippers are fully stocked in every OR and pre-op. Remove all razors. • Assign responsibility for administering and documenting antibiotics to anesthesia. • Have anesthesiologist administer antibiotics instead of "on call" to OR. • Develop and add incision time sticker to front of all surgery charts to facilitate timing of post-op antibiotics that will cease within 24 hours of surgery end time. • Communicate new process multiple times and multiple ways. • Update documentation forms for OR to prompt documentation of antibiotic administration.
Successful Process Changes	• Pre-op nurse administers test dose of antibiotics and provide documentation of allergic reaction. This allows anesthesiologist to give full dose in a more timely fashion.
Lack of Education	• Provide in-services and hold project steering meetings. • Conduct periodic testing on SIP knowledge via questionnaires. • Post "No Shave Zone" signs in OR and CVL. • Disseminate CDC guidelines. • Post reminders and frequent data reports in key strategic locations. • Communicate details of process to everyone involved, including seasonal employees. • Utilize story boards in lounges, restrooms and conference rooms.
Staff Resistance	• Set-up a feedback and recognition system for staff. • Include all involved staff in brainstorming ideas and soliciting feedback. • Make quality improvement activities part of performance evaluation and link to pay increases (ideally at all levels of organization).

Conclusion

Key Points to Remember when Improving Systems of Care

- Create a tension for change to motivate clinicians and staff to modify behavior and process (i.e. publicly-reported measures).
- To improve a system, we need a system for improvement.
- It is difficult to sustain and replicate improvement efforts that are not systematic and routine.
- It is okay for things not to be perfect when testing a change.
- Empower staff to make changes.
- If you have an idea, make it into a PLAN-be specific about who, what, when and where.
- Do something on a small scale-small scale testing decreases resistance and risk.
- Seek out feedback from others. Study those performing tasks in the test know best how it worked and how to improve it.
- ACT upon it; use information from the study to make modifications and run the cycle again.

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