Pre-Operative Antibiotic Timing
Congenital Heart Program

Clinical Safety & Effectiveness Cohort # 11

Center for Patient Safety & Health Policy
UT Health Science Center
San Antonio

Educating for Quality Improvement & Patient Safety
The Team

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- **Department of Cardiothoracic Surgery – Children’s Heart Program and UTHSCSA**
  - Adil Husain, MD
  - Lauren Kane, MD
  - Cindy Weston, RN, MSN, CCRN, CNS-CC, FNP-BC

- **Department of Pediatrics – UTHSCSA**
  - Cathy Woodward, DNP, RN, PNP-AC

- **Pediatric Anesthesia Division (Tejas Anesthesia)**
  - Deborah Rasch, MD
The aim of this project is to improve compliance of antibiotic administration time in relation to surgical cut time (skin) of congenital heart surgery patients in the Pediatric Intermediate Care Unit, Pediatric Intensive Care Unit, and Neonatal Intensive Care Unit by 15% during the period of May 1 – August 31, 2012.

The process begins with the initiation of an antibiotic infusion and ends with cutting of skin in the operating room.

This is important to improve because it aligns with our goal to protect the patient and reduce risk for surgical wound infection.
Project Milestones

- Team Created: March 2012
- AIM statement created: April 2012
- Team meetings: May 2012
- Intervention Implemented: May 15, 2012
- Data Analysis: September 2011 – August 2012
- CS&E Presentation: September 14, 2012
Background

- Surgical Care Improvement Project (SCIP) is a Joint Commission Core Measure focusing on the reduction of surgical site infection (SSI).

- By implementing SCIP quality measures, hospitals can prevent an estimated 13,000 patient deaths and 271,000 surgical complications each year. *AORN J 86 (July 2007) 94-101*

- Timing of antibiotic administration is important to achieve the establishment of bactericidal tissue and serum levels at the time of incision to reduce the risk of infection.

- Effective preoperative prophylaxis is crucial to SSI prevention and should be given within specified time frames, depending on antibiotic selection:
  - **β-Lactum**: within 60 minutes of skin cut time
  - **Glycopeptides**: within 60-120 minutes of skin cut time

- An estimated 40-60% of surgical wound infections are thought to be preventable with appropriate intervention.
Background

• Sternal wound infections increase the risk for mortality, morbidity, and length of stay, associated with increased cost and reduced patient satisfaction.

• Attention to SSI prevention includes:
  • Preoperative
  • Intraoperative
  • Postoperative

• Implementation of Congenital Heart Bundles at CSRCH
  • Preoperative SSI bundle (2009)
  • Open Sternum Bundle (2009)
  • Preoperative Antibiotic Compliance Initiative – May 2012
Past SSI rates/100 surgical procedure at CSRCH:
- **FY2009** – 2.7
- **FY2010** – 2.6
- **FY2011** – 1.0
- **FY2012** – 4.23 (NHSN criteria changed for inclusion of procedures in denominators)

**4th Quarter SSI Rate for April, May, & June - 0**

**1st Quarter SSI Rate to Date (FY2013)- 0**
Rationale

- Principles of antibiotic prophylaxis are based on:
  - Choice of antimicrobial agent
  - Timing of first administered dose
  - Duration of the prophylaxis regimen

- *Risk of infection increases if prophylaxis is given too early or too late.*
Pre-Intervention Data - Vancomycin

27% compliance

Vancomycin Pre-Operative Antibiotic Times (September 2011 to April 2012)
Pre-Intervention Data – Cefuroxime

Cefuroxime Pre-Operative Antibiotic Times (September 2011 to April 2012)

79% compliance
The Problem – Data Analysis

- Poor preoperative antibiotic administration compliance.
  - **Vancomycin** – 27% compliance
  - **Cefuroxime** – 79% compliance

- *The data supported a further look into the process!*
Pre-OP Cardiac PT

Pre-OP Vancomycin given by Unit RN @ 0630

Patient moved to Pedi Holding

To OR Room

Pre-OP Cefuroxime by Anesthesia

Time OUT to verify ABX given

Surgical Cut Time

Patient moved to Pedi Holding

To OR Room

Anesthesia to obtain IV Access

Pre-OP Vancomycin given by Anesthesia
Process Analysis: Fishbone

**IV ACCESS**
- No IV access prior to surgery
- Prolonged time to obtain access due to difficulty
- Variation in process between departments

**STAFF**
- Process of verifying administration time of ABX instead given
- Viewed as low priority
- Communication about start time between surgeon and anesthesiologist
- Given too early in relation to cut time
- Given too late by anesthesia
- Multiple departments involved with administration

**INSTITUTIONAL FACTORS**
- Significance of time recommendations for administration
- Lack of awareness
- False sense of compliance
- Need for Education
- Accountability by physician
- Availability of ABX
- Tool to verify ABX given on time

**OR KNOWLEDGE DEFICIT**
- BUY IN

PreOperative Antibiotic Time Delay
• We are 100% compliant!!
### Preconceptions/Assumptions

- It’s not me....

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<thead>
<tr>
<th></th>
<th>Dr. A</th>
<th>Dr. B</th>
<th>Dr. C</th>
<th>Dr. D</th>
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<tbody>
<tr>
<td><strong>Vancomycin Compliance</strong></td>
<td>19.5%</td>
<td>16.6%</td>
<td>26.6%</td>
<td>37.5%</td>
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<tr>
<td><strong>Cefuroxime Compliance</strong></td>
<td>77.5%</td>
<td>100%</td>
<td>93%</td>
<td>37.5%</td>
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Preconceptions/Assumptions

- Unaware of average cut time....

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<th>Wednesday</th>
<th>Thursday</th>
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<tr>
<td>Average Cut Time</td>
<td>9:23 am</td>
<td>9:34 am</td>
<td>9:04 am</td>
<td>10:21 am</td>
<td>9:14 am</td>
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Preconceptions/Assumptions

- Poor compliance on mornings with weekly meeting....
- Every Tuesday 7:00 am (Cardiac Conference)

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<tbody>
<tr>
<td>Cefuroxime</td>
<td>82.6%</td>
<td>84.6%</td>
<td>78.2%</td>
<td>60%</td>
<td>80%</td>
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<tr>
<td>Compliance</td>
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</tr>
<tr>
<td>Vancomycin</td>
<td>16.6%</td>
<td>32%</td>
<td>22.7%</td>
<td>60%</td>
<td>11.7%</td>
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<td>Compliance</td>
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Intervention

- Plan:
  - Data collection
  - OR start time
  - Vancomycin start time
  - Cefuroxime start time
  - Surgical cut time
  - Anesthesiologist??
  - Awareness
    - Fishbone/Flowchart
  - Process change
  - Education
  - On-going auditing of compliance
  - Accountability
Pre-Operative Antibiotic Compliance Initiative

• Awareness of Compliance Rates
  • On-going communication related to antibiotic compliance rates shared with the anesthesiologist and OR team

• Process Change
  • Vancomycin available OCTOR (on call to OR) and started in Pedi Holding with approval from the anesthesiologist.
  • Cefuroxime given in the OR by anesthesiologist.
  • Communication of antibiotic administration time during TIME OUT procedure between surgeon, anesthesiologist, and registered nurse (RN).
Pre-Operative Antibiotic Compliance Initiative

• Education
  • SCIP
  • Purpose and rationale

• Audit
  • Surveillance continues on all cardiac surgery patients for pre-operative antibiotic compliance.
  • Communication provided monthly to the individual anesthesiologist of personal compliance rates.

• Accountability
The Results: Vancomycin

Pre-Operative Vancomycin Compliance - Congenital Heart Program

Minutes from Start of Antibiotic to Surgical Cut Time

Number of Patients
The Results: Cefuroxime

Pre-Operative Cefuroxime Compliance

Minutes from Start of Antibiotic to Surgical Cut Time

Number of Patients
Compliance After Intervention

• Improved preoperative antibiotic administration compliance.

• **Pre-Intervention**
  • *Vancomycin* – 27% compliance
  • *Cefuroxime* – 79% compliance

• **Post-Intervention**
  • *Vancomycin* – 77% compliance
  • *Cefuroxime* – 96.4% compliance
Return on Investment

- For FY2012, the total number of cardiac procedures with a sternal incision = 142
- At the FY2012 infection rate of 4.23 per 100 surgeries, 6 sternal wound infections are predicted for FY2013
- Post-intervention, the total number of cardiac procedures with a sternal incision = 64
- Actual patient infection rate FYTD = 0 per 100 surgeries
- Based on FY2012 infection rate of 4.23 per 100 surgeries, the current infection rate of 0 per 100 surgeries, and 64 total surgeries post intervention, we have prevented 2.7 sternal wound infections this fiscal year.
- Literature indicates an infection can add, on the average, $28,000 per patient admission.

\[ \text{Total cost savings} = \$75,600 \]
Moving Forward…

- Looking further into SSI with delayed sternal closure.
- Changing pre-operative and post-operative antibiotic regimens based on current guidelines.
- Sustaining compliance…
References


Thank You!