patient's risk of this all-too-common postoperative complication.

Preventing surgical site infections
Surgical Care Improvement Project: A Valuable Initiative in Surgery

R. Taylor Ripley
January 23, 2012
Learning by presenting errors at a morbidity and mortality conference is a part of which of the following ACGME core competencies:

- A: Patient Care
- B: Medical Knowledge
- C: Practice-based learning and improvement
- D: System-based practice
The number of medical errors which kill patients in the United States is the equivalent of one jumbo jet crashing every:

- A: Day
- B: Week
- C: Month
- D: 3 months
Every Day!
Is This Photo Dramatic?

Not Compared to What the Lay Press Reports
13 Things Car Dealers Won’t Tell You

Reader’s Digest

The World’s Best-Read Magazine

EXCLUSIVE

Doctors Confess Their Fatal Mistakes

PAGE 86

Foods That Fight Back Pain PAGE 65

Sigourney Weaver Her Guilty Pleasure PAGE 98

October 2010 $3.99

People Weekly

JUNE 5, 2000

EXCLUSIVE!

Dana Carvey’s Medical Nightmare

At 42, the SNL star dropped from sight. For the first time, he talks about his two-year ordeal and the botched heart surgery that could have killed him
Medical Errors

• Do we have a perception problem:

    Absolutely.

• Do we have too many errors:

    Absolutely

• How can we decrease these errors in Surgery?

    Reduction in Surgical Infections!
Which of the following is the most effective dosing of antibiotics in a patient undergoing elective colon surgery:

- A: Single dose within 30 min prior to incision
- B: A single dose given at the time of skin incision.
- C: A single pre-operative dose + 24 hrs of postoperative antibiotics
- D: A single preoperative dose + 48 hrs of postoperative antibiotics
Surgical Care Improvement Project (SCIP)
SCIP: Outline

• Introduction

• Data
  – Compliance data
  – Patient outcome data
    • Morbidity and surgical site infections.

• Future directions
  – Implementation of the methods to add additional clinical relevant details.
  – Risk stratification.
SCIP: Introduction

• Institute of Medicine Quality of Healthcare:
  – *To Err is Human*, 2000.
    • Focused on patient safety.
    • Focused on improvement of delivery systems.
Don’t Let The Health Service Kill You

Jimmy Smyth
SCIP: Introduction

- Centers for Medicare and Medicaid Services:
  - Goal: To standardize treatment protocols with intent of improving patient outcomes.
  - 2002: Steering committee formed of medical society and governmental regulatory members.
  - 2003: Surgical Care Improvement Project (SCIP) formed.
SCIP: Introduction

- Process measures developed for three most common surgical complications:
  - Surgical site infections
  - Venous thromboembolism
  - Cardiac events
SCIP: Introduction

• Venous thromboembolism and cardiac events haven’t been developed or reported fully.

• Surgical site infections:
  – Received bulk of efforts and reporting
  – 6 process measures, but 4 reported publicly.
SCIP: Introduction

- Reported SCIP measures:
  - SCIP-1: Antibiotics within 1 hr of incision.
  - SCIP-2: Appropriate antibiotic prophylaxis.
  - SCIP-3: Discontinuation of antibiotics within 24 hrs of an operation.
  - SCIP-6: Appropriate hair removal.
SCIP: Introduction

- **Non-reported SCIP measures:**
  - SCIP-4: Compliance with 6 am blood glucose control in cardiac surgical patients.
  - SCIP-5: Rate of post-operative infection diagnosed during index hospitalization.
Surgical Care Improvement Project

Is SCIP Valuable?

YES!
How is SCIP Valuable?

Process: Mandatory Compliance with measures.

Patient Outcome: Reduction in Surgical Site Infections.
Hospitals collaborate to decrease surgical site infections

E. Patchen Dellinger, M.D.\textsuperscript{a,*}, Susan M. Hausmann, M.S.\textsuperscript{b}, Dale W. Bratzler, D.O., M.P.H.\textsuperscript{c}, Rosa M. Johnson, A.R.N.P., M.N.\textsuperscript{b}, Donna M. Daniel, Ph.D.\textsuperscript{b}, Kathryn M. Bunt, M.P.H.\textsuperscript{b}, Greg A. Baumgardner, M.S.\textsuperscript{b}, Jonathan R. Sugarman, M.D., M.P.H.\textsuperscript{b}

<table>
<thead>
<tr>
<th>Process measure</th>
<th>Median performance, by quarter</th>
<th>$P^\ddagger$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st</td>
<td>2nd</td>
</tr>
<tr>
<td>Antibiotic timing within 1 h</td>
<td>72</td>
<td>82</td>
</tr>
<tr>
<td>Appropriate antibiotic selection</td>
<td>90</td>
<td>94</td>
</tr>
<tr>
<td>Discontinuation of antibiotic within 24 h</td>
<td>67</td>
<td>69</td>
</tr>
<tr>
<td>Normothermia</td>
<td>57</td>
<td>64</td>
</tr>
<tr>
<td>Avoid shaving surgical site</td>
<td>59</td>
<td>83</td>
</tr>
</tbody>
</table>

Association of Surgical Care Improvement Project Infection-Related Process Measure Compliance with Risk-Adjusted Outcomes: Implications for Quality Measurement

<table>
<thead>
<tr>
<th>Process measure</th>
<th>Mean ± SD, %</th>
<th>Median (IQR), %</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCIP-1: antibiotic administered 1 hour before incision</td>
<td>93.7 ± 5.4</td>
<td>95.0 (92.0–97.0)</td>
</tr>
<tr>
<td>SCIP-2: appropriate prophylactic antibiotic administered</td>
<td>97.4 ± 2.0</td>
<td>98.0 (97.0–99.0)</td>
</tr>
<tr>
<td>SCIP-3: antibiotic discontinued within 24 hours after surgery</td>
<td>91.8 ± 5.3</td>
<td>93.0 (89.0–96.0)</td>
</tr>
<tr>
<td>SCIP-6: appropriate hair removal</td>
<td>98.0 ± 3.4</td>
<td>99.0 (98.0–100)</td>
</tr>
</tbody>
</table>
Surgical Site Infection Prevention

Time to Move Beyond the Surgical Care Improvement Program

Mary T. Hawn, MD, MPH,*† Catherine C. Vick, MS,* Joshua Richman, MD, PhD,*† William Holman, MD,*† Rhiannon J. Deierhoi, MPH,* Laura A. Graham, MPH,* William G. Henderson, MPH, PhD,‡ and Kamal M.F. Itani, MD§
SCIP: Data

• Number of reporting institutions very high secondary to reimbursements linked to the reports.

• Driven by CMS.
SCIP: Data

- The methodology results in significant compliance which will enable collection and study of data.

- Does SCIP result in lower morbidity or surgical site infections?
## Association of Surgical Care Improvement Project Infection-Related Process Measure Compliance with Risk-Adjusted Outcomes: Implications for Quality Measurement

<table>
<thead>
<tr>
<th>Overall morbidity versus</th>
<th>SCIP-1: antibiotic administered 1 hour before incision</th>
<th>SCIP-2: appropriate prophylactic antibiotic administered</th>
<th>SCIP-3: antibiotic discontinued within 24 hours after surgery</th>
<th>SCIP-6: appropriate hair removal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-0.13</td>
<td>0.08</td>
<td>-0.02</td>
<td>-0.09</td>
</tr>
<tr>
<td>Serious morbidity versus</td>
<td>SCIP-1: antibiotic administered</td>
<td></td>
<td>SCIP-2: appropriate prophylactic antibiotic administered</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------------</td>
<td>---</td>
<td>---------------------------------</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>1 hour before incision</td>
<td>-0.09</td>
<td>0.20</td>
<td>-0.13</td>
</tr>
</tbody>
</table>

Association of Surgical Care Improvement Project Infection-Related Process Measure Compliance with Risk-Adjusted Outcomes: Implications for Quality Measurement

<table>
<thead>
<tr>
<th>SSI versus</th>
<th>SCIP-1: antibiotic administered 1 hour before incision</th>
<th>SCIP-2: appropriate prophylactic antibiotic administered</th>
<th>SCIP-3: antibiotic discontinued within 24 hours after surgery</th>
<th>SCIP-6: appropriate hair removal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>−0.12</td>
<td>−0.20</td>
<td>−0.02</td>
<td>−0.10</td>
</tr>
<tr>
<td></td>
<td>0.08</td>
<td>0.004</td>
<td>0.79</td>
<td>0.17</td>
</tr>
</tbody>
</table>
SCIP: Data

• Appropriate antibiotic administration is highly significant with a reduction in surgical site infections.

• Other individual measures approach statistical significance for overall morbidity and infections.

• Do we have additional data that may be more convincing?
Adherence to Surgical Care Improvement Project Measures and the Association With Postoperative Infections

Individual SCIP measures

INF-1: prophylactic antibiotic received within 1 h prior to surgical incision
Adjusted Odds Ratio (95% CI)
0.89 (0.75-1.06)

INF-2: prophylactic antibiotic selection for surgical patients
0.83 (0.69-1.00)

INF-3: prophylactic antibiotics discontinued within 24 h after surgery end time
0.94 (0.78-1.13)

INF-4: cardiac surgery patients with controlled 6 AM postoperative blood glucose
0.93 (0.68-1.27)

INF-6: surgery patients with appropriate hair removal
1.00 (0.85-1.19)

JAMA. 2010;303(24):2479-2485
Individual measures of SCIP-1 and SCIP-2 show a reduction in surgical site infections.

- SCIP-1: Antibiotics within one hour.
- SCIP-2: Appropriate antibiotic administration.

The intent of SCIP is that collectively these measures result in reduction of infections.

- Does adherence with several impact infections?
Adherence to Surgical Care Improvement Project Measures and the Association With Postoperative Infections

Composite measures

S-INF-Core: all 3 original Surgical Infection Prevention (SIP) project perioperative infection-prevention measures

S-INF: all patients with at least 2 recorded SCIP infection-prevention measures in a single visit

0.86 (0.74-1.01)

0.85 (0.76-0.95)
• The collective implementation of the SCIP measures results in a significant reduction in surgical site infections.
SCIP: Data

• Does the surgical community believe this data?

• Do dissenting opinions about the value of SCIP exist?

Yes!

But they are Neglecting their own Data!
Conclusions: Adherence to SCIP measures improved whereas risk-adjusted SSI rates remained stable. SCIP adherence was neither associated with a lower SSI rate at the patient level, nor associated with hospital SSI rates. Policies regarding continued SCIP measurement and reporting should be reassessed.
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<table>
<thead>
<tr>
<th>SCIP Measure</th>
<th>Met</th>
<th>Measured N</th>
<th>Yes N</th>
<th>%</th>
<th>Unadjusted Odds Ratio</th>
<th>95% CI</th>
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</thead>
<tbody>
<tr>
<td>Timely</td>
<td>Yes</td>
<td>36,417</td>
<td>1958</td>
<td>5.0</td>
<td>0.67</td>
<td>0.58–0.77</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>2732</td>
<td>214</td>
<td>7.8</td>
<td></td>
<td></td>
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<tr>
<td>Appropriate</td>
<td>Yes</td>
<td>29,696</td>
<td>1582</td>
<td>5.3</td>
<td>0.36</td>
<td>0.30–0.43</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>1177</td>
<td>158</td>
<td>13.4</td>
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<tr>
<td>Discontinue</td>
<td>Yes</td>
<td>28,955</td>
<td>1631</td>
<td>5.6</td>
<td>1.07</td>
<td>0.95–1.22</td>
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<tr>
<td></td>
<td>No</td>
<td>5791</td>
<td>305</td>
<td>5.3</td>
<td></td>
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<tr>
<td>Hair Removal</td>
<td>Yes</td>
<td>48,074</td>
<td>3023</td>
<td>6.3</td>
<td>1.32</td>
<td>0.85–2.05</td>
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<tr>
<td></td>
<td>No</td>
<td>434</td>
<td>21</td>
<td>4.8</td>
<td></td>
<td></td>
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<tr>
<td>Normothermia</td>
<td>Yes</td>
<td>6,455</td>
<td>1018</td>
<td>15.8</td>
<td>1.09</td>
<td>0.95–1.25</td>
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<td></td>
<td>No</td>
<td>2111</td>
<td>309</td>
<td>14.6</td>
<td></td>
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<tr>
<td>Composite</td>
<td>Yes</td>
<td>21,016</td>
<td>993</td>
<td>4.7</td>
<td>0.55</td>
<td>0.49–0.62</td>
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<td></td>
<td>No</td>
<td>5011</td>
<td>417</td>
<td>8.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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Conclusions: Adoption of SCIP measures increased risk-adjusted SSI rates remained stable, and there was no association with a lower SSI rate at the patient level. This is consistent with other hospital SSI rates. Policies regarding continuous improvement and SCIP should be reassessed.

The Conclusion is not supported by their data!
Surgeon Perspective:

Mandatory reporting of these measures does not improve patient outcome.
The Public Perspective:
SCIP: Future Directions

• The methodology should serve as a model that adds additional variables and discontinues non-significant measures.

• Risk adjustment models can improve interpretation and implementation of SCIP.
### Now Reporting Additional Variables

<table>
<thead>
<tr>
<th>Serious Complications</th>
<th>UNIVERSITY OF COLORADO HOSPITAL ANSCHUTZ INPATIENT</th>
<th>U.S. NATIONAL RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collapsed lung due to medical treatment</td>
<td>No Different than U.S. National Rate</td>
<td>Not Available⁵</td>
</tr>
<tr>
<td>Serious blood clots after surgery</td>
<td>No Different than U.S. National Rate</td>
<td>0.39 per 1,000 patient discharges</td>
</tr>
<tr>
<td>A wound that splits open after surgery on the abdomen or pelvis</td>
<td>No Different than U.S. National Rate</td>
<td>5.88 per 1,000 patient discharges</td>
</tr>
<tr>
<td>Accidental cuts and tears from medical treatment</td>
<td>Worse than U.S. National Rate</td>
<td>2.07 per 1,000 patient discharges</td>
</tr>
</tbody>
</table>

[http://www.hospitalcompare.hhs.gov](http://www.hospitalcompare.hhs.gov)
# Risk Adjustment for Comparing Hospital Quality with Surgery: How Many Variables Are Needed?

Justin B Dimick, MD, MPH, FACS, Nicholas H Osborne, MD, MS, Bruce L Hall, MD, PhD, FACS, Clifford Y Ko, MD, MS, FACS, John D Birkmeyer, MD, FACS

| Table 1. Importance of Risk-Adjustment Variables in the Stepwise Logistic Regression Models |
|-----------------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Variable                                      | Order of importance |
| Mortality models                              | 1    | 2    | 3    | 4    | 5    |
| Cholecystectomy                               | Functional status | ASA class | Ascites | Weight loss | Albumin |
| Ventral hernia repair                         | Functional status | Dialysis | ASA class | Wound class | Dyspnea |
| Gastric bypass                                | Functional status | CHF      | Hypertension | Gender | Dyspnea |
| Pancreatectomy                                | Functional status | CHF      | ASA class | Dyspnea | Albumin |
| Colectomy                                     | ASA class | Functional status | Emergency | Albumin | Dyspnea |
| Morbidity models                              | 1    | 2    | 3    | 4    | 5    |
| Cholecystectomy                               | ASA class | Functional status | Wound class | Ascites | Albumin |
| Ventral hernia repair                         | ASA class | Functional status | Wound class | Dyspnea | BMI   |
| Gastric bypass                                | Functional status | Bleeding disorder | ASA class | Diabetes | CHF   |
| Pancreatectomy                                | Functional status | ASA class | Bleeding disorder | Dyspnea | BMI   |
| Colectomy                                     | ASA class | Functional status | Emergency | Albumin | BMI   |
How Are We Doing?
Outpatients having surgery who got an antibiotic at the right time – within one hour before surgery (higher numbers are better)

Average for all Reporting Hospitals in The United States: 94%

Average for all Reporting Hospitals in

DENVER HEALTH MEDICAL CENTER: 94%
ROSE MEDICAL CENTER: 100%
UNIVERSITY OF COLORADO HOSPITAL ANSCHUTZ INPATIENT: 79%

Not Available - A state average was not calculated because too few hospitals in state submitted data

Top Hospitals represents the top 10% of hospitals nationwide. Top hospitals achieved a 100% rate or better.

http://www.hospitalcompare.hhs.gov
Surgery patients who were given an antibiotic at the right time (within one hour before surgery) to help prevent infection

- Average for all Reporting Hospitals in The United States: 97%
- Average for all Reporting Hospitals in DENVER HEALTH MEDICAL CENTER: Not Available
- Average for all Reporting Hospitals in ROSE MEDICAL CENTER: 81%
- Average for all Reporting Hospitals in UNIVERSITY OF COLORADO HOSPITAL ANSCHUTZ INPATIENT: 100%

Top Hospitals represents the top 10% of hospitals nationwide. Top hospitals achieved a 100% rate or better.

http://www.hospitalcompare.hhs.gov
Outpatients having surgery who got the right kind of antibiotic (higher numbers are better)

- Average for all Reporting Hospitals in The United States: 95%
- Average for all Reporting Hospitals in DENVER HEALTH MEDICAL CENTER: 98%
- Average for all Reporting Hospitals in ROSE MEDICAL CENTER: 99%
- Average for all Reporting Hospitals in UNIVERSITY OF COLORADO HOSPITAL ANSCHUTZ INPATIENT: 83%

Not Available - A state average was not calculated because too few hospitals in state submitted data

Top Hospitals represents the top 10% of hospitals nationwide. Top hospitals achieved a 100% rate or better.
Conclusion: SCIP is Valuable

- CMS mandatory reporting has resulted in significant compliance with regulations.
- SCIP has resulted in fewer surgical site infections.
- Individual SCIP measures better than others.
- SCIP is valuable model to implement other measures as deemed clinically relevant.
Thank You