

Pre-Operative Antibiotic Timing Congenital Heart Program



Clinical Safety & Effectiveness Cohort # 11



Educating for Quality Improvement & Patient Safety



CHRISTUS.
SANTA ROSA
Children's Hospital

The Team

- CHRISTUS Santa Rosa Children's Hospital
 - LeAnn Dudley Vela, RN, CCRN (Cardiac Coordinator PICU/PIMC)
 - Dana Rohman, RN, BSN, CPN (Nursing Director PICU/PIMC)
 - Michelle Shepherd, RN, BSN, CPN (Supervisor PICU/PIMC)
 - Morris Sauter, Pharm.D. (Clinical Pharmacist PICU)
- 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



Aim Statement



- 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 Lactam: 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



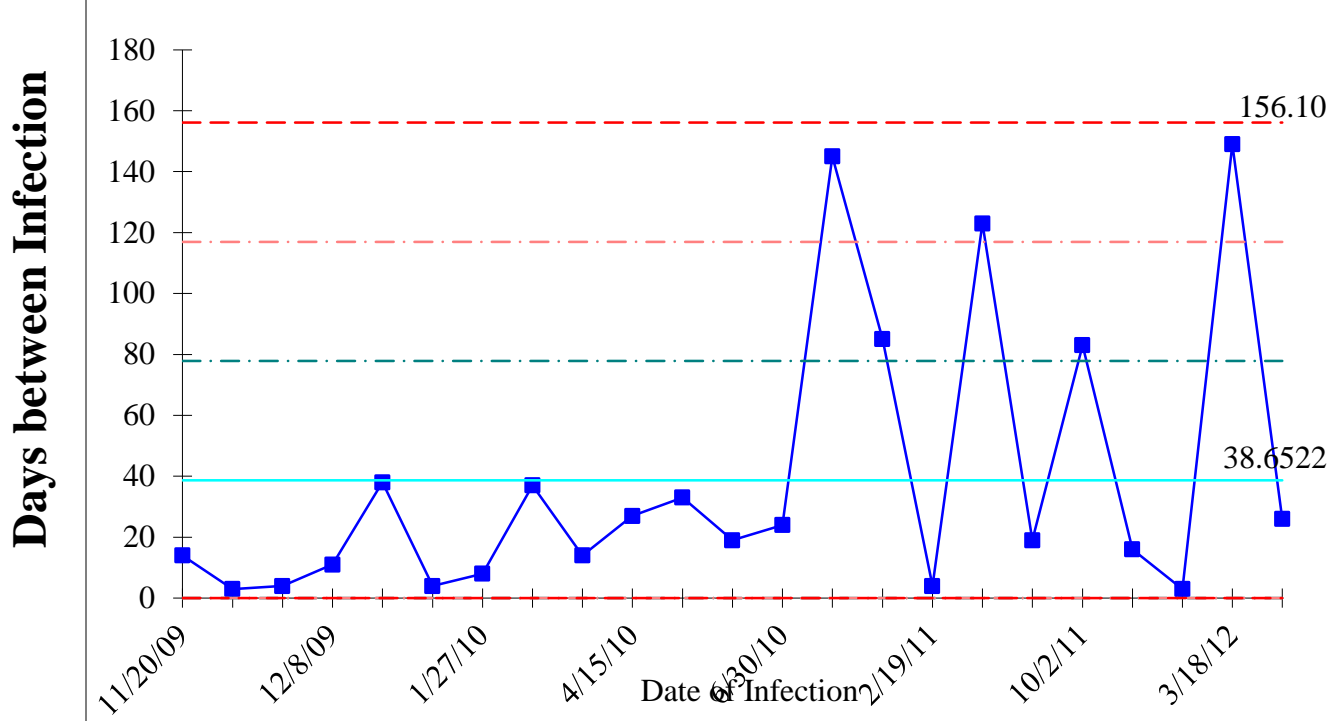
Past SSI rates/100 surgical procedure at CSRCH:

- **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

Sternal Wound Infection Days



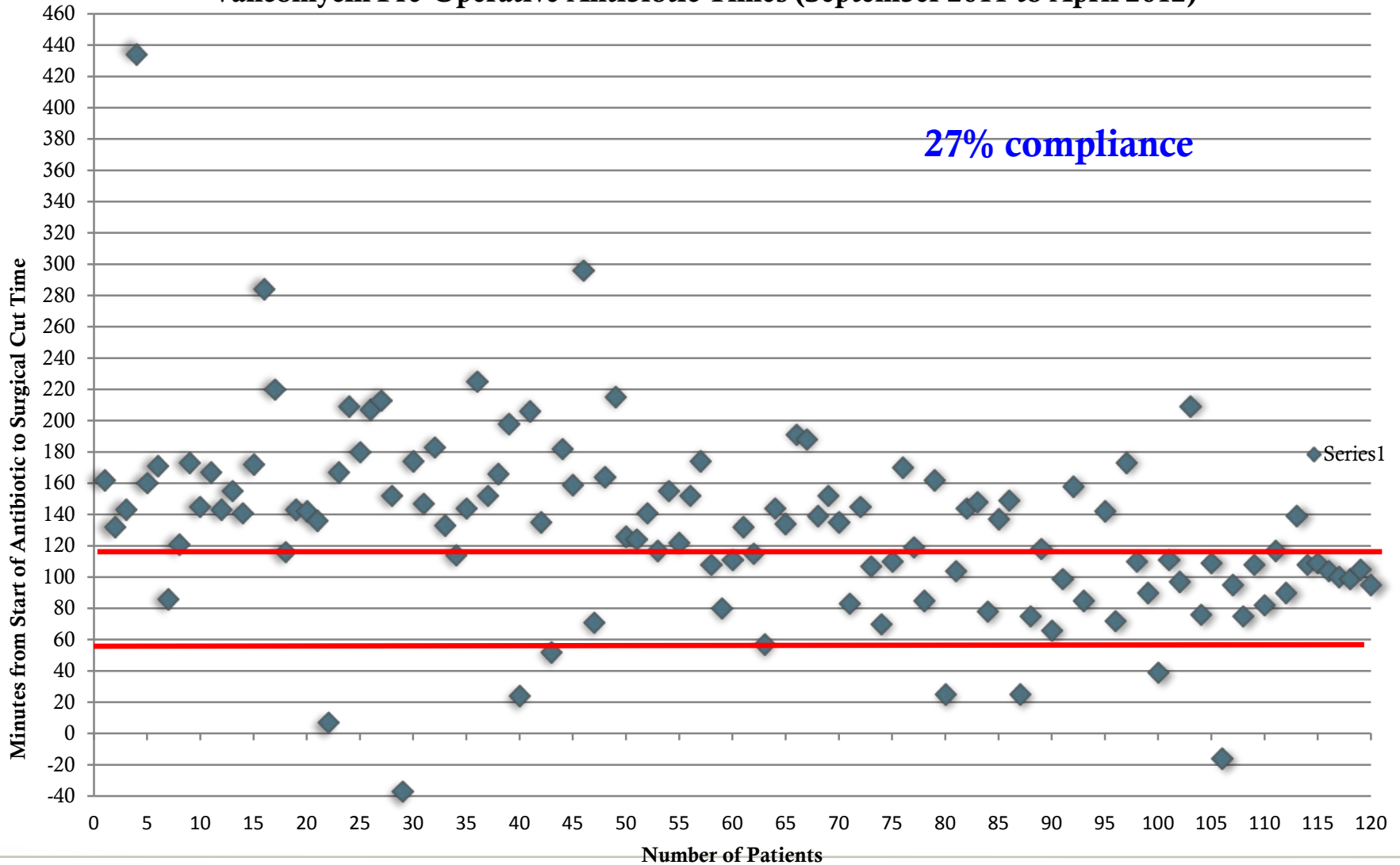
Rationale



- 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.*

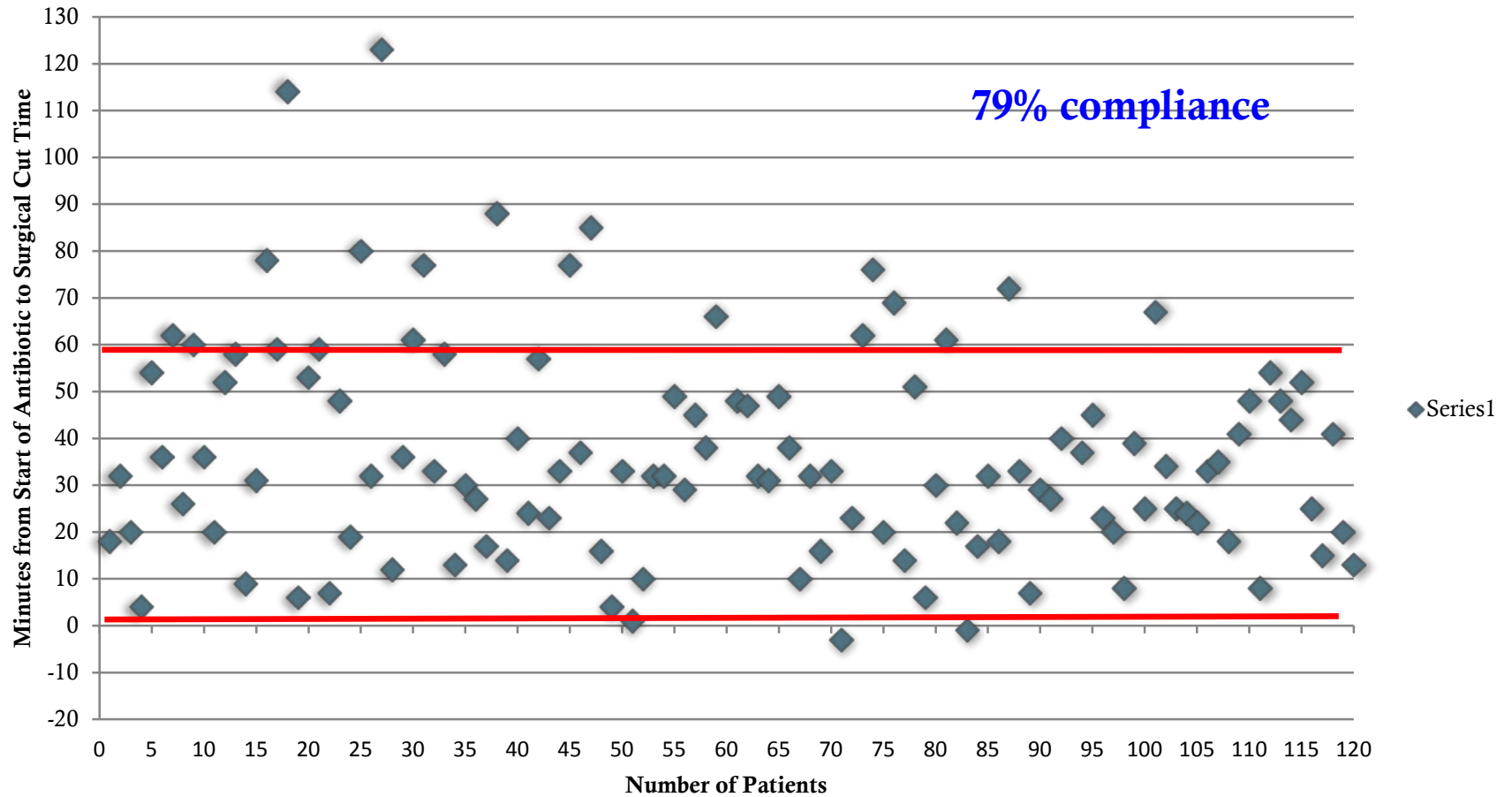
Pre-Intervention Data - Vancomycin

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



Pre-Intervention Data – Cefuroxime

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



The Problem – Data Analysis

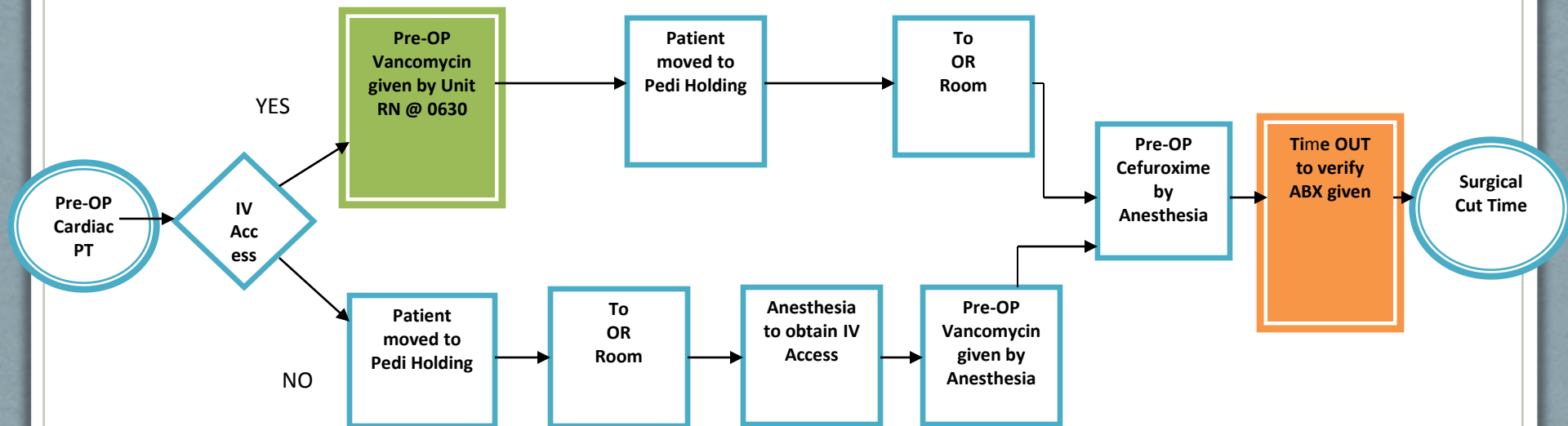


- Poor preoperative antibiotic administration compliance.
- **Vancomycin – 27% compliance**
- **Cefuroxime – 79% compliance**

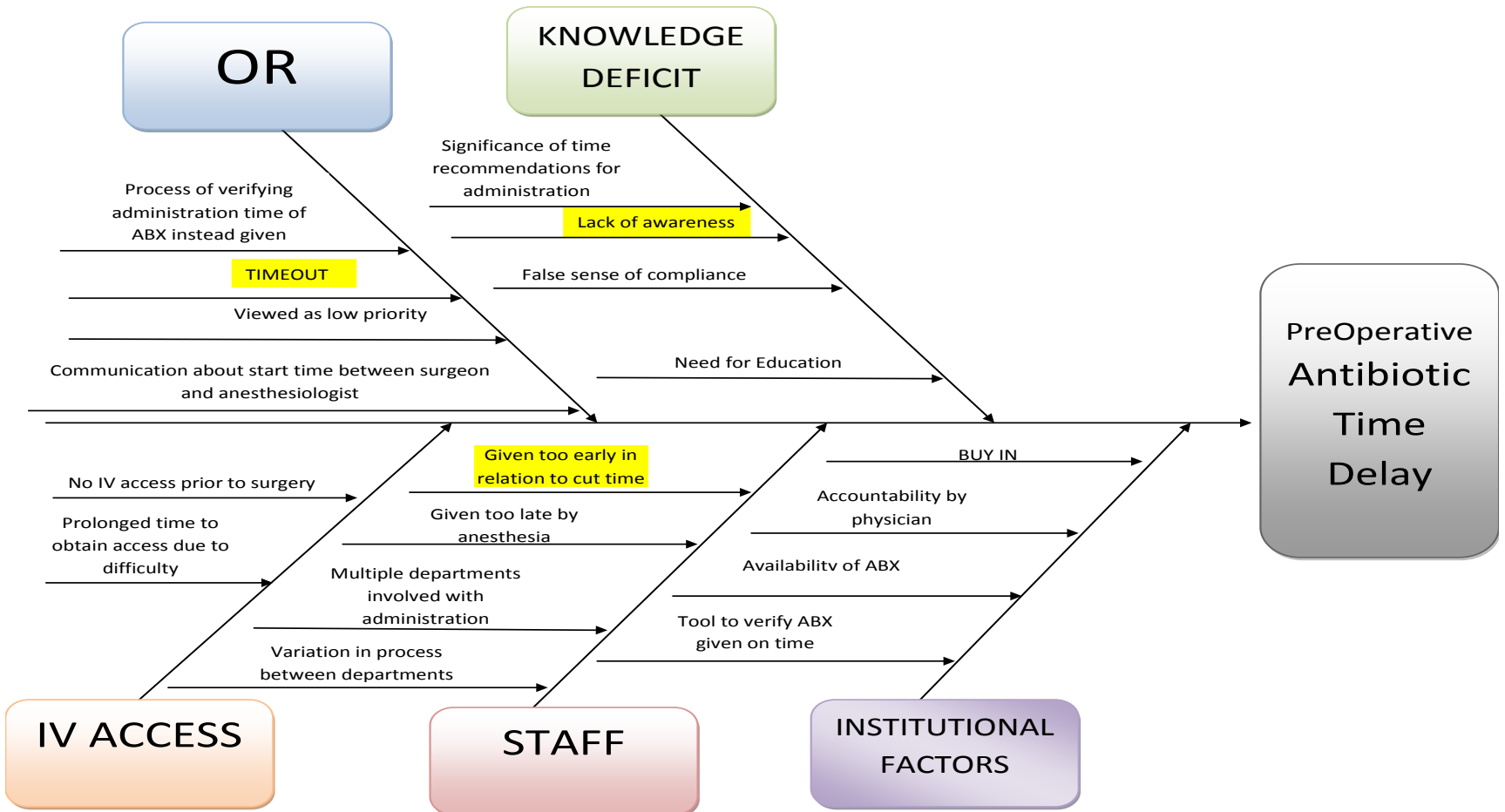


- *The data supported a further look into the process!*

Process Analysis: Flowchart



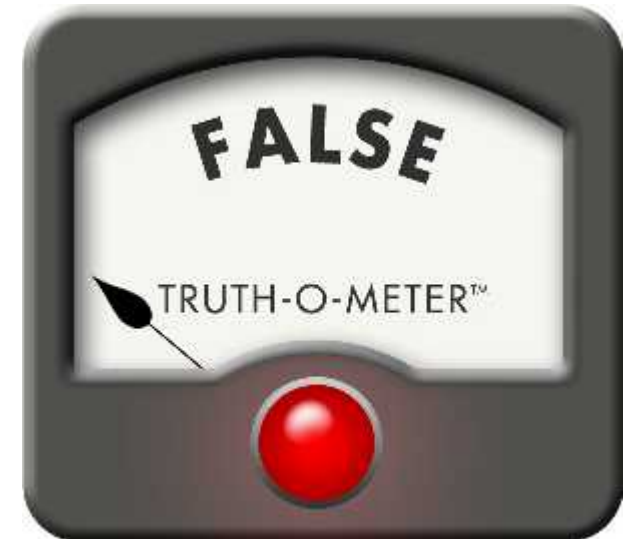
Process Analysis: Fishbone



Preconceptions/ Assumptions



- **We are 100% compliant!!**



Preconceptions/ Assumptions



- It's not me....

	Dr. A	Dr. B	Dr. C	Dr. D
Vancomycin Compliance	19.5%	16.6%	26.6%	37.5%
Cefuroxime Compliance	77.5%	100%	93%	37.5%

Preconceptions/ Assumptions



- Unaware of average cut time....

	Monday	Tuesday	Wednesday	Thursday	Friday
Average Cut Time	9:23 am	9:34 am	9:04 am	10:21 am	9:14 am

Preconceptions/ Assumptions



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

	Monday	Tuesday	Wednesday	Thursday	Friday
Cefuroxime Compliance	82.6%	84.6%	78.2%	60%	80%
Vancomycin Compliance	16.6%	32%	22.7%	60%	11.7%

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).

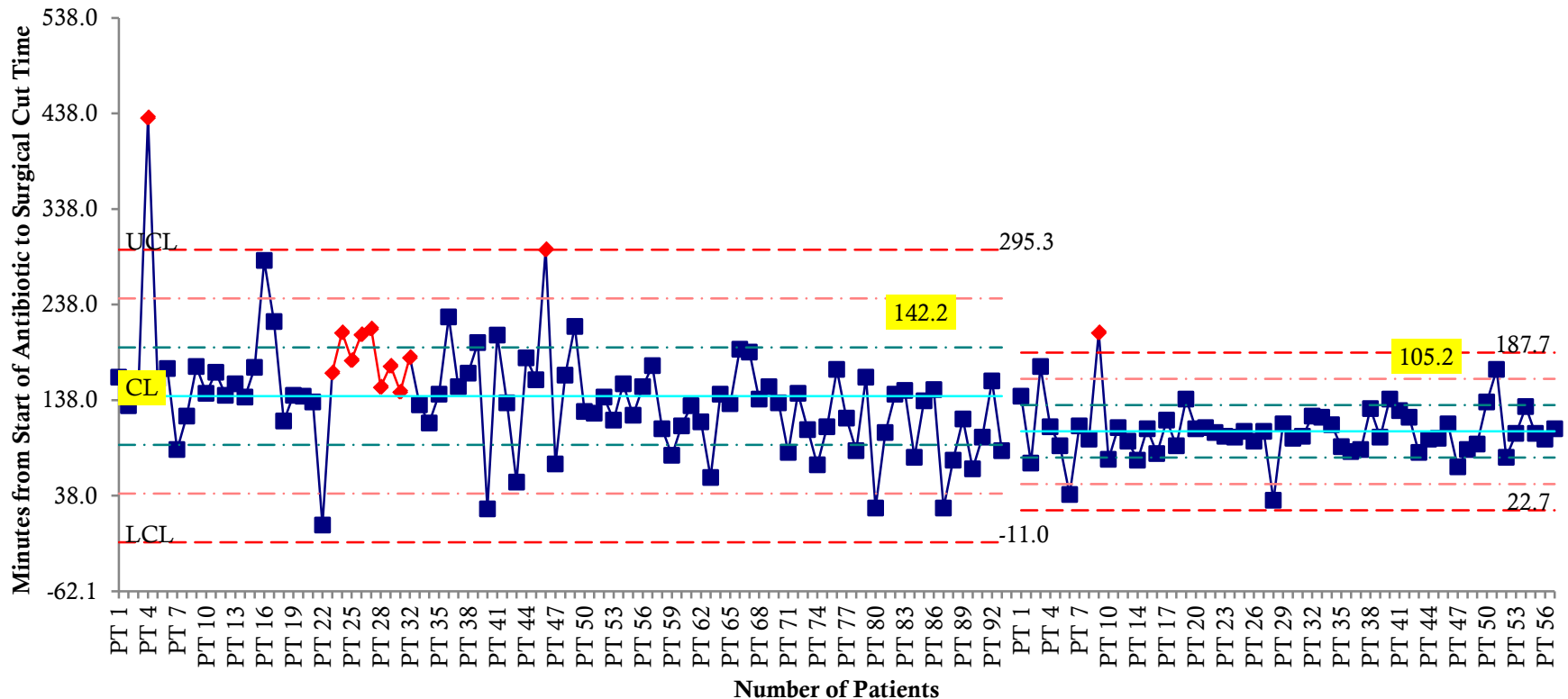
Pre-Operative Antibiotic Compliance Initiative



- 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

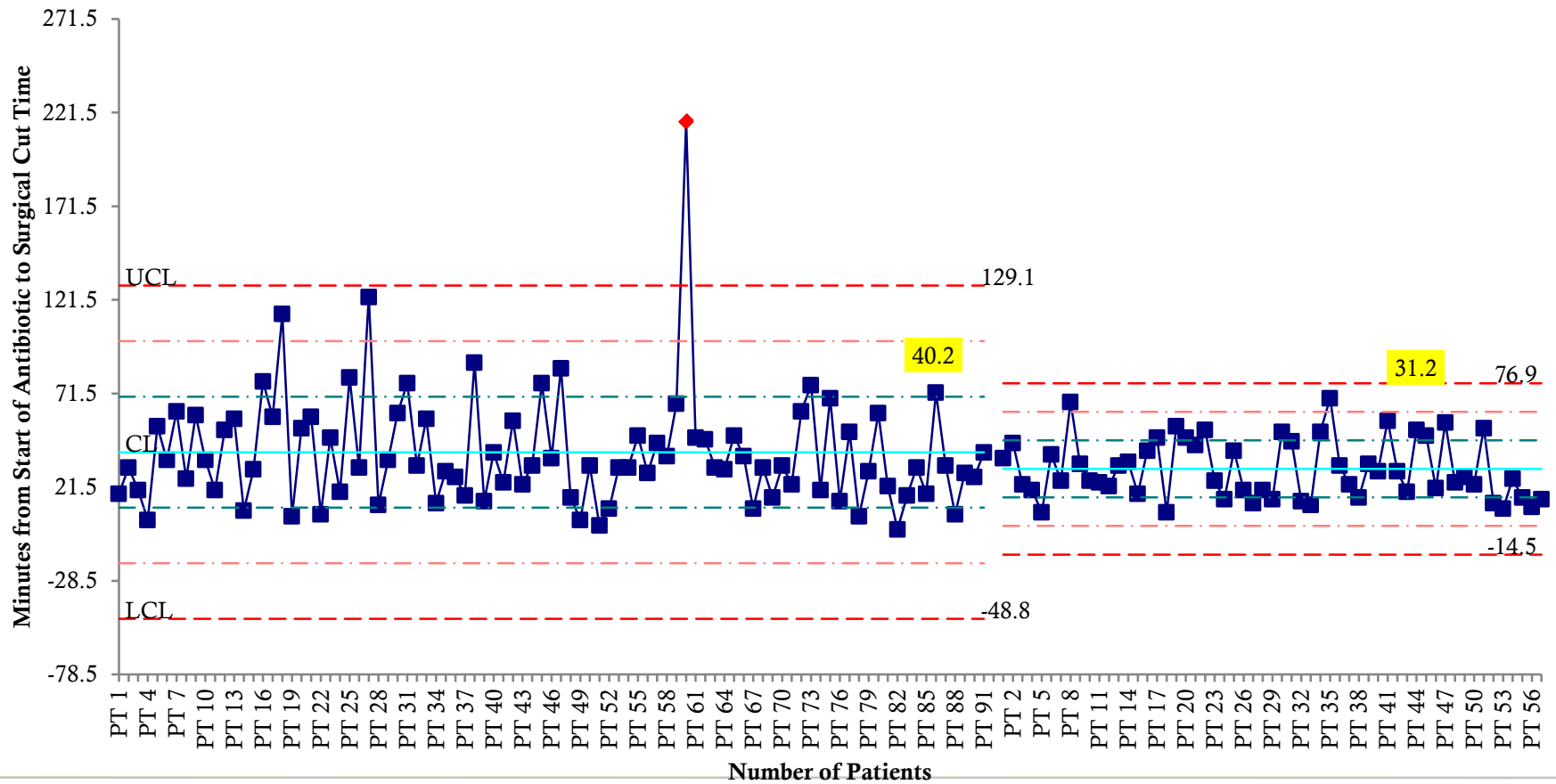
The Results: Vancomycin

Pre-Operative Vancomycin Compliance - Congenital Heart Program



The Results: Cefuroxime

Pre-Operative Cefuroxime Compliance



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.



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

- National Healthcare Safety Network Patient Safety Component Manual. Center for Disease Control website. <http://www.cdc.gov/nhsn/PDFs/pcsManual/9pscSSIcurrent.pdf>. Accessed August 12, 2012.
- Woodward CS, Son M, Calhoun J, Michalek J, Husain SA. Sternal wound infections in pediatric congenital cardiac surgery: a survey of incidence and preventative practice. *Ann Thorac Surg*. 2011;91(3): 799-804
- Woodward CS, Son M, Taylor R, Husain SA. Prevention of sternal wound infection pediatric cardiac surgery: a protocolized approach. *World Journal for Pediatric and Congenital Heart Surgery*. 2012
- Connor JA, Kline N, Mott S, Harris SK, Jenkins KJ. The meaning of cost for families of children with congenital heart disease. *Journal of Pediatric Health Care*. 2010;24(5): 318-325.
- Kappeler R, Gillman M, Brown NM. Antibiotic prophylaxis for cardiac surgery. *J Antimicrob Chemother*. 2012;67: 521-522.
- Steinberg JP, Braun B, Hellinger WC, Kusek L, Bozikis M, Bush AJ, Dellinger EP, Burke JP, Simmons B, Kritchevsky SB. Timing of antimicrobial prophylaxis and the risk of surgical site infections: results from the trial to reduce antimicrobial prophylaxis errors. *Annals of Surgery*. 2009;250(1): 10-16.
- Maher KO, VanDerElzen K, Bove EL, Mosca RS, Chenoweth CE, Kulik TJ. A retrospective review of three antibiotic prophylaxis regimens for pediatric cardiac surgical patients. *Ann Thorac Surg*. 2002;74: 1195-1200.
- Prtak LE, Ridgway EJ. Prophylactic antibiotic surgery. *Surgery*. 2009;27(10): 431-434.
- Knoderer CA, Cox EG, Berg MD, Webster AH, Turrentine MW. Efficacy of limited Cefuroxime prophylaxis in pediatric patients after cardiovascular surgery. *Am J Health-Syst Pharm*. 2011;68:909-914.
- Barker GM, O'Brien SM, Welke KF, Jacobs ML, Jacobs JP, Benjamin DK, Peterson ED, Jagers J, Li JS. Major infection after pediatric cardiac surgery: a risk estimation model. *Ann Thorac Surg*. 2010;89: 843-850.
- Adler AL, Martin ET, Cohen G, Jeffries H, Gilbert M, Smith JS, Zerr DM. A comprehensive intervention associated with reduced surgical site infections among pediatric cardiovascular surgery patients, including those with delayed sternal closure. *Journal of the Pediatric Infectious Diseases Society*. 2012;1(1): 35-43.
- Costello JM, Graham DA, Morrow DF, Morrow J, Potter-Bynoe G, Sandora TJ, Pigula FA, Laussen PC. Risk factors for surgical site infection after cardiac surgery in children. *Ann Thorac Surg*. 2010;89: 1833-1842.

Thank You!

