

Six Sigma Methodology To Improve the Process of Timing of Antimicrobial Prophylaxis In Patients Undergoing Non Cardiac Surgery At The Cleveland Clinic

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September 8, 2006

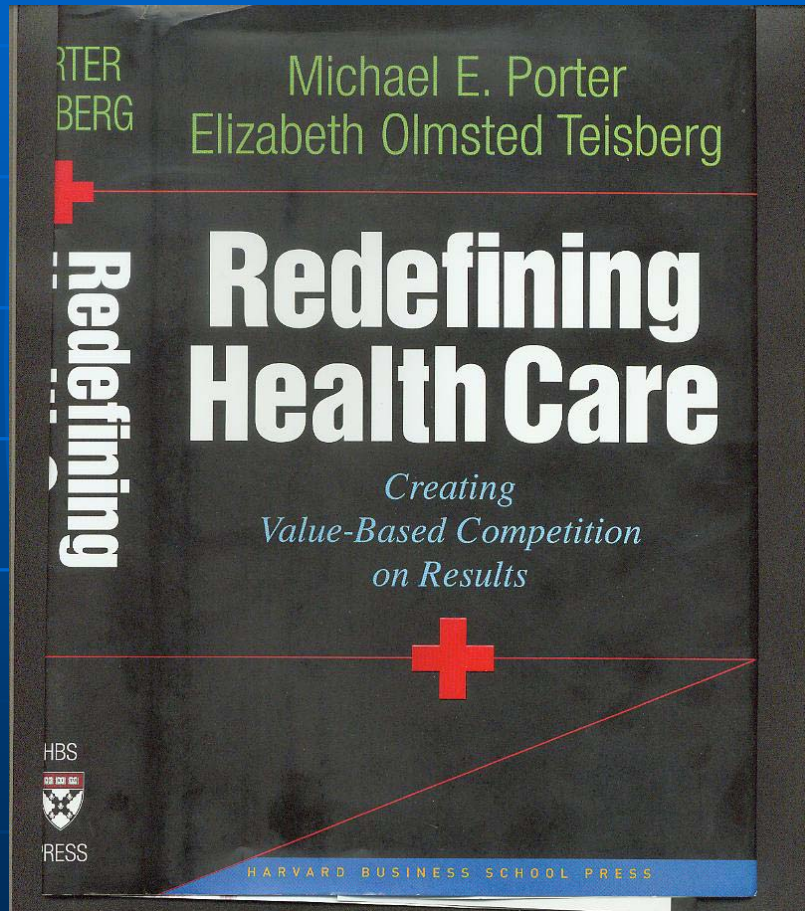
THE CLEVELAND CLINIC

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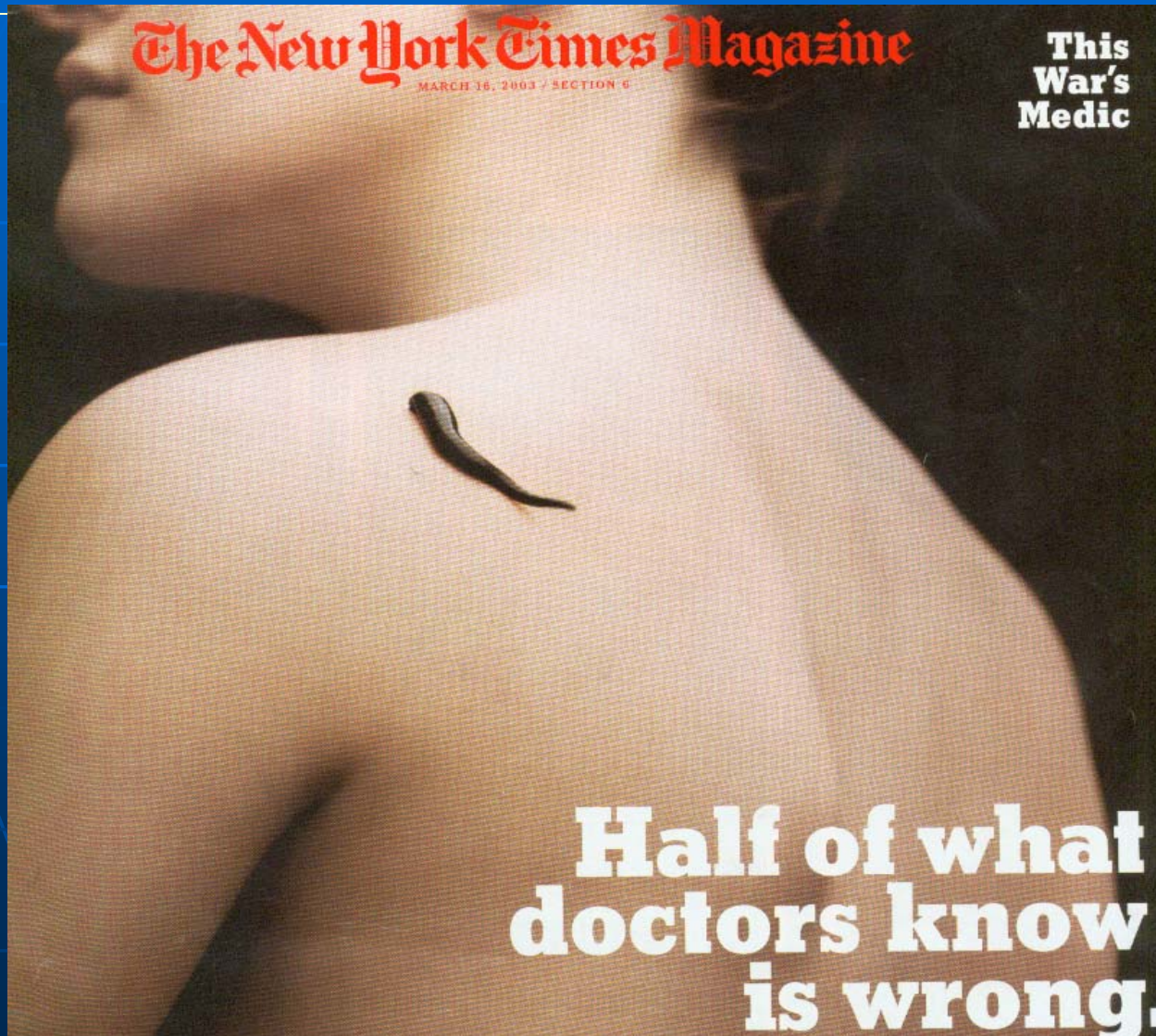
Disclosures

Principal Investigator in two ongoing
3M sponsored studies

Value-Based Competition



Knowledge Gap in Healthcare!



The New York Times Magazine

MARCH 16, 2003 / SECTION 6

**This
War's
Medic**

**Half of what
doctors know
is wrong.**

Adherence Gap

One of the most consistent findings in health research is the gap between evidence and practice. It is estimated that the care received by 30-40% of patients in the US and the Netherlands does not conform to currently available scientific evidence

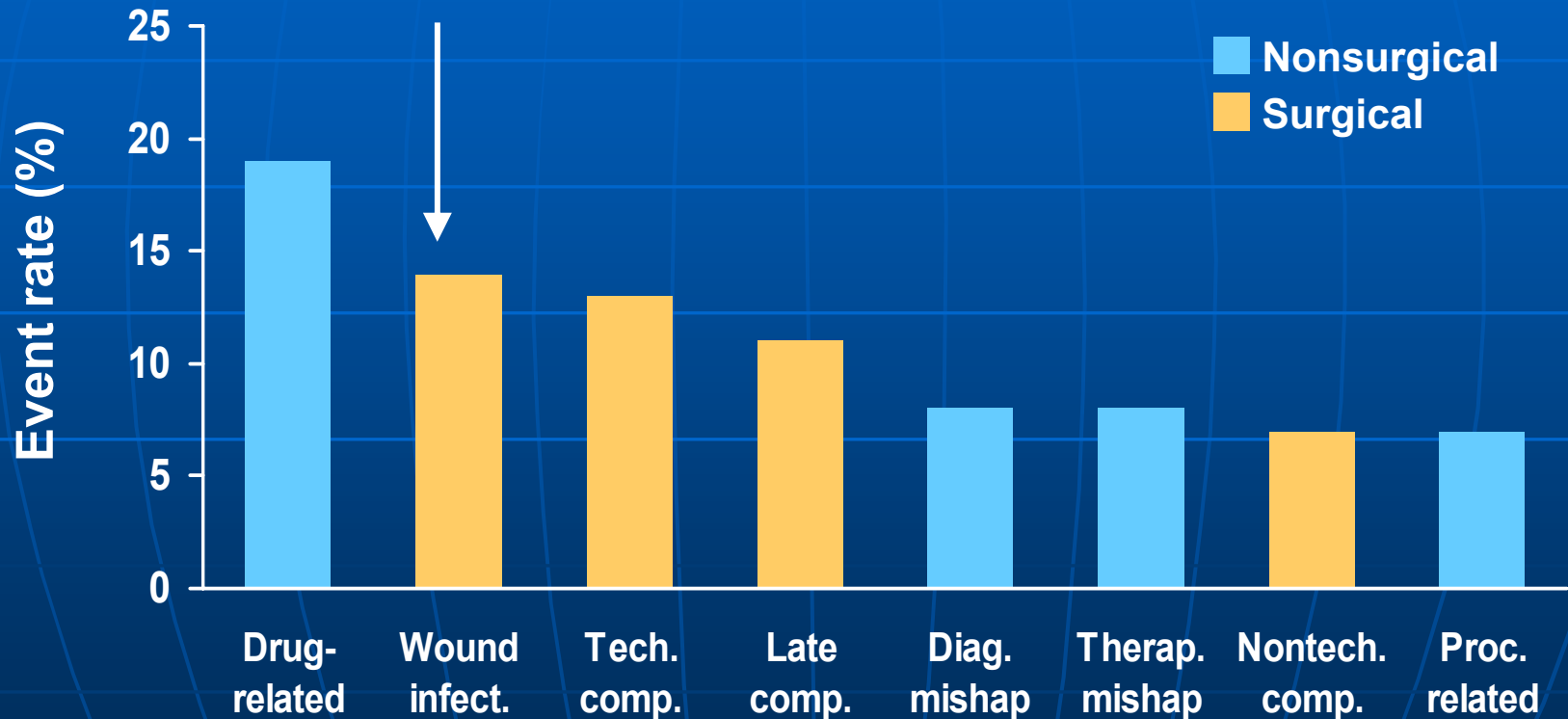
Pierre Durieux, M.D., MPH
Editorial, New England Journal of
Medicine 3/10/05

Cleveland Clinic

- 1148 beds
- 68,052 Surgical Cases (2004)
 - 24,467 inpatient/43,585 outpatient surgeries



Most Frequent Categories of Adverse Events



SURGICAL INFECTION PREVENTION

Medicare Quality Improvement Project

MAJOR ARTICLE

Antimicrobial Prophylaxis for Surgery: An Advisory Statement from the National Surgical Infection Prevention Project

Dale W. Bratzler¹ and Peter M. Houck,² for the Surgical Infection Prevention Guidelines Writers Workgroup*

Oklahoma Foundation for Medical Quality, Oklahoma City, Oklahoma; and Centers for Medicare and Medicaid Services, Seattle, Washington

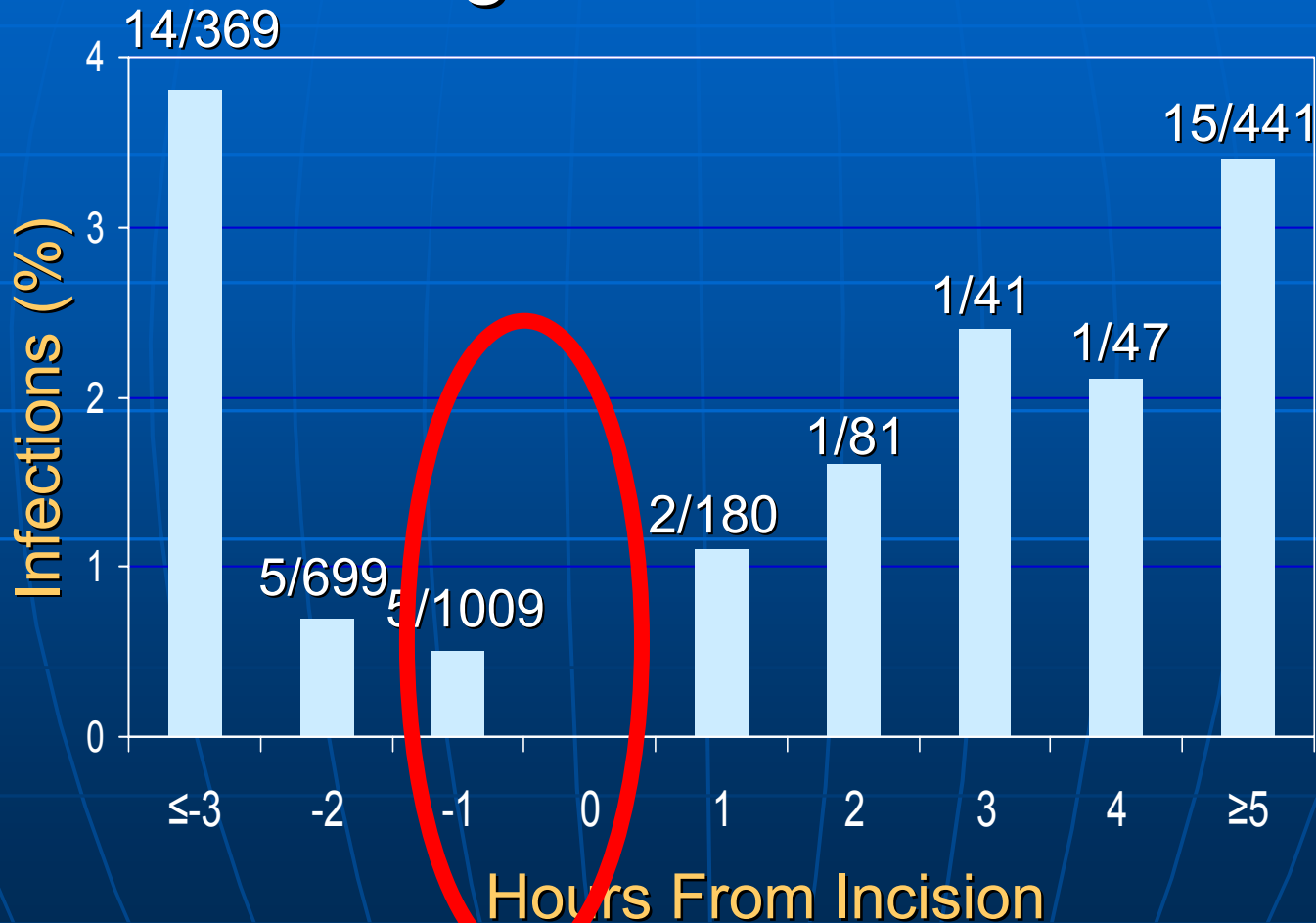
In January 2003, leadership of the Medicare National Surgical Infection Prevention Project hosted the Surgical Infection Prevention Guideline Writers Workgroup (SIPGWW) meeting. The objectives were to review areas of agreement among the most-recently published guidelines for surgical antimicrobial prophylaxis, to address inconsistencies, and to discuss issues not currently addressed. The participants included authors from most of the groups that have published North American guidelines for antimicrobial prophylaxis, as well as authors from several specialty colleges. Nominal group process was used to draft a consensus paper that was widely circulated for comment. The consensus positions of SIPGWW include that infusion of the first antimicrobial

Prophylactic Antibiotics

- Antibiotics given for the purpose of preventing infection when infection is **not** present but the risk of postoperative infection **is** present

The Decisive Period for Antibiotic Prophylaxis in Surgery

Timing of Administration



Cleveland Clinic Team

Multidisciplinary Team of Stakeholders

Michael Henderson, MD Quality Review Officer, Division of Surgery
(Process Owner)

Brian Parker, MD Quality Review Officer, Division of Anesthesiology
(Process Owner)

Jason Beedlow, CRNA

Aimee Calvert, RN, BSN

Lori Dewitt, RN, BSN

Barb Fahey, RN

Kitty Ribar, RN

Sue Vitagliano

Monica Weber, RN, MSN

Anesthesia

Same Day Surgery

Same Day Surgery

Surgical Services

General Surgery (Outpatient)

Division of Surgery Quality

Infection Control

Wendy Thill (3M) Six Sigma Blackbelt!

Challenge (Opportunity)

- National Data: ~56% of patients receive their ATB within 1 hour prior to incision
- Cleveland Clinic: (audit in March 2005)

Only 38% of patients in same day surgery area received their ATB within 1 hour Vs >90% of Cardiothoracic patients

- Process improvement opportunity!

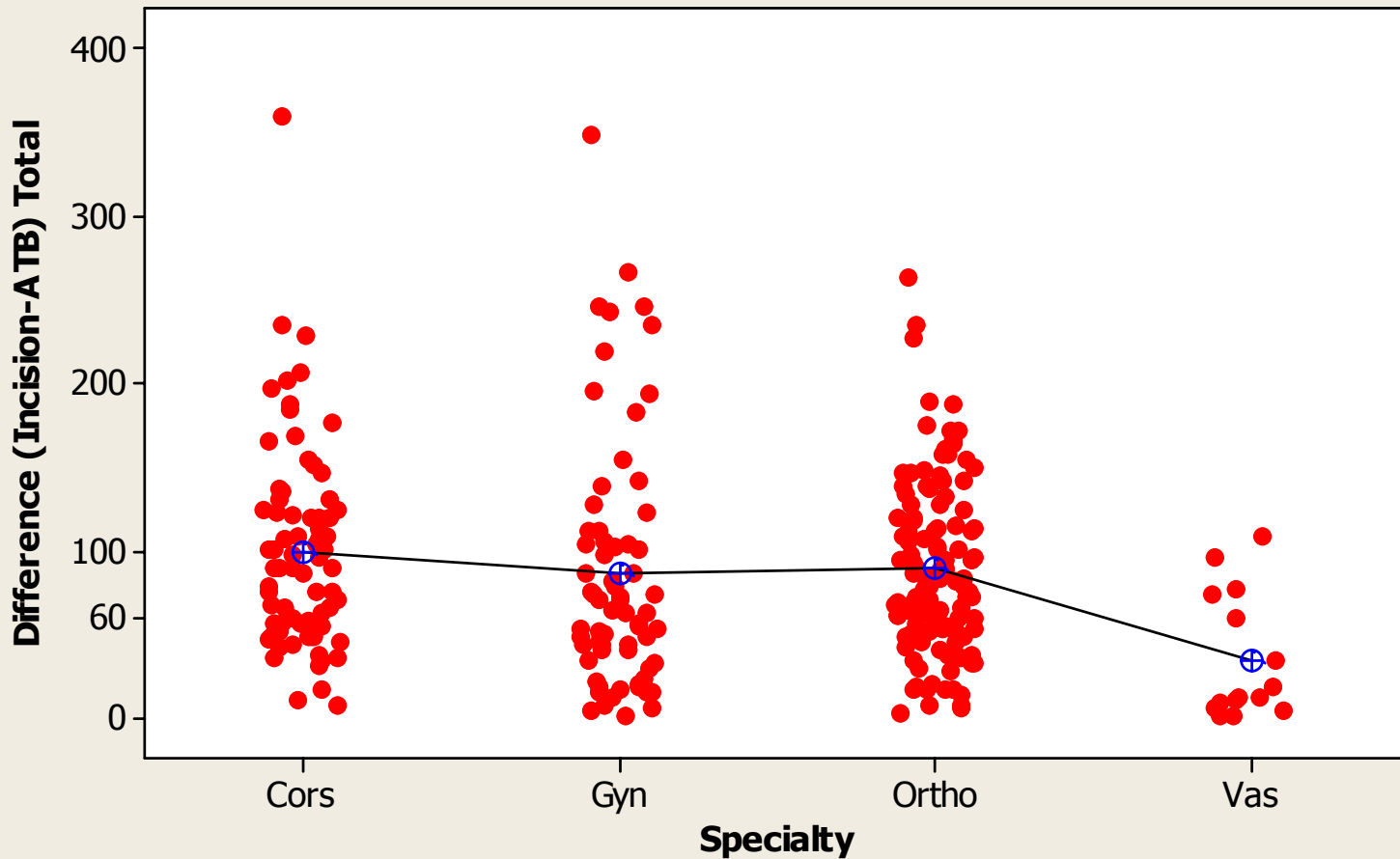
Process in Control

% of Cardiothoracic Surgical Cases Receiving Antibiotics Within 60 Minutes



Non Cardiac Surgery (Same Day Surgery) and Timing of Antibiotic Prophylaxis by Specialty, March 2005

Individual Value Plot of Difference (Incision-ATB) Total vs Specialty



3M

Six Sigma

DMAIC Methodology for Customer Green Belts (Cleveland Clinic Team: June and August 2005)



Background

Process is the combination of people, equipment, materials, methods and environment that produce output (given product or service)

- “a particular way of doing something”

Understanding how these factors interact and affect process is key in process studies

What Is Six Sigma

Six Sigma process generates a defect probability of 3.4 parts per million (6 std deviations). Coined by Motorola

Proactive means of achieving excellence in process

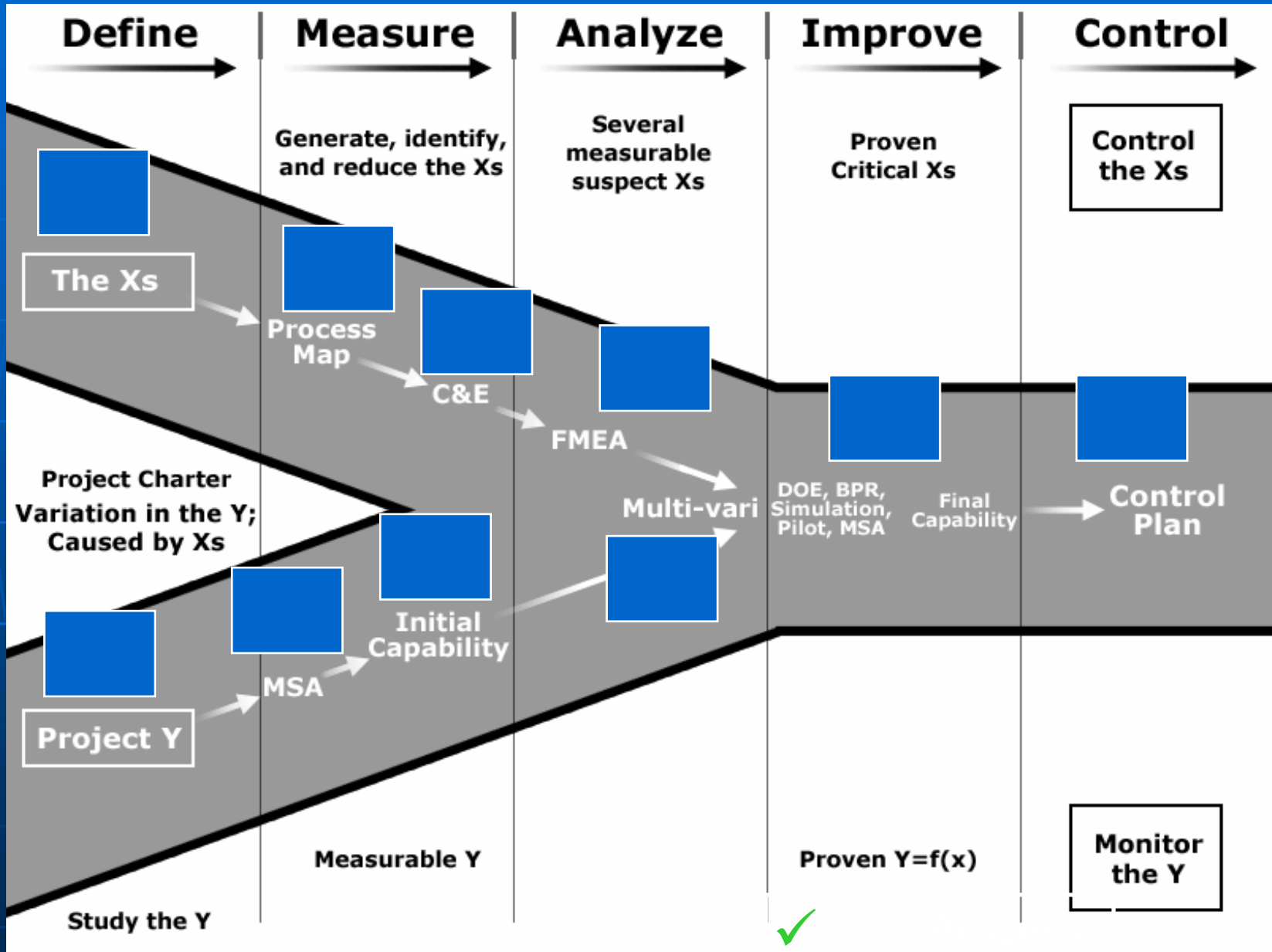
Measurement of performance or improvement

Data driven approach (vs intuitive)

Increasing applications in healthcare environment (Barry R. The Six Sigma Book for Healthcare, Health Administration Press 2002.)

The Process: DMAIC

- Define: What is Problem
- Measure: What is root cause and how can it be measured
- Analyze: How can I understand the root cause (data driven)
- Improve: How can I make it better (remove root cause)
- Control: Ensure problem will not recur



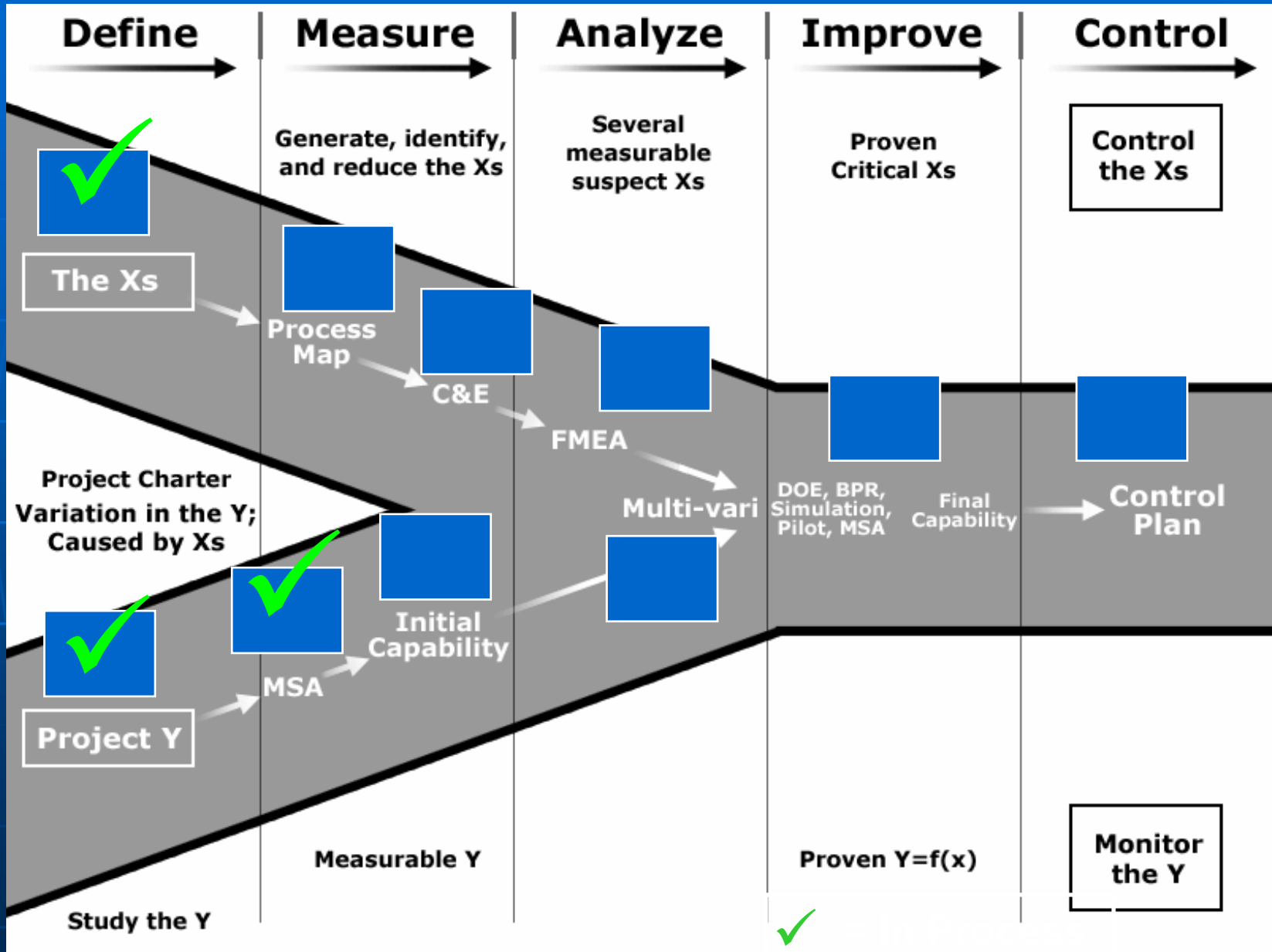
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The Tools

- Process Maps: documents key process steps, inputs and outputs
- Cause and Effects Matrix: prioritizes key inputs for action
- Measurement Systems Analysis: evaluates accuracy and precision of measurement system

The Tools (continued)

- Failure mode and effects analysis: identifies high risk inputs and improvement actions
- Multi-vari studies: provide quantitative clues for identifying inputs to leverage
- Control plans: document all actions necessary to maintain performance



✓ = Complete

Cleveland Clinic Project Charter

Project Y

Y: Increase the % of patients receiving their ATB within 1 hour of incision time to a level comparable to Cardiothoracic Surgery (>90%).

Project Scope

Patient Population: All same day surgery patients (SDS) at Cleveland Clinic

Defects: Or, what's in it for Us?

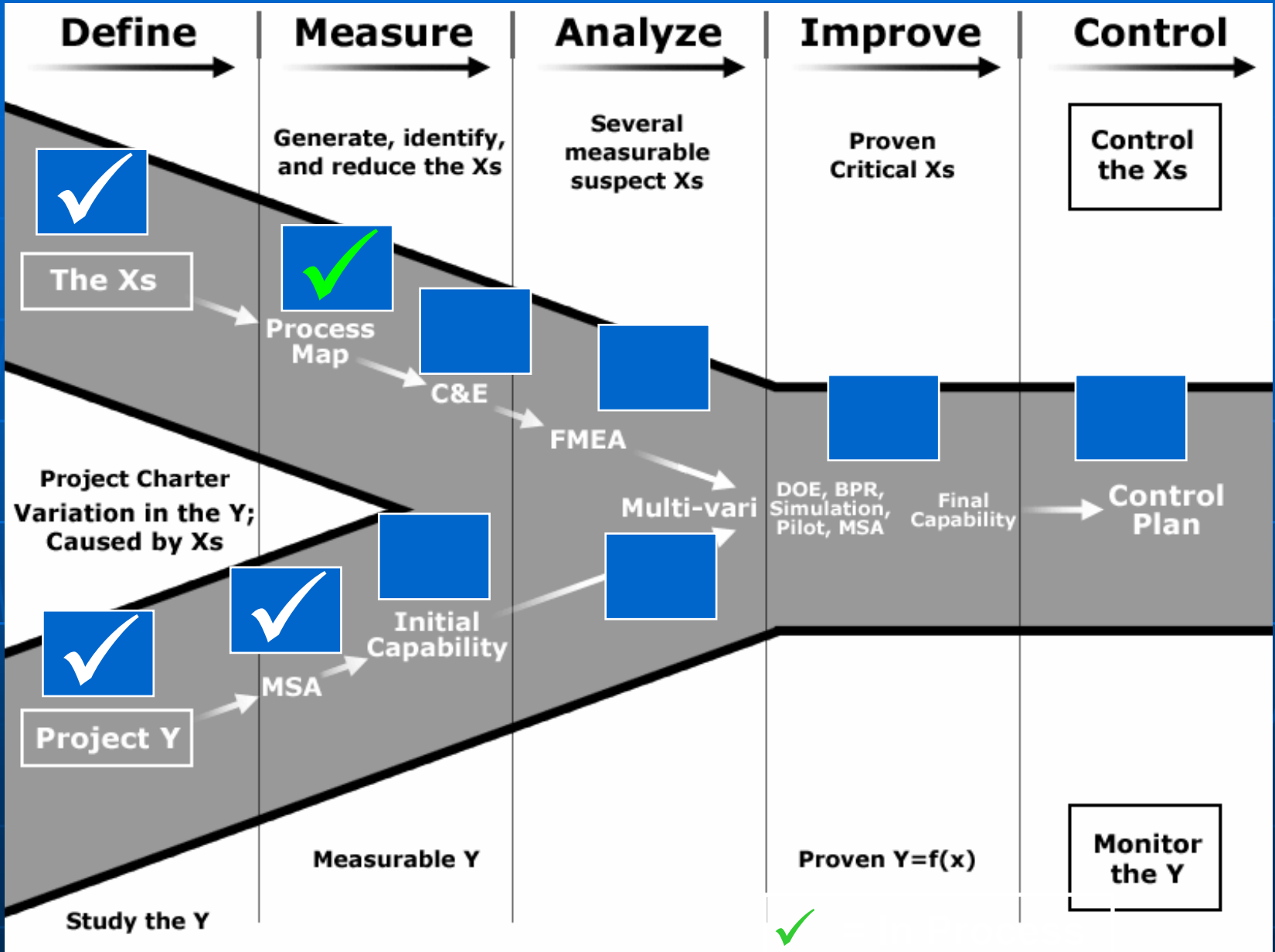
- Not all patients receive their ATB within 1 hour
- Improved quality of patient care
- Reduce the potential risk of surgical site infection
- Compliance with public reporting guidelines

Process

The process by which patients receive their ATB prior to surgery

Metrics

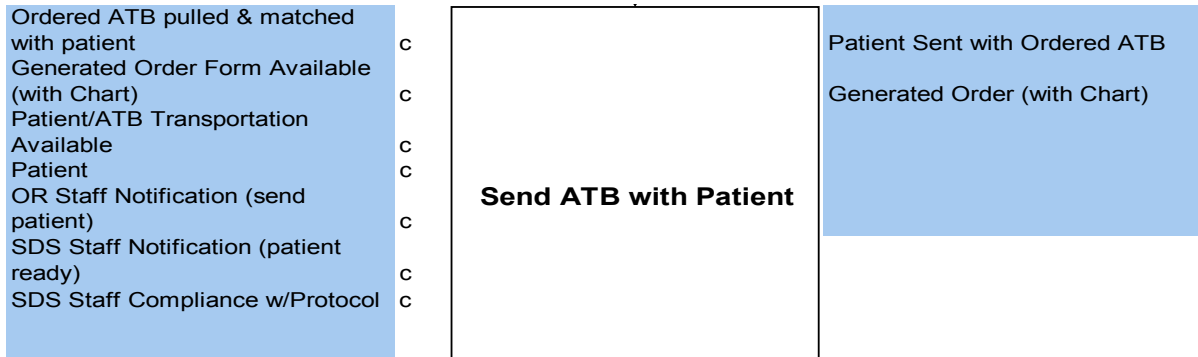
Primary: % of patients receiving their ATB within 1 hour of incision



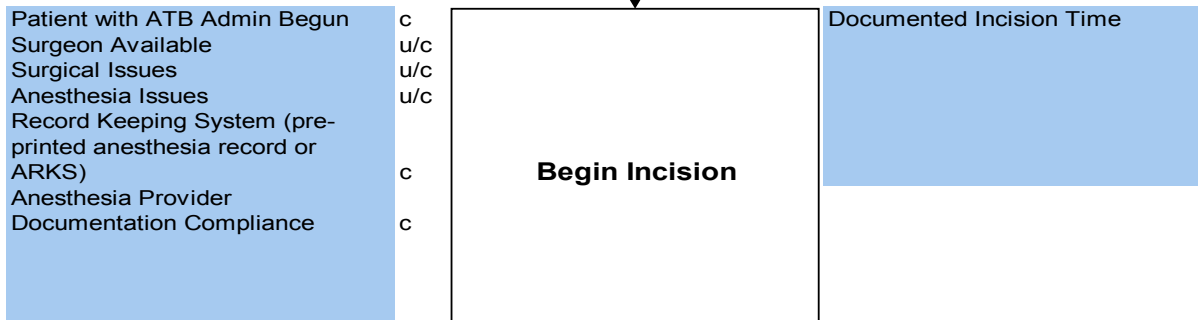
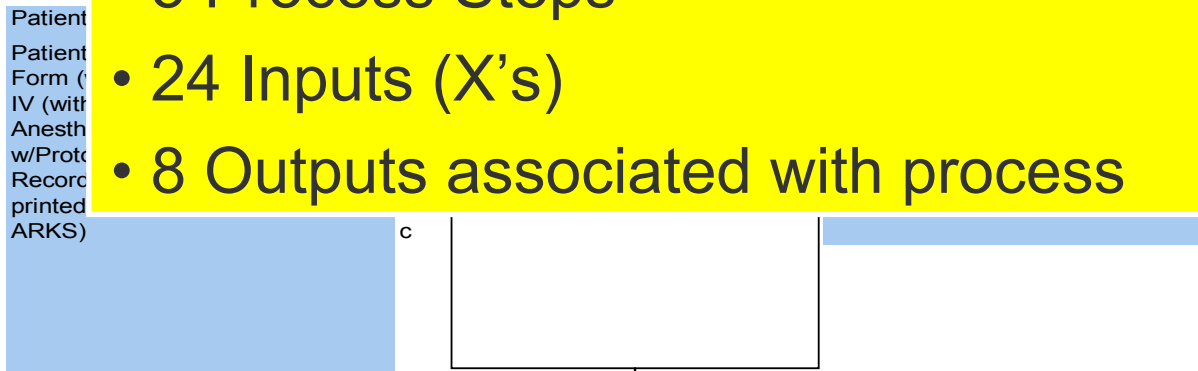
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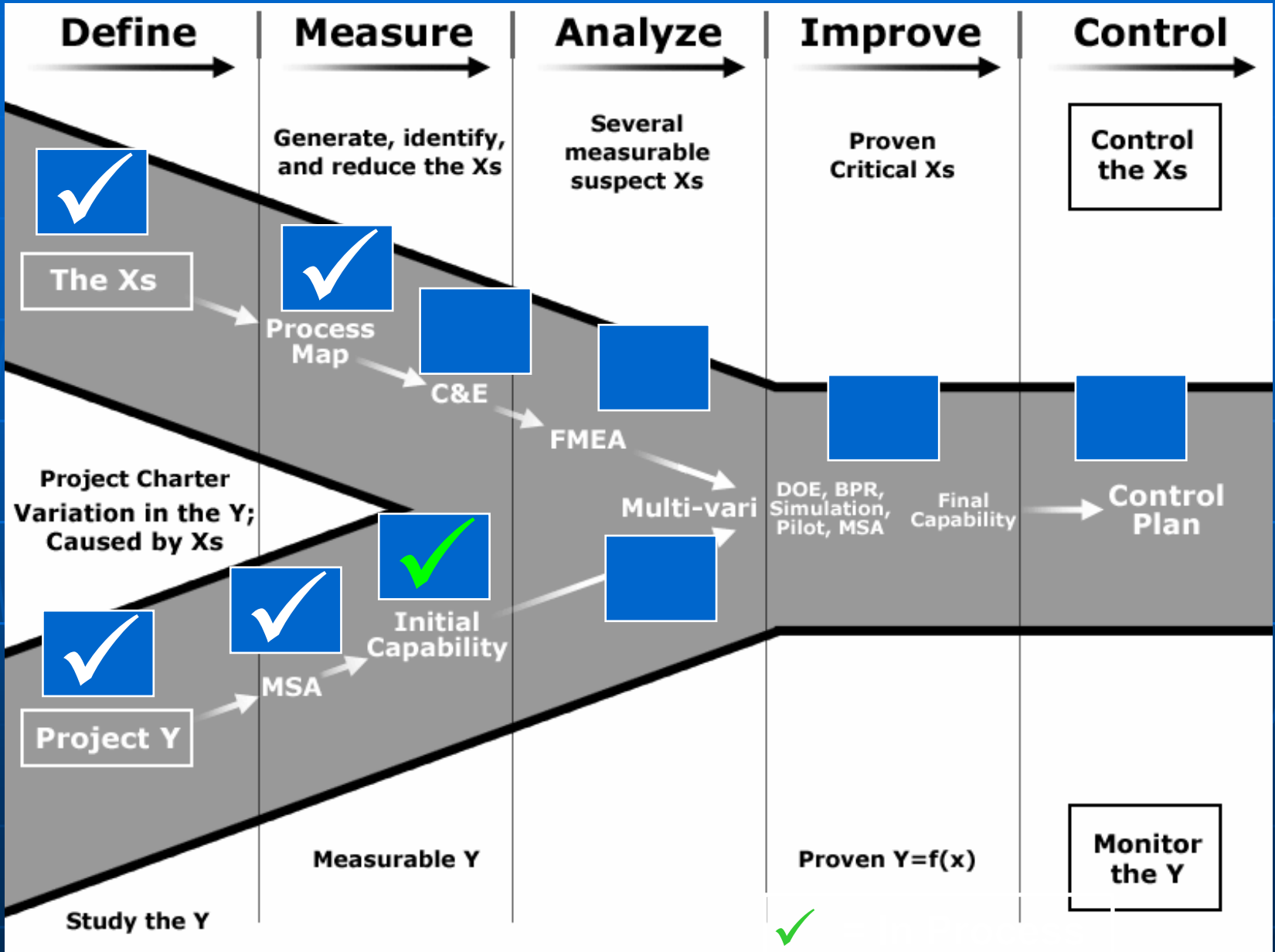
Cleveland Clinic

Process Map: Antibiotic Prophylaxis for Surgery



- 5 Process Steps
- 24 Inputs (X's)
- 8 Outputs associated with process

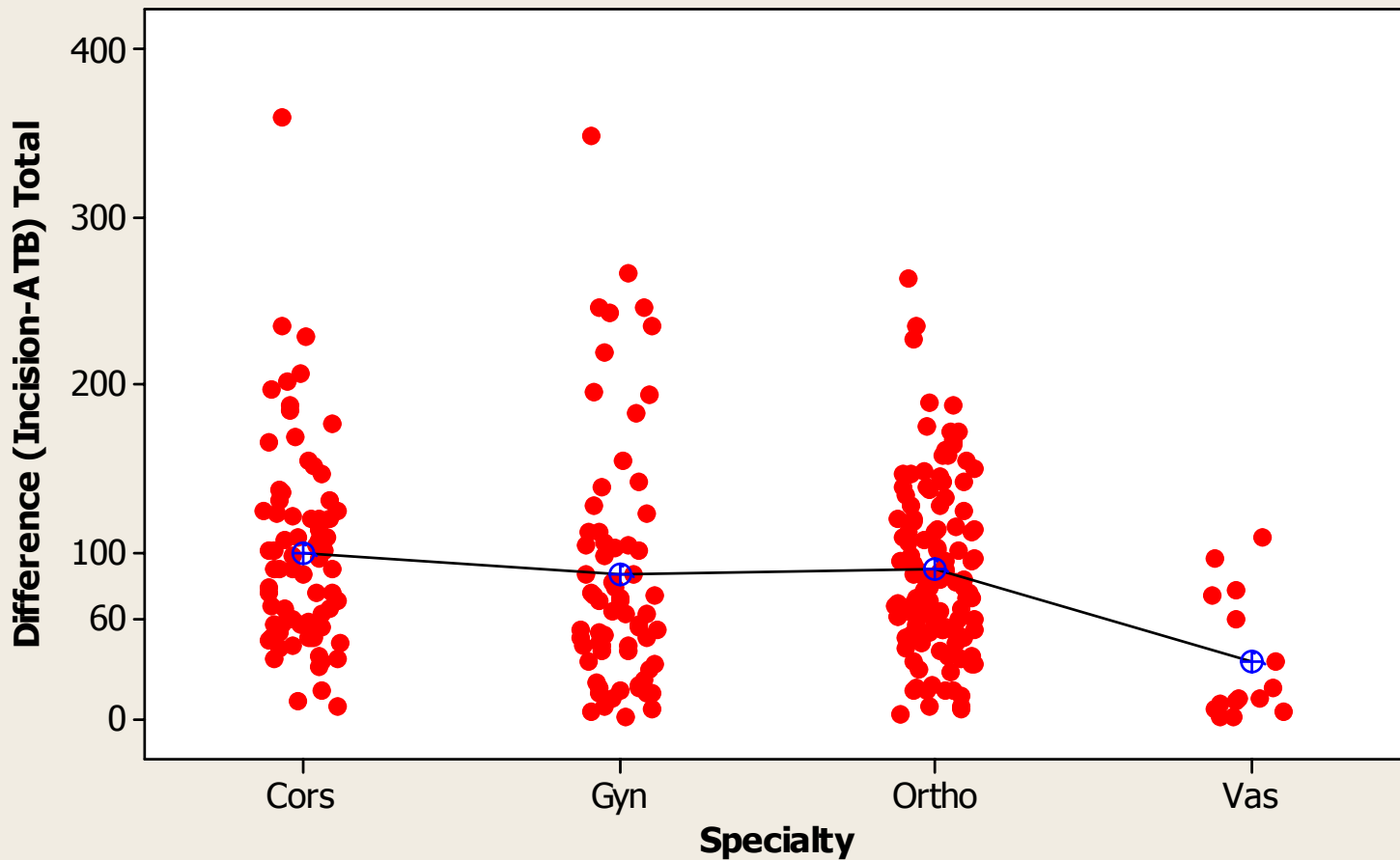


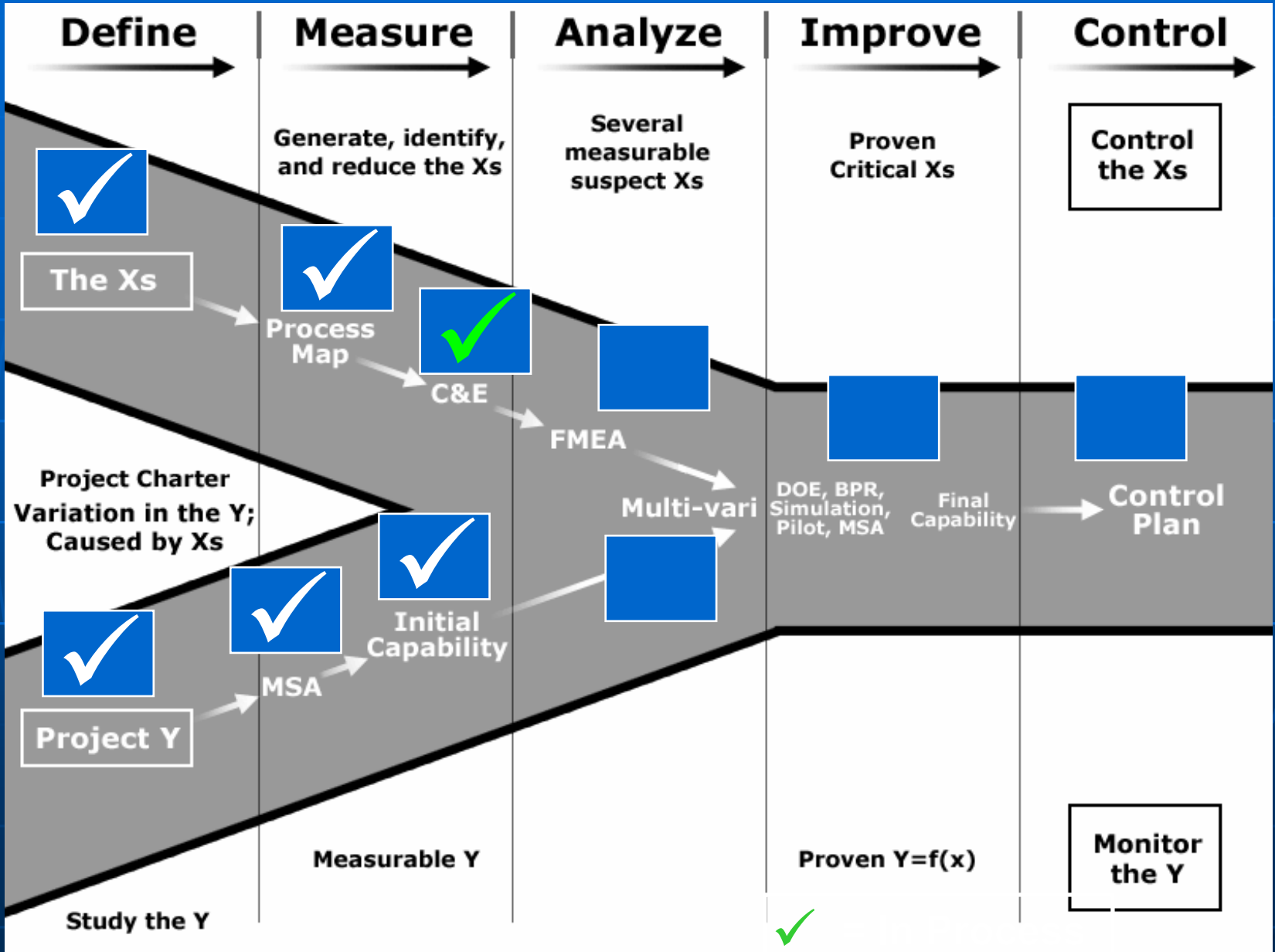


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Non Cardiac Surgery (Same Day Surgery) and Timing of Antibiotic Prophylaxis by Specialty, March 2005

Individual Value Plot of Difference (Incision-ATB) Total vs Specialty





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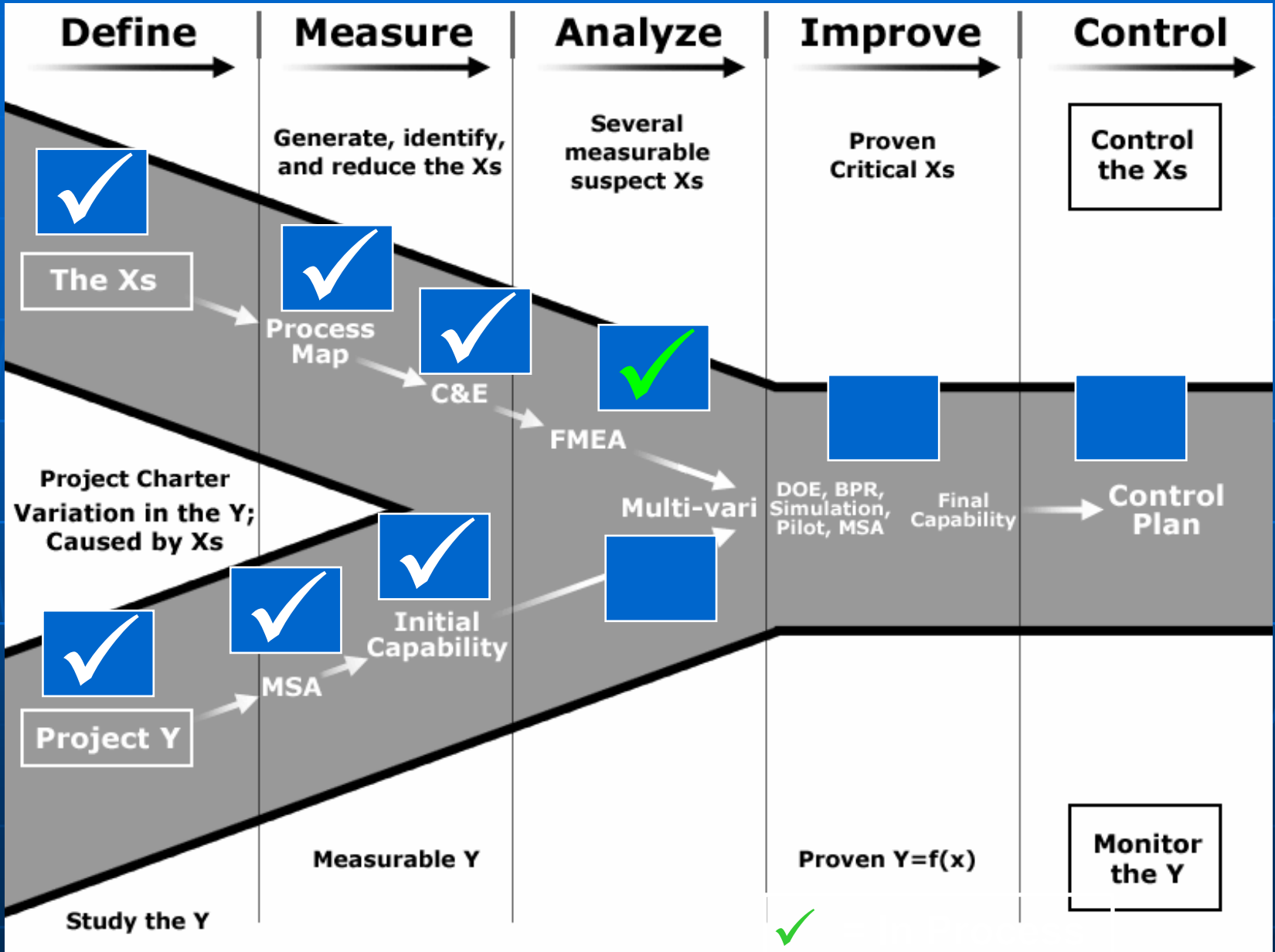
Cause & Effects Matrix

Key Requirements	Change in X has what kind of effect on Y? or What effect does Input X have on Output? 9 = Direct & Strong Effect/Relationship	receiving their in 1 hour of time	satisfaction with experience	the satisfaction process				

11 Key X's:

- X1-X4: Staff Compliance w/Protocol (Pre-Op Care Team, SDS, Anesthesia)
- X5-X6: ATB Order Form (Available & Correct)
- X7: Available ATB
- X8: ATB (Pulled & Matched with Patient)
- X9-X10: Patient (Sent with ATB & Order Form)
- X11: IV (with secondary set)

14	Pull ATB in SDS	SDS Staff Time to get ATB	3	0	9	0	0	57
1	Generate Pre-Op Paper Work (includes ATB order)	Order Form (with Chart)	3	0	3	0	0	39
42	Begin Incision	Surgeon Available	3	0	1	0	0	33
23	Send ATB with Patient	Patient/ATB Transportation Available	1	0	0	0	0	10
35	Administer ATB in OR	Record Keeping System (pre-printed anesthesia record or ARKS)	0	0	1	0	0	3
45	Begin Incision	Record Keeping System (pre-printed anesthesia record or ARKS)	0	0	1	0	0	3



✓ = Complete

Cleveland Clinic

Failure Mode and Effects Analysis (FMEA)

8 Key X's:

- X1-X6: Staff Compliance w/Protocol (Pre-Op Care Team, SDS, Anesthesia) including ATB pulled, matched with patient, and sent to OR with Order Form
- X5-X6: ATB Order Form (Available & Correct)
- X7: Available ATB
- X8: IV (with secondary set)

Process	Failure Mode	Effect	Severity	Occurrence	Detection	Control	Residual Risk		
5	Send ATB Patient						7		
7	Send ATB Patient						10		
8	Administer in OR						10		
11	Administer in OR						10		
2	Pull ATB						10		
4	Pull ATB						10		
1	Generate Pre-Op Paper Work (includes ATB order)	Pre-Op Care Team (Physician or NP, PA, Resident) Compliance w/Protocol	Not compliant with protocol (don't generate order)	No order generated, ATB not pulled and given, or delay	10	Lack of knowledge of protocol (including don't know form exists)	8	Orientation, QRO's communication to department and staff, final paperwork check by someone within the department.	8
2	Pull ATB in SDS	Generated Order Form (Available & Correct) (with Chart)	Order form not correct ("To be given in OR" is crossed off)	ATB will be given in SDS, delay	8	Pre-Op Care Team lack of knowledge of protocol	8	Orientation, QRO's communication.	10

Cleveland Clinic Improvement Plan

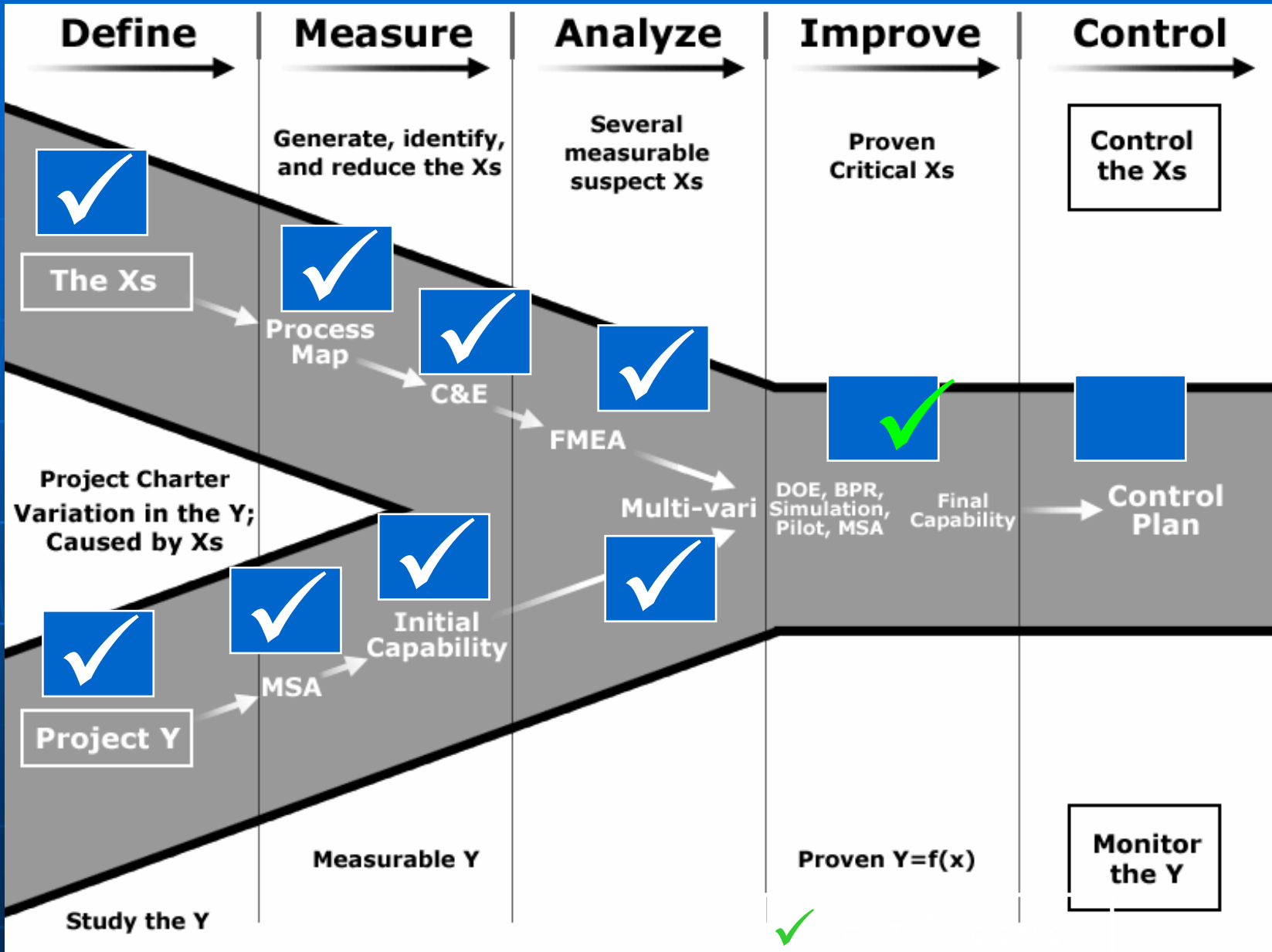
Require all antibiotics to be ordered on the correct form
Same day surgery staff flag records without antibiotic orders so surgeon can address prior to surgery

ATB will be pulled in same day surgery, sent with IV tubing, and administered in the operating room

Same day surgery to train staff

Anesthesia to be accountable for administration of antibiotic prophylaxis

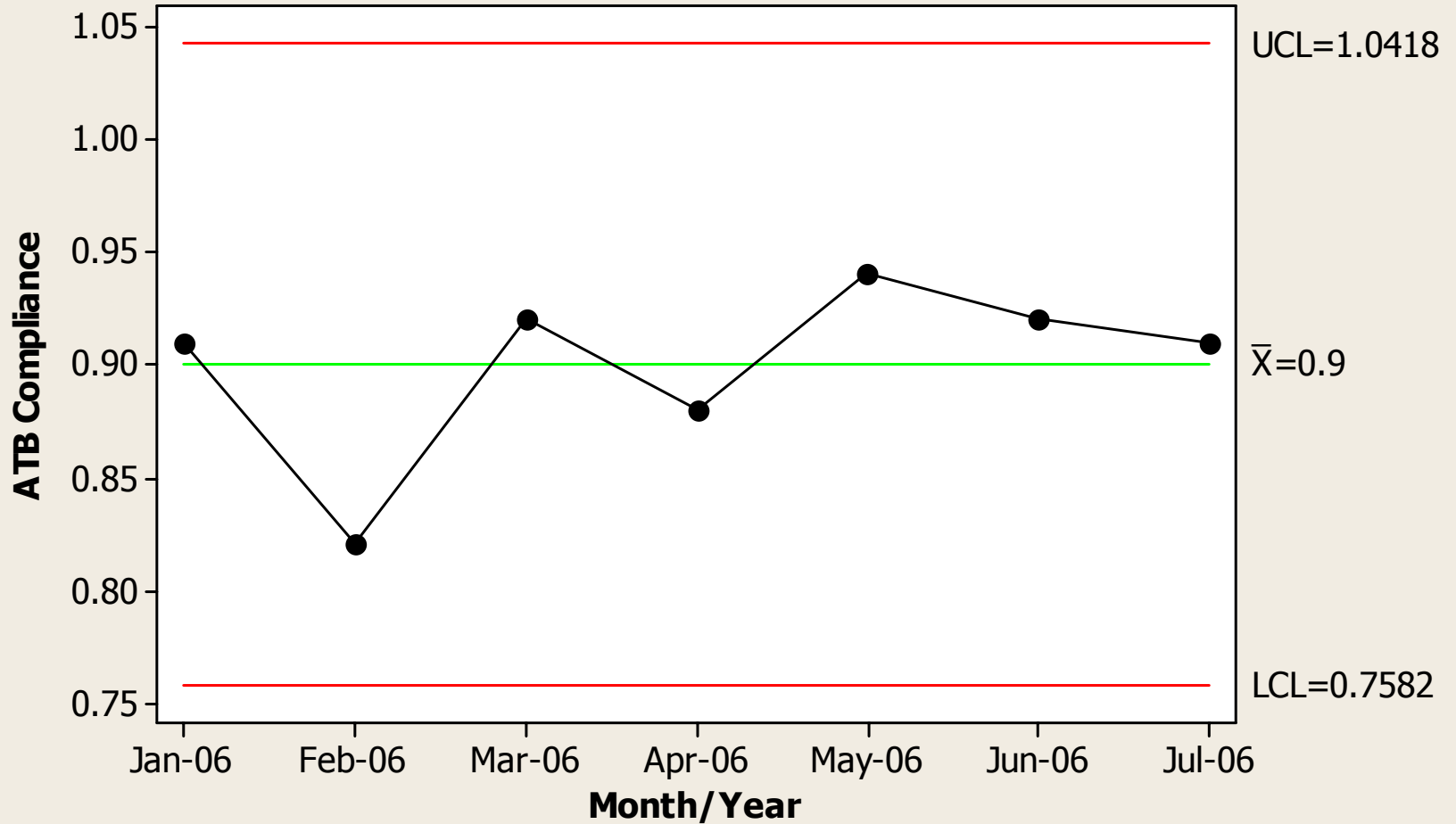
Individual Meetings with all stakeholders including all Surgical Departments (Chair, QRO, Administrator)



✓ = Complete

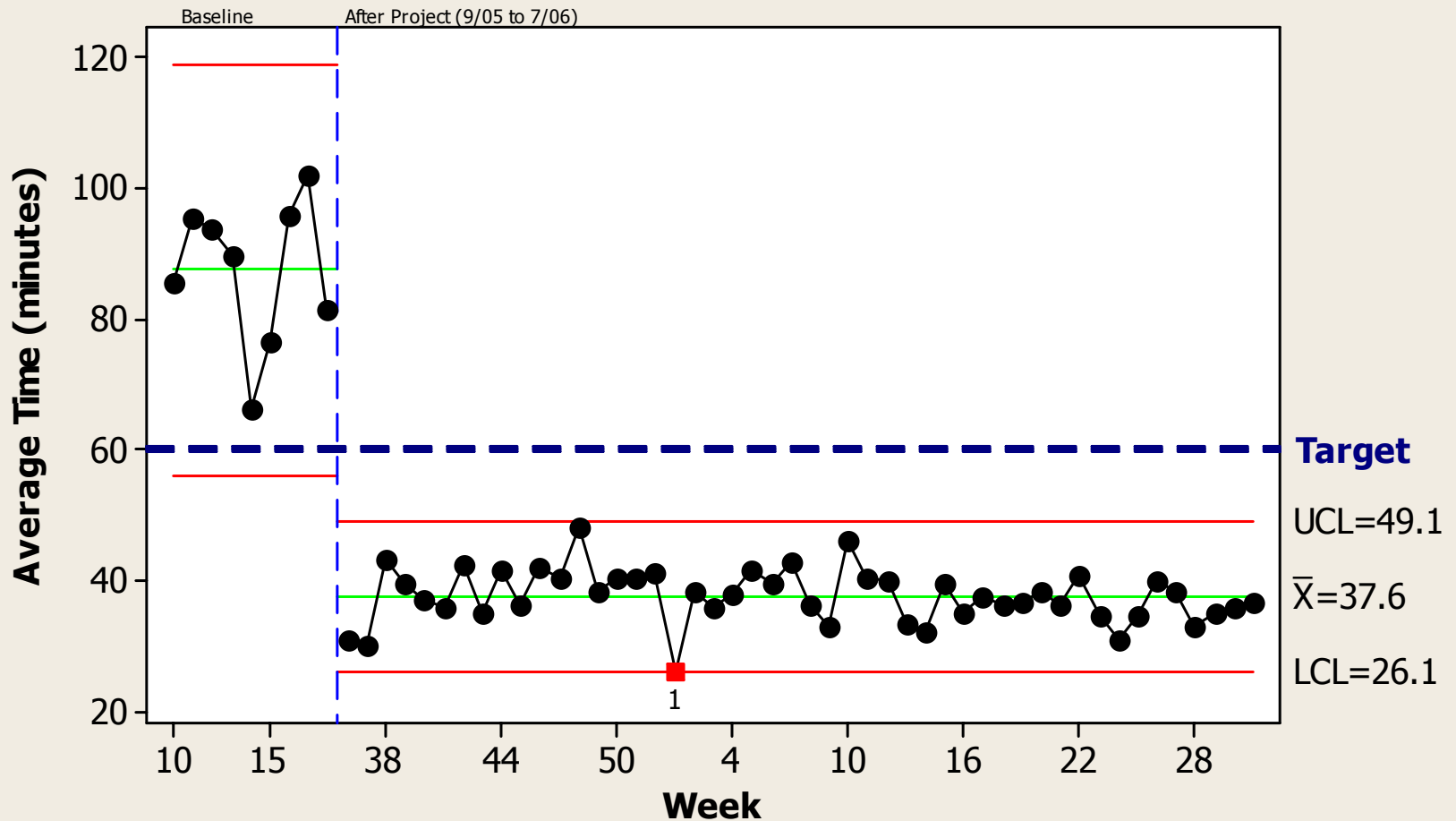
Preop Antibiotic Timing Compliance - All Cases

Individuals Chart of ATB Compliance by Month GYNE



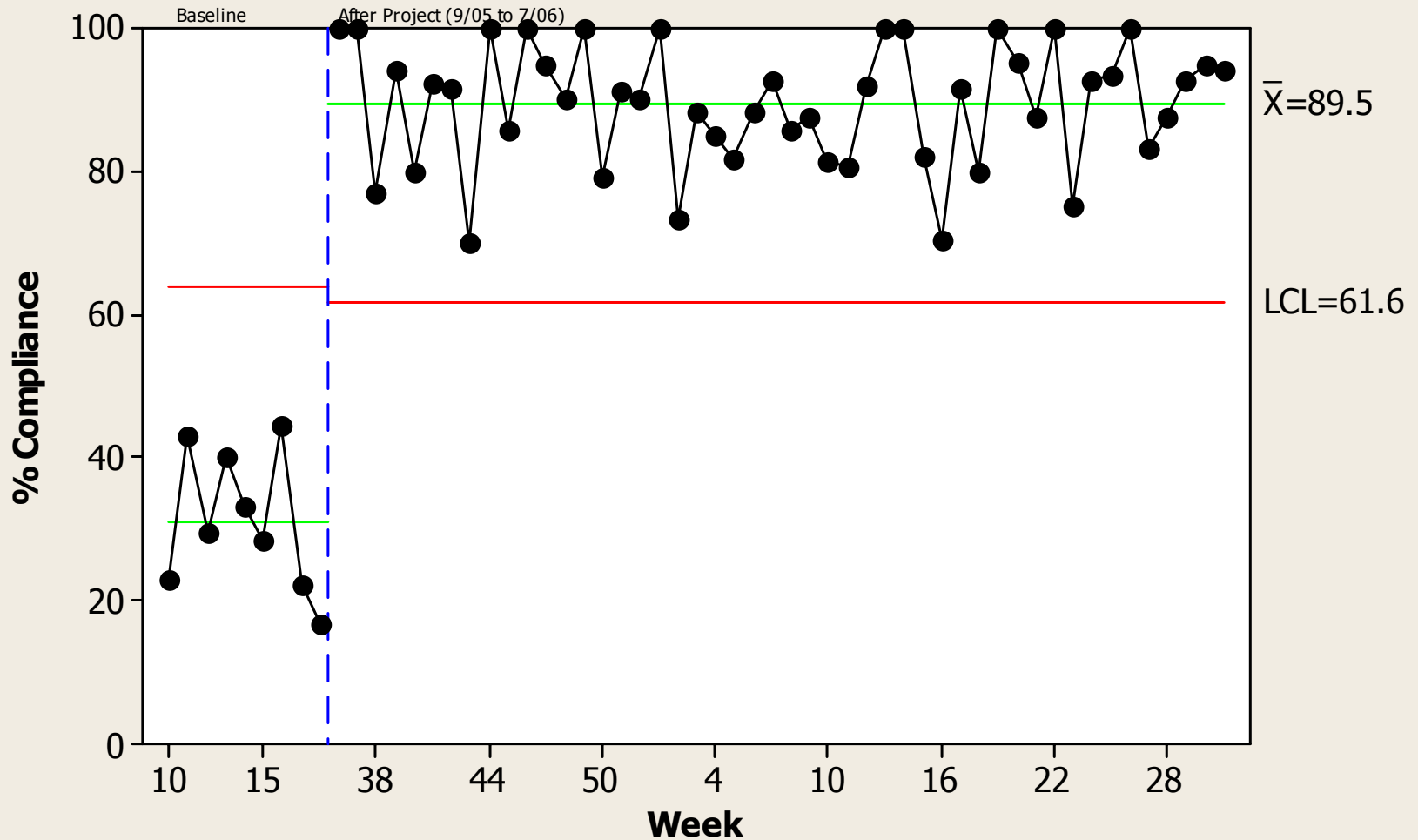
Preop Antibiotic Timing Compliance - Select CMS-defined Cases

All Specialties - Average Antibiotic Administration Time by Week (excluding vancomycin)



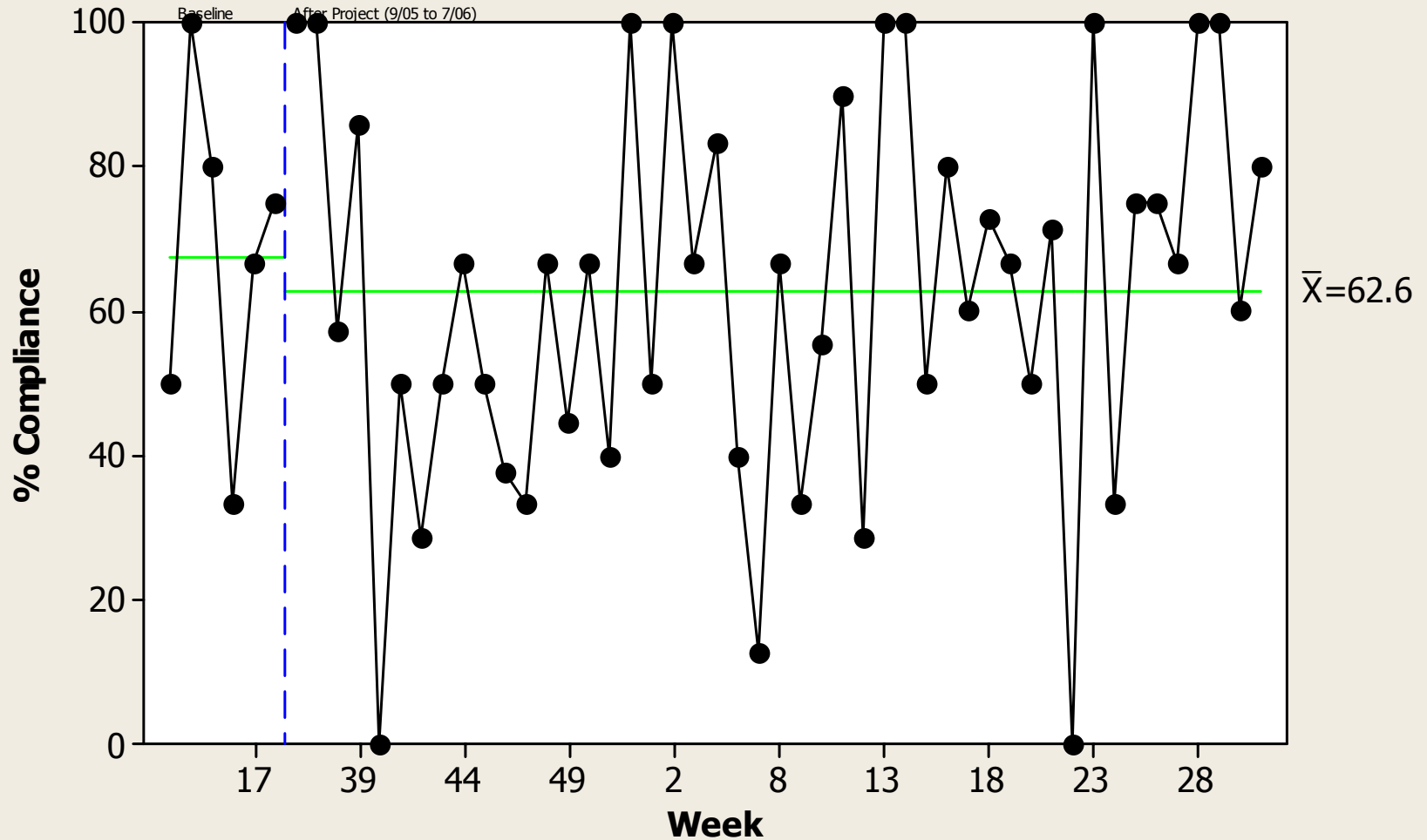
Preop Antibiotic Timing Compliance - Select CMS-defined Cases

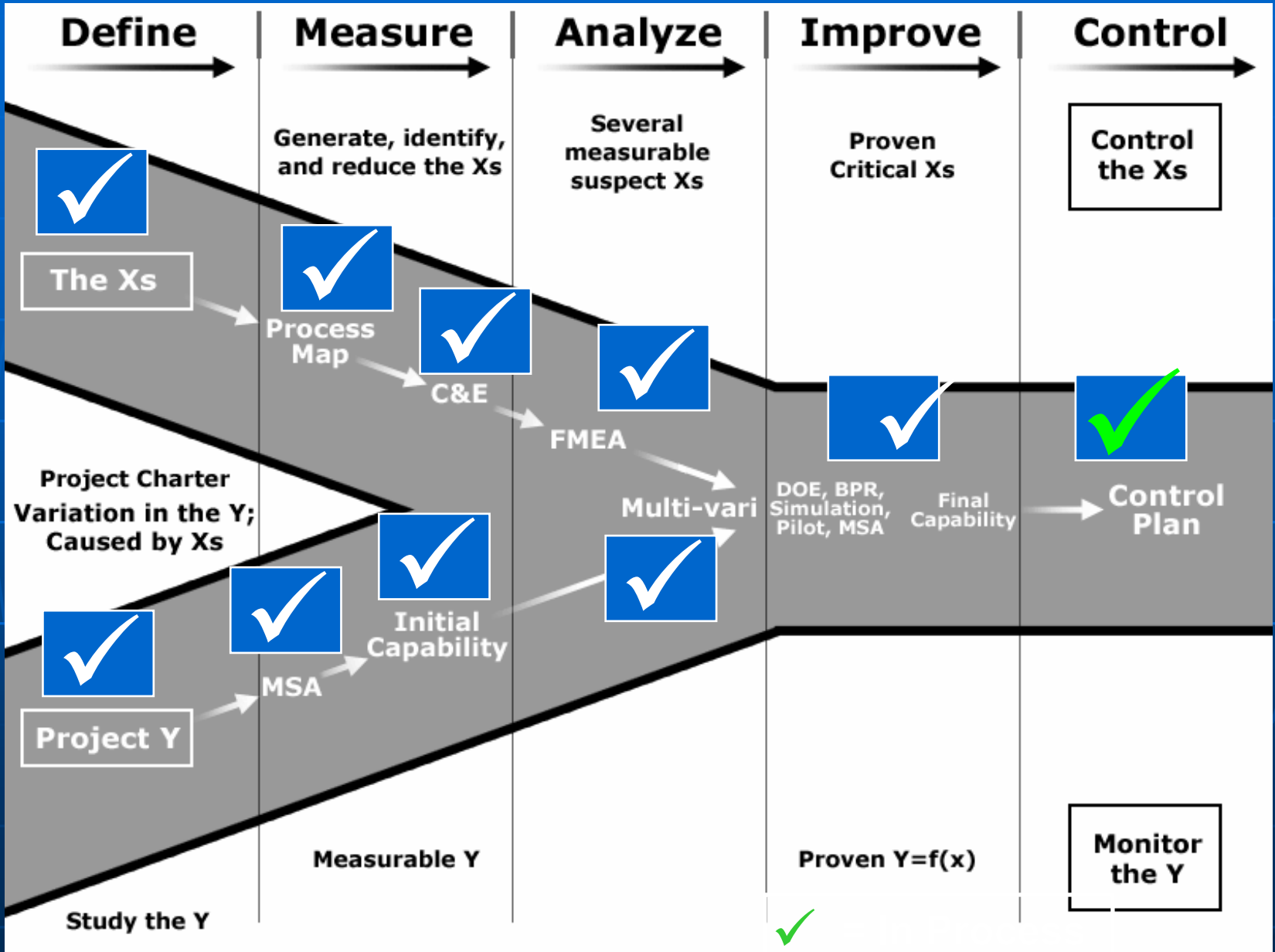
Colorectal Surgery - % Receiving Antibiotic In Time by Week



Preop Antibiotic Timing Compliance - Select CMS-defined Cases

Vascular Surgery - % Receiving Antibiotic In Time by Week

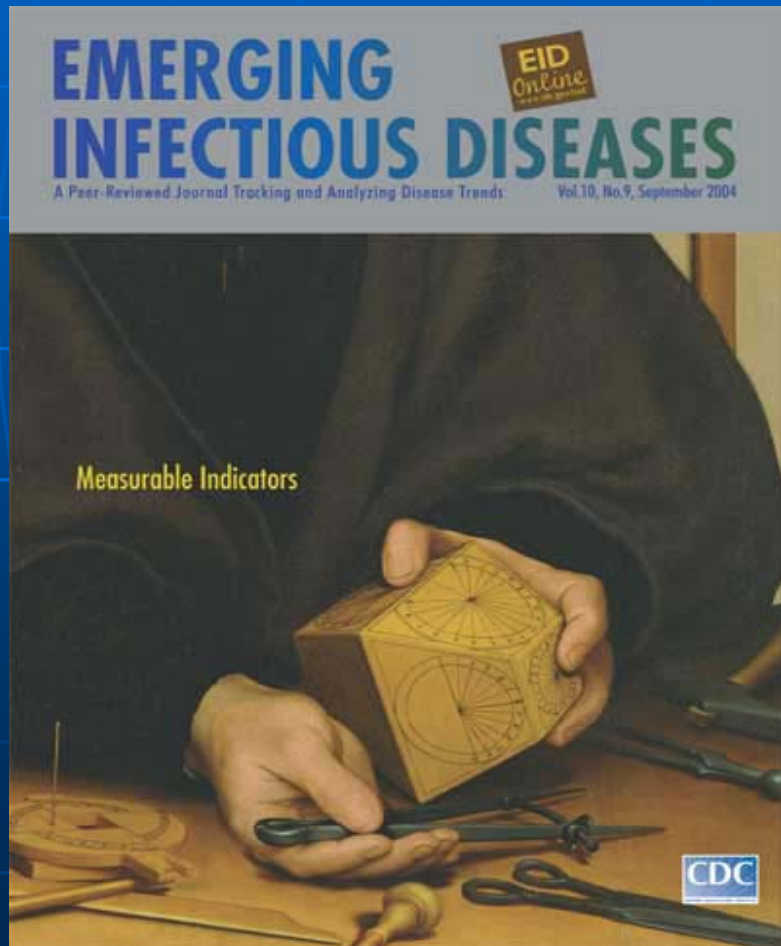




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“If you can’t measure it, you can’t manage it”

Edward Deming



- Standardized, Equivalent and Uniformly Collected Measurements

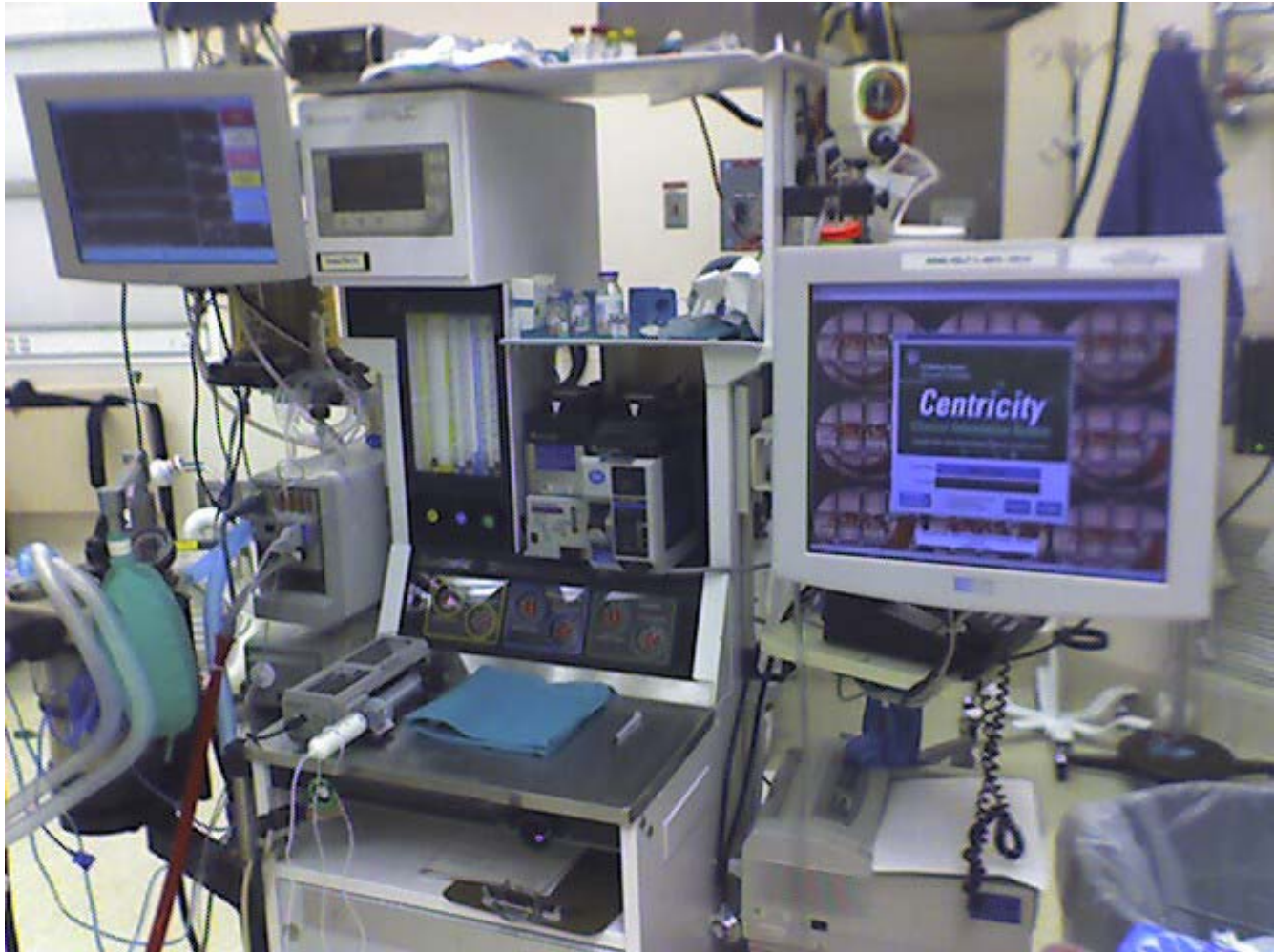
Anesthesia Record Keeping System (ARKS)



A computer system for automated anesthesia record keeping

ARKS

in the operating rooms



Current State

Bolus Meds
Respiration



14:05 14:10 14:15 14:20 14:25 14:30 14:35 14:40 14:45 14:50 14:55 15:00 15:05

Flow: L/min

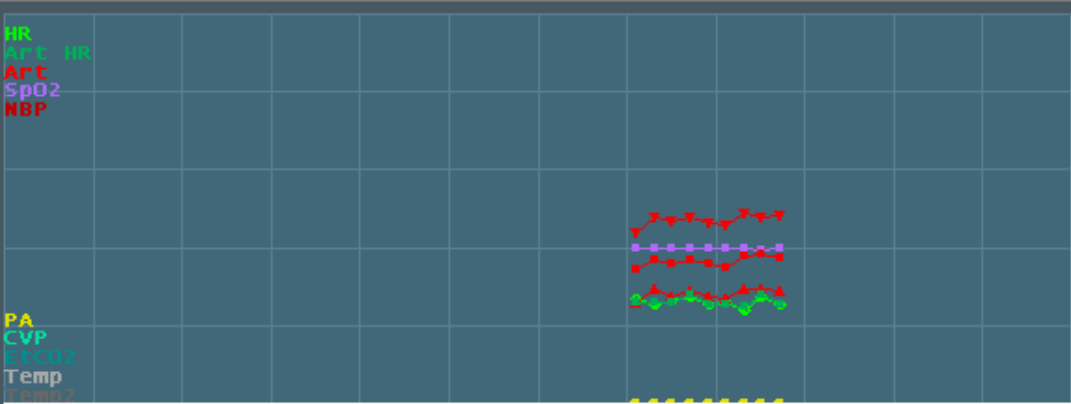
SpO2: %

Events/Comments Start case

Blood Gas

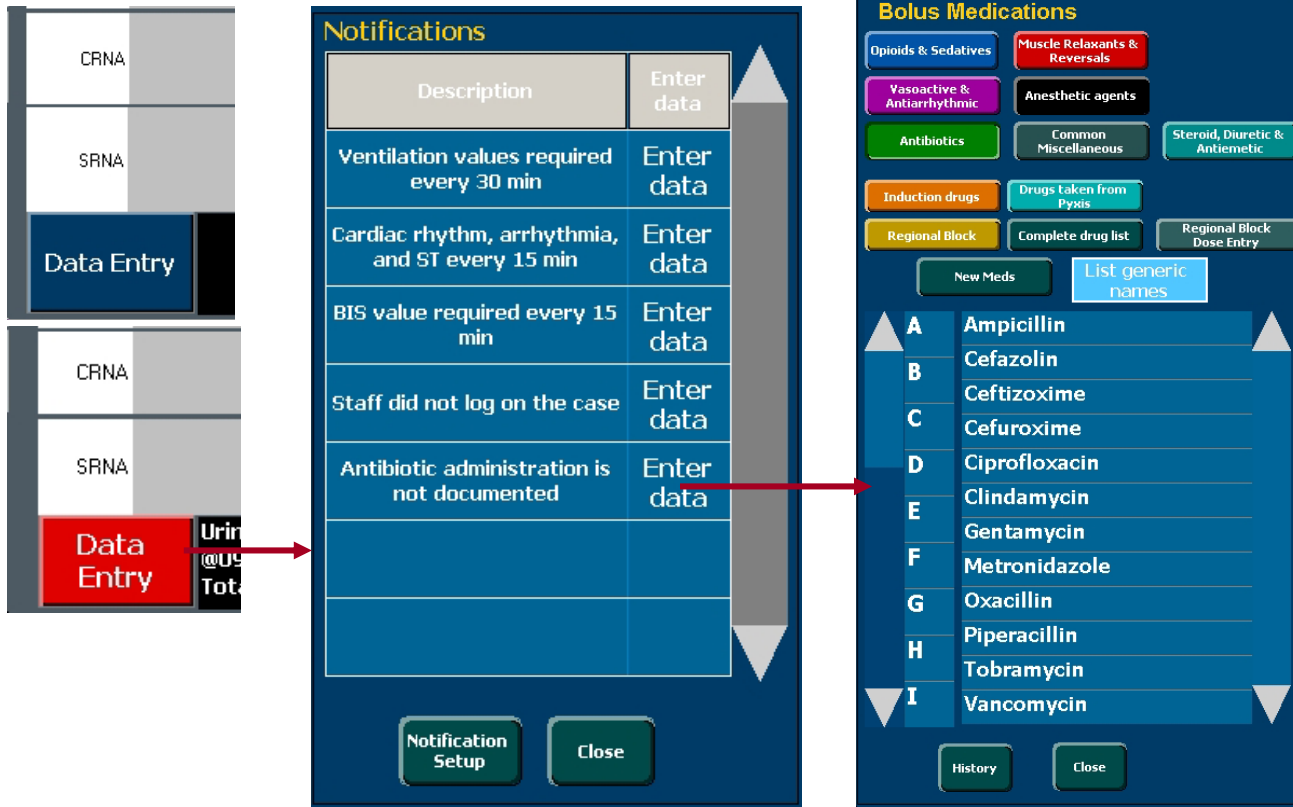
Hemo Values

Table with columns for Hemo Values and rows for various parameters like Tvi, Inle, O2, etc.



- Phase
- Start Case
- Induction
- Incision
- Start CPB
- Finish CPB
- Emergence
- Finish Case - OR
- Case End - ICU

Task	Brief description
Starting time	Start case @14:40
Equipment check	Takla, George
Patient Info	Height (in)= 66.930 Weight (kg)= 66.000
Monitoring	
Add Lines	
Add Fluids	
Record ST baseline	



Rules implemented in ARKS for reminding antibiotics administration

- 1) After Anesthesia Start Case, if an antibiotics has not been documented
- 2) If 1 hour has elapsed from the last antibiotics and if no Incision event has been documented within that 1 hour.

Conclusions

The process of antibiotic administration before surgery isn't as simple as it might appear

Six Sigma DMAIC process was successful in improving the process of timing of antibiotic prophylaxis

Were able to identify additional failure modes/causes that were not initially considered

Human element drives complexity

Communication/dissemination of information in complex organization is challenging

Process may work well in one area, but not all

Next Steps

Centricity provides key to providing “real time” measurements of process of antibiotic prophylaxis

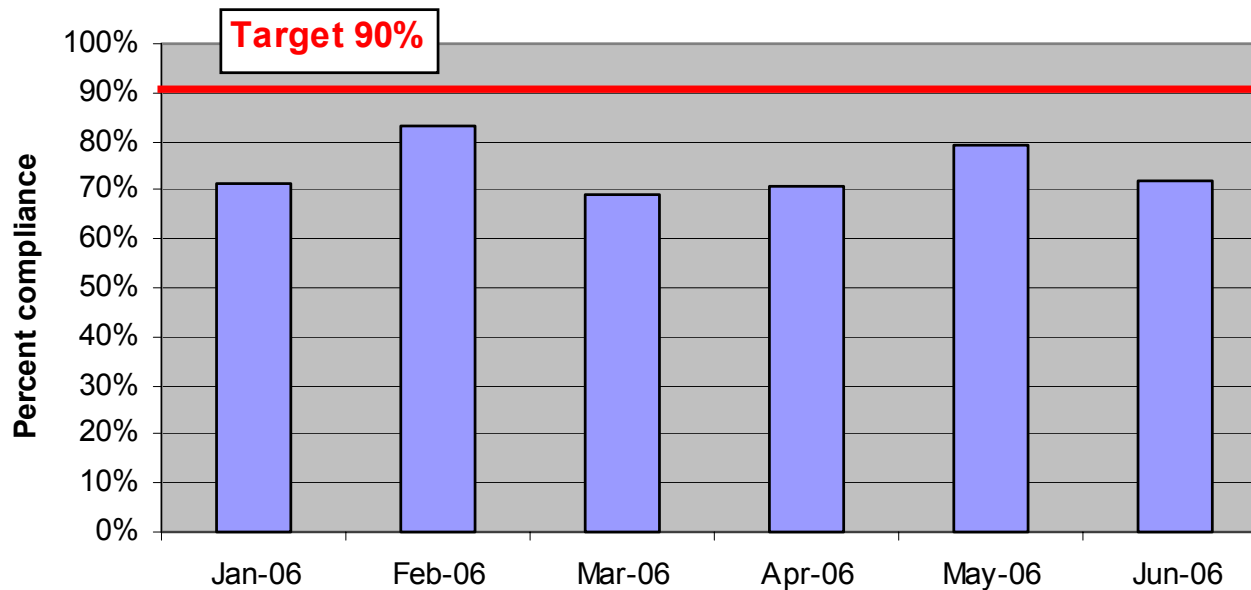
- Surgeon and anesthesiologist specific rates for antibiotic prophylaxis
- Target > 90% adherence

Centricity provides opportunity to provide measurements for Surgical Care Improvement Process

- Cardiovascular, venous thromboembolism, and respiratory complication prevention

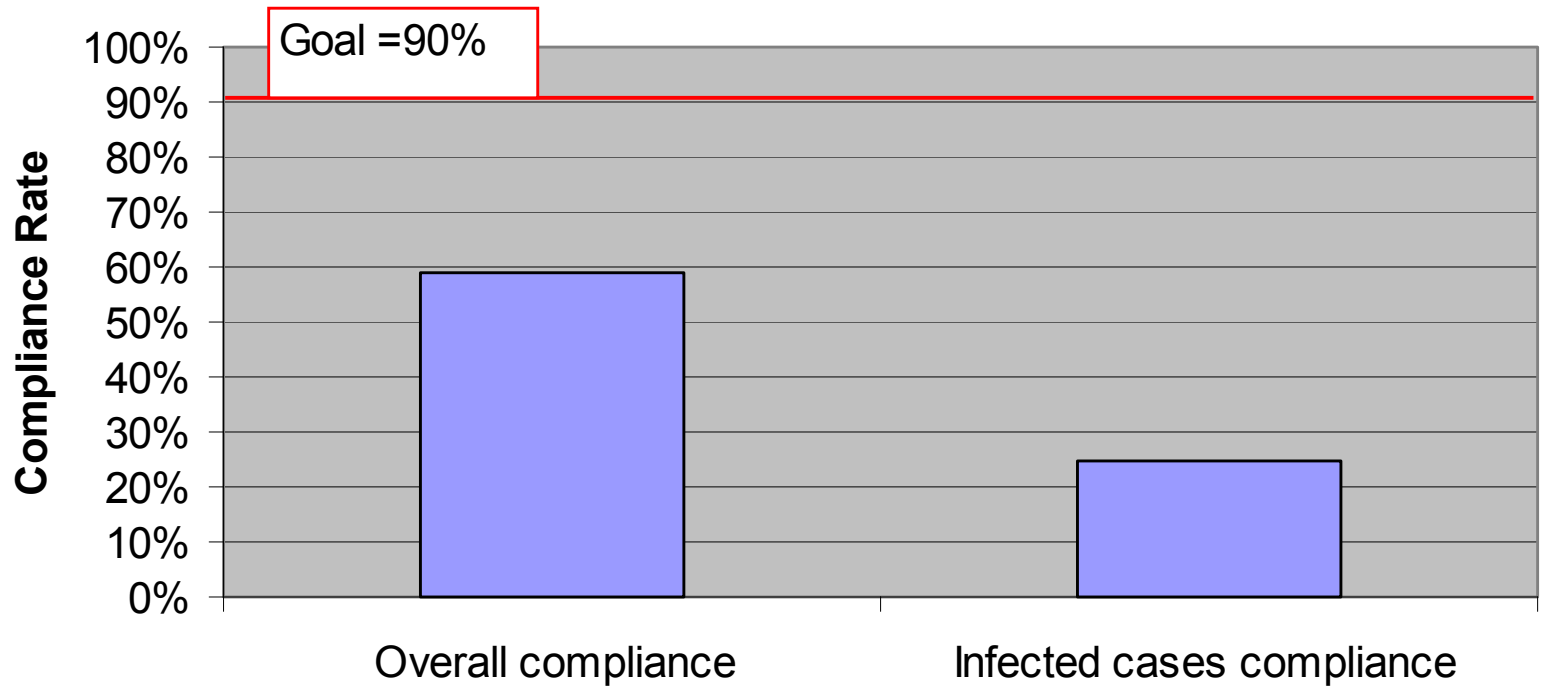
Opportunity to provide institutional mechanism for pay for performance measurements

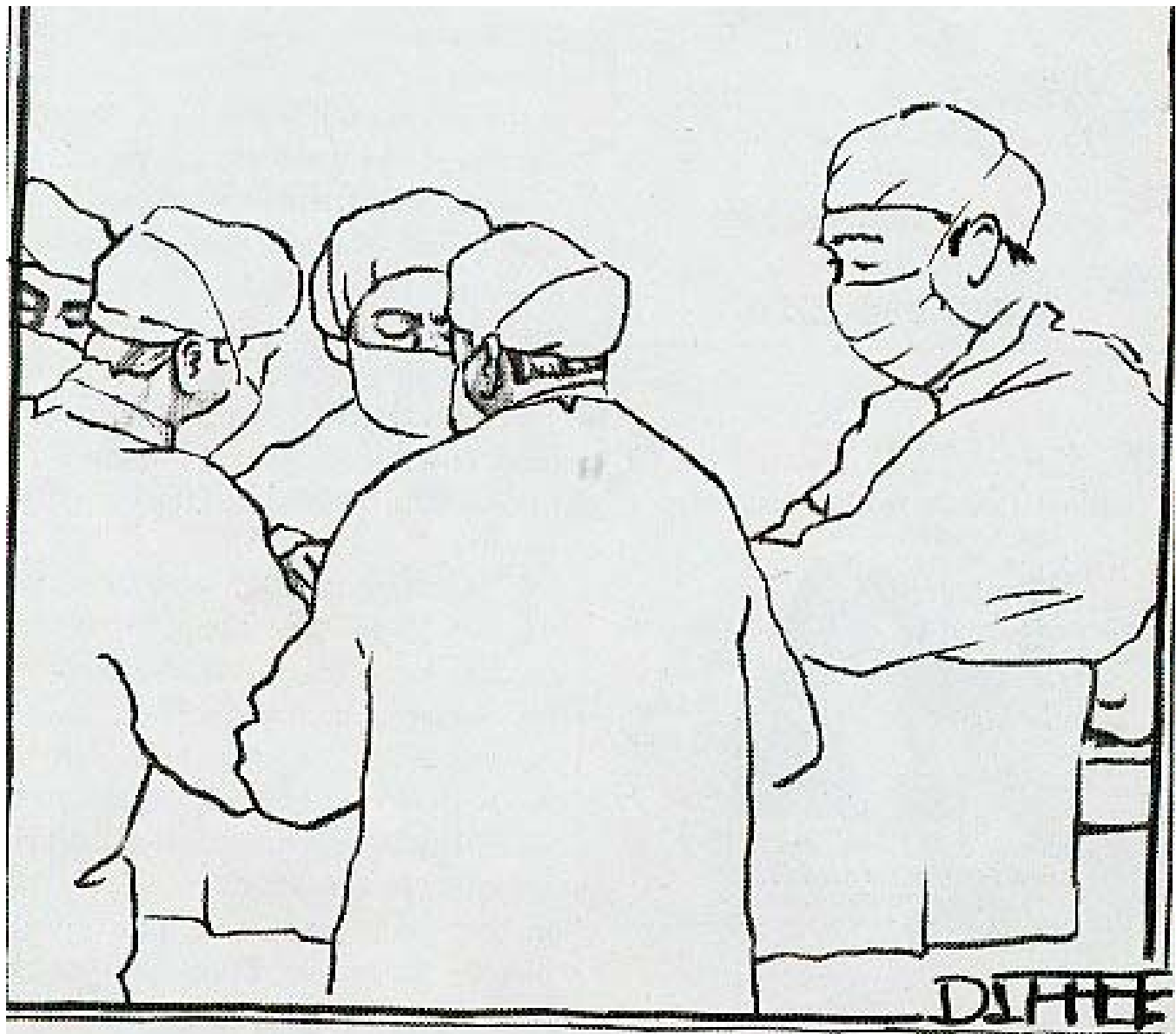
**Brain Tumor Institute
Preoperative Antibiotic Timing Compliance*
All cases
2006**



*Preop antibiotics documented and given **Month**
within 60 minutes before incision

Endovascular Neurosurgery Preoperative Antibiotic Timing Compliance Rates 2Q 2006





"Try jiggling the liver."

Extra Slides

ARKS

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Password:

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Change Password

Use of this application is limited to authorized users only. Unauthorized use is illegal.

Cancel

Login

Evolution of the Surgical Infection Prevention Project

SCIP Surgical Care Improvement Project *A National Quality Partnership*

Making Surgery Safer



Preliminary Project Overview *as of September 14, 2004*

**Project overview available at:
www.medqic.org/scip**

Surgical Care Improvement Project (SCIP)

- Preventable Complication Modules
 - Surgical infection prevention
 - Cardiovascular complication prevention
 - Venous thromboembolism prevention
 - Respiratory complication prevention

Automatic information flow for ARKS

