Reducing OB Surgical Site Infections: A Successful Program

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Maternal Fetal Medicine

Objectives

- Significance of SSIs in OB
- Pathogenesis of SSI
  - Patient factors, procedural factors
- CDC recommendations for prevention
- UCSF experience
  - CDC recommendations
  - Antibiotic timing

Surgical Site Infections

- 3rd most frequent nosocomial infxn
  - 15% of nosocomial infxns
- Increased hospital stay & costs
  - 7-10 extra hospital days
  - Cost >$3000 each
- C/S: Most common surgery in US
  - SSIs common: endometritis, wound infxn
  - Rate of C/S SSI at UCSF as high as 12%


National Surgical Care Improvement Project

- SCIP Steering Committee:
  - JCAHO
  - CDC
  - CMS
  - AHRQ
  - ACS
  - AHA
  - IHI
  - VHA

- Goal: Reduce incidence of surgical complications nationally by 25% by 2010
Pathogenesis of SSI

- Multi-factorial event driven by
  - Procedure variables
  - Patient risk factors

- Main pathogens = pt’s own flora
  - from skin & vagina

- Exogenous sources of SSI pathogens (less common)
  - OR environment
  - Surgical personnel
  - Instruments

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Patient Factors Contributing to SSI

- Coincident infxns
- Obesity
- Diabetes
- Indwelling invasive devices
  - Tobacco use
  - Severity of illness

- Loss of intact skin
- Blood transfusions
- Poor Nutritional Status
- Steroid Therapy
- Extremes of Age

What can we do to prevent SSI?

- CDC Recommendations 1999
  - Pre-op
  - In OR
  - Post-op

- These are general recommendations, not OB specific (but most apply to OB)

Olson Hosp Inf Contr Hosp Epi 2008
Vogel Surg Infect 2009
Simchen Rev Inf Dis 1981

CDC “Guideline for Prevention of Surgical Site Infection, 1999” available online at www.cdc.gov/ncidd/hip
Preoperative: Hair Removal

- Use clippers, not razors for hair removal
  - Micro-breaks in skin barrier
  - Clipping immediately before associated with lower SSI risk than shaving or clipping night before
- Don’t remove hair unless interferes with operation
- Tell pts not to shave

Seropian, 1971, others

Preoperative: Antiseptic Shower/Bath

- Decreases skin microbial colony counts
- Require pts to shower with antiseptic agent the night before OR (elective cases)
  - Pre-clean skin using soap/CHG
    - Remove any gross contamination

Preoperative: Skin Preparation in OR

- Skin Prep—2 elements:
  - Physical separation of bugs—friction & soap
  - Chemical activity on bugs by antimicrobial soln
- Use fast-acting, broad spectrum antimicrobial
  - Tincture of iodine or alcohol, CHG
  - Allow to air dry

Preop: Skin Prep in the OR

- Apply skin prep in concentric circles moving outward
  - For C/S, make sure mons is included
- Prep area large enough to extend incision or add drain sites
Surgeon Hand/Forearm Prep

- Objectives
  - Remove dirt, debris & transient flora
  - Reduce microbial counts as much as possible
  - Leave antimicrobial residual on the skin
- Optimum duration unknown
  - 2-5 min scrub as effective as 10 min
- Chlorhexidine gluconate (CHG)
  - Persistent effect, broad spectrum

Preoperative Hand Prep

- Artificial Nails
  - Increased bacterial & fungal colonization
  - Long nails increase tears in gloves
  - Increased nosocomial infxns
- Nail polish & hand jewelry
  - SSI risk unknown
- No artificial nails or polish, nail beds free of infxn

Antimicrobial Prophylaxis: Agents, Timing

- 1st & 2nd gen cephalosporins most common
  - As effective as 3rd gen for C/S (Cochrane 1999)
- Giving ≤ 2 hrs before incision reduces SSI (0.59% vs ≥ 3.3%)
- General consensus: 30-60 min before incision
  - Except C/S, after cord clamping

Antibiotic Prophylaxis

- Cefazolin 1g
  - 2g if > 80kg
- Repeat Dosing
  - Cochrane re: C/S prophylaxis—1 dose as good as multiple doses
  - Repeat for long (>4 hr) cases or excess blood loss (>1500cc)
- Maintain therapeutic levels during case & at most, few hours after closure

CDC/HICPAC/APIC/SHEA/IDSA hand hygiene guidelines 2002

CDC Hand Hygiene, Mayo

Cochrane 1999

Cat 1A
Intraoperative Issues

- OR environment
  - Ventilation
    - Bugs in air directly proportional to # of people moving in OR
  - Cleaning
    - Surfaces rarely implicated as source of SSI pathogens
  - Sterilization of surgical instruments

Surgical Attire: Recommendations

- Sterile gowns/gloves during case
- Masks/eye protection to **protect staff**
  - Theoretically filters aerosols from staff to patient - not proven
  - When sneezing or coughing w/ mask on, face sterile field directly
- Scrub clothes—Change if soiled or moist
- Hair covering in OR

SSI Surveillance

- Surveillance of SSI w/ feedback to surgeons reduces SSI risk
- Successful surveillance program includes:
  - effective surveillance methods
  - data feedback
  - Starbucks cards & emails!

Surgical Techniques Believed to Reduce SSI Risk

- Good hemostasis
- Handle tissues gently
- Eradicate dead space
- Avoid inadvertent entry into hollow viscus
- Remove devitalized tissues
- Use drains & suture material appropriately
- Prevent hypothermia
Other C/S-related Methods

- Avoid chorioamnionitis
- Spontaneous Delivery of Placenta
  - 5.7% vs 15.2% endometritis w/ manual extraction @ C/S
    - Baksu Acta Obst Gyn Scand 2005
- ? Uterine exteriorization
  - Quicker, less febrile morbidity
    - Jakobs-Jokhan Cochrane 2004

Are C/S SSI a problem at your hospital?
1. Yes
2. No

Scope & Magnitude of SSI at UCSF

- 2003: 217 C/S in 6 months at UCSF
  - 9% rate SSI (13 incisional, 6 endometritis)
  - NNIS benchmark 3%
  - Analysis of risk factors: only diabetes & BG >200 were significantly associated
- Identified as an area for improvement in our L&D
- Task force
  - MDs, RNs, Administrators, Hospital infection control

Reducing SSI in L&D at UCSF: Feb 2005

- Retrain RNs in aseptic technique
- Reduce nonessential personnel in OR
- Improve scrub technique
- Blood Sugars
- New surgical prep (Duraprep)
- O2 Post-op Patient warming
- REDUCE C/S SSIs
Objective

- To examine effect of change in L&D unit policy re: timing of atbx prophylaxis on post-C/S SSI

Methods

- Retrospective cohort
  - 1,316 women
  - Term pregnancies
  - Singleton
  - Cesarean deliveries

Reduction in Surgical Site Infections

- Administer atbx prior to incision
- Retrain RNs in aseptic technique
- New surgical prep
- Blood Sugars
- Improve scrub technique
- Reduce nonessential personnel in OR
- Patient warming
- Supplemental O2

Methods

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<thead>
<tr>
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<tbody>
<tr>
<td>Retrain RNs in aseptic technique</td>
<td>Antibiotics administered prior to incision</td>
<td>Study completed</td>
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<td>New surgical prep</td>
<td>Patient warming</td>
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<tr>
<td>Reduce nonessential personnel</td>
<td>Improve scrub technique</td>
<td></td>
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<tr>
<td>Supplemental O2</td>
<td>Improve BG control</td>
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Historical Controls

- Intervention Group

Kaimal AJOG 2008
Methods

- Univariate analysis
  - Primary outcome: Surgical site infection, cellulitis, endometritis
- Multivariable logistic regression
  - Controlling for labor, prior C/S, parity, maternal age, BMI, DM

All Cesareans

<table>
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<tr>
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<th>2005-2006 n= 800</th>
<th>2006-2007 n= 516</th>
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<tbody>
<tr>
<td>Overall SSI (%)</td>
<td></td>
<td>p = 0.002</td>
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<tr>
<td>Endometritis SSI (%)</td>
<td>p = 0.014</td>
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<tr>
<td>Cellulitis SSI (%)</td>
<td>p = 0.020</td>
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Kaimal SMFM 2008

Cesarean prior to labor

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<tr>
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<th>2005-2006 n= 424</th>
<th>2006-2007 n= 280</th>
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<tbody>
<tr>
<td>Overall SSI (%)</td>
<td>p = 0.16</td>
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<tr>
<td>Endometritis SSI (%)</td>
<td>p = 0.53</td>
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</tr>
<tr>
<td>Cellulitis SSI (%)</td>
<td>p = 0.07</td>
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Cesarean in labor

<table>
<thead>
<tr>
<th></th>
<th>2005-2006 n= 376</th>
<th>2006-2007 n= 236</th>
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<tbody>
<tr>
<td>Overall SSI (%)</td>
<td>p = 0.005</td>
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<tr>
<td>Endometritis SSI (%)</td>
<td>p = 0.017</td>
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<tr>
<td>Cellulitis SSI (%)</td>
<td>p = 0.116</td>
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Multivariable Regression

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<tr>
<th></th>
<th>aOR</th>
<th>95% CI</th>
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<tbody>
<tr>
<td>Overall SSI</td>
<td>0.33</td>
<td>0.14-0.77</td>
</tr>
<tr>
<td>Endometritis</td>
<td>0.34</td>
<td>0.13-0.92</td>
</tr>
<tr>
<td>Cellulitis</td>
<td>0.22</td>
<td>0.49-0.96</td>
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Controlling for labor, parity, prior cesarean delivery, maternal age, BMI, DM

Results at UCSF

- Change in policy to administer prophylactic atbx prior to incision → significant decrease in C/S SSI
- Demonstrate the integration of research findings into real-life clinical practice
- Our protocol is now to ask anesthesia to routinely administer cephalosporin prior to incision

Similar Results Elsewhere: Magee-Womens

- 9,010 C/S before/after change in policy: timing of cefazolin
- Decreased SSI w/ preop atbx vs cord clamp
  - Endometritis aOR 0.6 [0.5-0.8]
  - Wound infxn aOR 0.7 [0.6-0.9]
- No difference in early onset neonatal infxn
- Lower late onset neonatal infxn
  - 1.8% vs 5.7% p<0.001
- No difference in “rule-out sepsis”

ACOG Committee Opinion Sept 2010

- Recommends atbx prophylaxis for all C/S
  - unless the patient is already receiving appropriate atbx (eg, for chorioamnionitis)
- Prophylaxis should be administered within 60 minutes of the start of the C/S

Owens ObGyn 2009
Has your L&D made the change?
1. Yes
2. No

Results at UCSF
- Continued surveillance
- Trend downward

Continued Surveillance
- Spike in 11/09 also seen at other area hospitals, attributed to bad lot of skin prep
- 1-2 cases a month—usually in high risk pts (obese, DM2)

Extended spectrum Prophylaxis
- Ureasplasma increases risk for C/S SSI
  - Cephalosporin doesn’t cover
- RCT at UAB: 597 pts
  - Cefotetan +/- doxy 100mg IV + azithro 1g po 6hrs later vs placebo
  - 17% vs 25% endometritis \( p = 0.02 \)
  - 1% vs 4% wound infxns \( p = 0.03 \)

Andrews, ObGyn 2003
Tita ObGyn 2008
Extended spectrum Prophylaxis

- F/U in Birmingham over 14 years
  - In 2000, IV cefotetan or cefazolin & IV azithro at cord clamp
  - Decreased endometritis
  - Decreased wound infections

Tita ObGyn 2009
Tita AJOG 2008

Extended spectrum Prophylaxis

- UCSF baseline rate much lower
- Hesitant to extend atbx spectrum for all C/S pts
  - Concerns re atbx resistance
- Selectively extend atbx spectrum
  - eg, pt w/ DM/obesity
  - Cefazolin 2g IV preop + azithro 500mg IV after cord clamp (mix in 250mL/give over 1 hr)

Review: Reducing C/S SSIs

- CDC Guidelines 1999, ACOG 2010
  - Atbx prophylaxis—BEFORE INCISION
  - Treat remote infxsns—UTI, chorio
  - Control blood sugars perioperatively
    - Antiseptic shower/bath
    - Preoperative skin prep
    - Appropriate antisepsis for surgical team
    - Good surgical technique
    - Adequate ventilation/oxygenation

Conclusions

- Multi-disciplinary approach
- Decreasing chorioamnionitis/managing labor probably as important as OR issues
- Give pre-op prophylaxis pre-op
- Consider extended spectrum atbx for high risk pts
- Track SSIs
Thank you

- Anjali Kaimal, former MFM Fellow
- Mari-Paule Thiet, MD, Chief of OB
- Elspeth Connatty, RN, Infection Control
- Aaron Caughey, MD, PhD
- Patsy Creedy, RN
- Diane VonBehren, RN
- Molly Killion, RN