Abdominal Hysterectomy

Surgical Site Infection Prevention

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Polling Questions: TRUE OR FALSE

• 1. Most surgical site infections (SSIs) are caused by exogenous sources of bacteria.

• 2. The purpose of using surgical antimicrobial prophylaxis is to reduce the microbial burden of intraoperative contamination.

• 3. Ideally, surgical prophylactic antibiotics should be timed such that the optimal concentration is in the serum/tissue at the time of the incision.

• 4. A single dose of cephalosporin is generally considered to be a good choice of drug for elective clean procedures.

• 5. Continuing the surgical prophylaxis antimicrobial agent past 24 hours after surgery has not been shown to improve SSI rates.

• 6. Tight control of perioperative blood glucose levels may lead to better SSI outcomes.
Topics to Discuss

• Incidence of abdominal hysterectomy surgical site infections
• Risk factors for surgical site infections
• Interventions that can be instituted to reduce the incidence of SSIs
Impact of Surgical Site Infections

Healthcare Impact

· SSI has added $3 to $10 billion to the cost of healthcare
· 2% to 5% of patients undergoing inpatient surgery will develop an SSI
· There were over 290,000 cases of SSI in 2002, which resulted in over 8,000 deaths

“Programs that reduce the incidence of SSI can substantially decrease morbidity and mortality and reduce the economic burden for patients and hospitals.”
Impact of Surgical Site Infections, cont.

On average, patients who sustain surgical site infections:

· spend an additional 7-10 days in the hospital
· are 60% more likely to spend time in ICU
· are 5 times more likely to be readmitted to the hospital
· have a 2-11 times higher risk of death than patients without a SSI
· incur an additional cost of $11,087 to $34,670 per infection

What is a Hysterectomy?

Hysterectomy involves the removal of the uterus, and, occasionally, one or two fallopian tubes, the ovaries, or a combination of ovaries and fallopian tubes.

Hysterectomy - Uterus Anatomy
Female Reproductive System
Abdominal Hysterectomy

Excision of uterus through an abdominal incision with or without concurrent excision of ovary and/or fallopian tube.

**Vertical incision** gives the surgeon greater access to the pelvis.

**Horizontal incision** follows the skin’s natural lines, usually leaving a thinner scar.
Abdominal Hysterectomy, cont.

• The first described abdominal supracervical hysterectomy was performed by Wilhelm Alexander Freund in 1878.*

• From 1950 onwards, hysterectomy was performed almost exclusively as total hysterectomy, until the 1990s (introduction of classic Intrafascial Supracervical Hysterectomy (CISH technique).

*Freund WA. Bemerkungen zu meiner Methode der Uterusextirpation. ZBL Gynakol. 1878;2:497-500
Hysterectomy, cont.

• Hysterectomy is second only to Caesarean delivery as the most frequently performed major gynecologic operation in the U.S.
• More than 600,000 hysterectomies are performed annually in the U.S.
• The incidence of surgical site infection (SSI) ranges widely from 2 – 21% after hysterectomy.
• In the 2000-2004 National Hospital Discharge Survey, abdominal hysterectomy accounted for about 2/3 of the hysterectomy procedures.
• Reported SSI rates tend to be higher for the abdominal approach (compared to vaginal hysterectomy)

Hysterectomy Approaches

• Abdominal hysterectomy
• Vaginal hysterectomy
• Laparoscopic-or robot assisted method

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Abdominal</td>
<td>67.9%</td>
<td>1.31% /100 procedures</td>
</tr>
<tr>
<td>Vaginal</td>
<td>32.1%</td>
<td>1.36 – 5.17% / 100 procedures</td>
</tr>
<tr>
<td>Laparoscopic</td>
<td></td>
<td>1.15% / 100 procedures</td>
</tr>
</tbody>
</table>
Hysterectomy has been classified as a “clean contaminated” procedure because of the lower reproductive tract flora and its introduction into the operative site at surgery.

Importance of reducing abdominal hysterectomy-related surgical site infections (SSIs):

- Promote patient safety
- Reporting requirement of SSIs to the Centers for Medicare and Medicaid Services (CMS)
Centers for Medicare and Medicaid (CMS)

- Reporting requirement for SSI data for inpatient **abdominal hysterectomy procedures** beginning with surgical procedures performed on **January 1, 2012**.

**Exceptions:** Hospitals that performed 9 or fewer of any of the specified colon and abdominal hysterectomy procedures in the calendar year prior to the reporting year can request an exception for submission of SSI measures.

Additional information: www.cdc.gov/nhsn/psc_pa.html.
Cross-section of Abdominal Wall Depicting CDC Classifications of Surgical Site Infection

What should the goal SSI rate be?

Although the potential to totally eliminate SSIs is unknown at this time and remains debatable, a zero infection rate should always be the target as prevention efforts are implemented.
Risk Factors for SSI After Hysterectomy

- Obesity
- Blood loss requiring transfusion
- Longer duration of operation
- Increased serum glucose
- Lower serum albumin
- Depth of subcutaneous tissue
- Abdominal approach
- Open vaginal cuff
- Inadequate antimicrobial prophylaxis
- Previous history of postsurgical infection
Prevention Strategies

• Preoperative preparation of the patient is one area for intervention.

• Some variables cannot be modified (e.g., age and sex), but others can be modified (e.g., glucose control and hair removal).

• Several interventions, such as minimizing the duration of preoperative hospital stay and eradicating remote infections, have been shown to reduce SSI rates.
Because most contamination happens during the operation through contact or airborne transmission, events that occur during the postoperative period (e.g., improper dressing changes or isolation technique) are less likely to contribute to a SSI, though this has not been well studied.

Prevention Strategies

• **Microbial characteristics** (e.g. degree of contamination and virulence of pathogen)

• **Patient characteristics** (e.g., comorbid conditions)

• **Surgical characteristics** (e.g., type of procedure, introduction of foreign material, and amount of damage to tissue)
Microbial Characteristics

- Surgical-site infections require microbial contamination of the surgical wound to occur.
  
  (if the number and virulence of bacteria overwhelm natural host defense mechanisms)

- These organisms may originate from either endogenous or exogenous sources.

<table>
<thead>
<tr>
<th>Endogenous Source</th>
<th>Exogenous Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient’s skin, mucous membranes, or hollow viscera</td>
<td>Contaminated items on/in the sterile surgical field including surgical team members, instruments, air, or materials</td>
</tr>
</tbody>
</table>
Microbial Characteristics, cont.

<table>
<thead>
<tr>
<th>Normal flora Vagina</th>
<th>Abdominal Hysterectomy</th>
<th>Vaginal Hysterectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal flora of vagina include staphylococci, streptococci, enterococci, lactobacilli, diphtheroids, E. coli, anaerobic streptococci, <em>Bacteroides</em> species, and <em>Fusobacterium</em> species</td>
<td>Polymicrobial; gram-positive cocci and enteric gram-negative bacilli predominate Anaerobes are frequently isolated</td>
<td>Polymicrobial; enterococci, aerobic gram-negative bacilli <em>Bacteroides</em> species are isolated most frequently</td>
</tr>
</tbody>
</table>

- Postoperative vaginal flora differ from preoperative flora; enterococci, gram-negative bacilli, and *Bacteroides* species increase postoperatively.

- Postoperative changes in flora may occur independently of prophylactic antimicrobial administration and are not by themselves predictive of postoperative infection.
Prevention Strategies
Microbial Characteristics

• Antimicrobial prophylaxis
  • Consistent with published guidelines
  • Key timing
  • Discontinuation

• Skin antisepsis:
  • Pre-surgical shower or scrub
  • Prep solution
Prevention Strategies
Microbial Characteristics, cont.

• Skin is a major source of microbial contamination in the surgical practice environment.

• All perioperative personnel should follow established hand hygiene practices for maintaining healthy skin and fingernail condition.

• A surgical hand scrub should be performed before donning sterile gloves.
Prevention Strategies
Microbial Characteristics, cont.

• 30% of surgical site infections are preventable with appropriate use of preoperative antibiotics.*

*Dellinger EP 2005
## Microbial Characteristics, cont.

### Antimicrobial Prophylaxis

<table>
<thead>
<tr>
<th>Surgical Procedure</th>
<th>Approved Antibiotics (SCIP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hysterectomy</td>
<td>Cefotetan, Cefazolin, Cefoxitin, or Cefuroxime</td>
</tr>
<tr>
<td></td>
<td>If β-lactam allergy: Clindamycin + Gentamicin, or</td>
</tr>
<tr>
<td></td>
<td>Clindamycin + Ciprofloxacin**, or</td>
</tr>
<tr>
<td></td>
<td>Clindamycin + Aztreonam</td>
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<tr>
<td></td>
<td>OR</td>
</tr>
<tr>
<td></td>
<td>Metronidazole + Gentamicin, or</td>
</tr>
<tr>
<td></td>
<td>Metronidazole + Ciprofloxacin**</td>
</tr>
<tr>
<td></td>
<td>OR</td>
</tr>
<tr>
<td></td>
<td>Clindamycin monotherapy</td>
</tr>
</tbody>
</table>

** Special Considerations  

** Levofloxacin 750 mg given once may be substituted for Ciprofloxacin.

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Antibiotic Timing and Incidence of Surgical Site Infection (SSI)

## Microbial Characteristics

### Surgical Skin Antisepsis

<table>
<thead>
<tr>
<th>Iodophors (e.g., povidone-iodine)</th>
<th>Chlorhexidine gluconate (CHG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disrupts cell membranes by oxidation and substitution</td>
<td>Disrupts cellular membranes</td>
</tr>
<tr>
<td>Short lasting and must be allowed to dry in order to maximize their action</td>
<td>Long lasting against gram-positive and gram-negative organisms. Kills on contact.</td>
</tr>
<tr>
<td>Inactivated by blood or serum proteins</td>
<td>Not inactivated by organic components (e.g., blood)</td>
</tr>
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</table>
Skin/Surgical Site Prep

The skin prep agents should have the following properties:
- Fast acting
- Persistent and cumulative action
- Non-irritating

Two separate areas are prepared for the skin preps:
1. abdominal prep
2. vaginal prep

Abdominal-perineal and abdominal-vaginal procedures require separate skin preps since the perineal and vaginal areas are considered contaminated.

The abdomen, vagina, and perineum are prepped with antimicrobial solution. If hair must be removed, hair clippers (not razors) should be used to avoid nicking the skin.

The abdomen is prepped in the same manner as an open laparotomy, from the nipple line to below the symphysis pubis.

The vaginal prep involves the symphysis pubis to the external genitalia, as well as the inside of the vagina.

The prep solution should not be allowed to pool or accumulate under, or adjacent to, the patient in order to prevent chemical burns and decrease the risk of electrosurgical or laser burn.
Other Interventions to Reduce Microbes

– Bath or shower with antiseptic agent the night before surgery and/or the morning of surgery
– Laxative to clear the bowel
– Enema to empty bowel
– Betadine douche to cleanse the vaginal area
– Urinary catheter
– Hair removal (Shave prep)
Bowel Cleansing

- Bowel cleansing is very important for vaginal hysterectomy in order to evacuate solid stool from rectum, reduce the bacterial load of intestinal tract and to reduce the incidence of postoperative ileus and constipation.
Vaginal Prep

• Swedish study, Jan 2000 – Feb 2008 involving 6496 patients who underwent vaginal or laparoscopically assisted vaginal hysterectomy found:

  No significant difference in infectious morbidity within 6-8 weeks postop between those who used vaginal prep (saline or CHG) vs those who performed no cleansing.

Patient Characteristics

- Diabetes
- Nicotine use
- Malnutrition
- Prolonged hospital stay
- Immunosuppressive therapy
  - Steroid use
  - Chemotherapy
Patient Characteristics, cont.

• No hair removal or proper hair removal, if indicated *(if indicated: perform immediately prior to the skin incision and clip, don’t shave)*

• Control blood glucose level during the immediate postoperative period

• Maintain perioperative normothermia

• Maintain appropriate oxygenation control

• ASA Score > 3

• Wound classification contaminated or dirty
Surgical Characteristics

- Duration of procedure
  - Re-dose antibiotics for procedures lasting > 4 hrs
- Avoid dead space within the surgical wound (insert drains)
- Delayed closure for severely contaminated wounds
- Absorbable sutures
- Management of infected or colonized surgical personnel (presence of open skin wounds)
- Adherence to surgical PPE
Surgical / Operative Characteristics, cont.

• Operating Room Environment:
  – Ventilation (20-25 air exchanges / hr)
  – Temperature and humidity
    • Temp: 68 – 75%
    • Humidity: 20-60% (new ASHRAE standards adopted by CMS May 2013)
  – Environmental surfaces
  – Proper cleaning and disinfection of sterile instruments
    • avoid Immediate Use Steam Sterilization (IUSS) sterilization (formerly known as “flash” sterilization)
  – Minimize traffic in the OR
Skin Closure

• Topical Skin Adhesive – can act as a barrier against bacterial microbes
  – Works like glue to hold edges of skin together
  – Areas do not have to be kept dry during healing
  – Bandages are often not required
  – Forms a strong, flexible bond fast
  – The adhesive “sheds” from the skin naturally as the wound heals
  – No sutures to remove

Prevention

Incision Care:

• Protect with a sterile dressing for 24 – 48 hrs postoperatively an incision that has been closed primarily.

• Wash hands before and after dressing changes and any contact with surgical site.

• When an incision dressing must be changed, use aseptic technique.
The risk of infection continues even after the patient leaves the hospital.
Discharge Planning

• Educate the patient and/or family regarding:
  – proper incision care
  – symptoms of surgical site infection, and the need to report those symptoms
  – cover cough and wash hands prior to performing wound care

*Take home materials should be easy-to-read.*
Scenario
Scenario

1/22: patient underwent a laparoscopic-assisted abdominal hysterectomy

• 2/1: abdominal pain with purulent drainage in 2 of 3 trochar sites: Temp 38.4 C.

• 2/3: Surgeon opens draining sites and notes purulent material at the facial layer; cultures obtained and sent.

• 2/5: Cultures positive for Pseudomonas aeruginosa

Is this a surgical site infection? Yes
Which of the following are components of efforts to reduce SSIs?

A. Administer pre-operative antibiotic prophylaxis (if indicated) within 60 minutes before incision (2 hours for vancomycin or quinolones).
B. Do not use shaving as a method of hair removal.
C. Maintain normothermia.
D. Maintain glucose control.
E. All of the above.

Answer: E. All of the above.
While advances have been made in infection control practices, including improved operating room ventilation, sterilization methods, barriers (e.g. gloves, masks, and gowns), surgical technique, and giving antibiotics within 60 minutes of the incision, SSIs remain a substantial cause of complications and death among hospitalized patients.
Conclusion

• Surgical site infection risk depends upon a number of factors. The risk of SSI increases with the number of patient and operative risk factors. By addressing key aspects of prevention, such as:
  • pre-existing medical illness
  • prolonged operative time
  • wound class and wound contamination
  • antimicrobial prophylaxis timing and dosing
  • skin prep/antisepsis
Appendix
Epidemiology of Surgical Site Infection

Wound infection is caused by exogenous or endogenous bacteria; infection is influenced not only by the source of the infecting inoculum but also by the bacterial characteristics.

Ensure that prophylactic antibiotics, if indicated, are present in tissue in adequate concentrations at beginning of operation.

Endogenous factors or sources of bacteria

Bacterial characteristics of importance (virulence and antibiotic resistance)

Exogenous factors or sources of bacteria

Remote sites of infection
- Postpone elective operation if possible. Treat remote infection appropriately.

Skin
- Nature and site of operation
  - Is the operation
    - Clean
    - Contaminated
    - Clean-contaminated
    - Dirty or infected

Bowel
- Size of inoculum required to produce infection
  - Varies in different clinical situations.

Operating team-related
- Comportment
- Use of impermeable drapes and gowns
- Surgical scrub [see Sidebar Preoperative Preparation of the Operative Site]

Operating room-related
- Traffic control
- Cleaning
- Air

Preventive measures to control bacteria
- Decontamination of patient’s skin [see Sidebar Preoperative Preparation of the Operative Site]
- Bowel preparation
- Prophylactic antibiotics
  - Right antibiotic
  - Correct timing
  - Right duration
  [see Sidebar Antibiotic Prophylaxis of Infection and Table 7]

Surveillance and quality assurance

Meakins, JL. Prevention of Postoperative Infection. 2008 BC Decker Inc
Resources

SSI NHSN Module:


APIC Public Policy:

http://www.apic.org/Advocacy

CMS IPPS Final Rule:

www.cms.gov/AcuteInpatientPPS/IPPS2010/list.asp

CDC Prevention of surgical Site Infections, 1999:


CMS Hospital Care:

http://www.medicare.gov