衞生防護中心
Centre for Health Protection

# Recommendations on Prevention of Surgical Site Infection

**Scientific Committee on Infection Control, and**
**Infection Control Branch, Centre for Health Protection,**
**Department of Health**

**February 2009**

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*The recommendations are dedicated to the late*

***Dr. Rosie Fan***

*who had contributed enormously to the development of the recommendations.*

## Background

The Scientific Committee on Infection Control (SCIC) endeavours to prevent surgical site infection. In this connection, the SCIC has developed the Recommendations on Prevention of Surgical Site Infection with the joint effort by *the Infection Control Branch, Centre for Health Protection, Department of Health* and *the Central Committee on Infectious Diseases and Emergency Response*, *Hospital Authority*. The recommendations provided by SCIC serve as guidance for the hospital colleagues in the formulation of strategies, programmes and plans for the prevention of surgical site infection.


## Acknowledgements

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## Contents

## Introduction

Surgical site infection (SSI) is the second most common health care-associated infection (1). Surgical site infection accounts for 14% to 16% of hospital-acquired infections. Reported surgical site infection rates ranged from 0.5% to 13%, depending on the type of surgery and patient characteristics (2, 3). Applying strategies for the prevention of surgical site infection help to reduce surgical patients' morbidity, mortality and length of stay, and save cost for the healthcare institutions (4).

2. All SSI prevention measures effective in adult surgical care are also applied to pediatric surgical care (4).

3. Nowadays, more and more open surgeries are replaced by laparoscopic surgeries in Hong Kong and evidence shows that the risk of surgical site infection of laparoscopic surgery is comparatively lower. SSI prevention measures which are applied in open surgery (e.g. open cholecystectomy) in the recommendations are also indicated for their laparoscopic counterparts (e.g. laparoscopic cholecystectomy) unless indicated otherwise (4).

4. It is widely accepted that patient risk factors and operative characteristics increase the risk of surgical site infection and few have been proven to independently influence the risk of surgical site infection. Some of the patient factors are not alterable, such as extremes of age. Cessation of smoking requires patient initiative and is appropriate for elective surgery only. Obesity may be associated with increased risk of surgical site infection.

5. There are no recommendations for discontinuing systemic steroid use, enhancing nutritional support and wound space oxygenation to prevent surgical site infection (4). When modern approaches to prevent surgical site infection including antimicrobial prophylaxis, ventilation control and limit number of personnel in the operating theatres are implemented, the additional benefit of installing lamina airflow ventilation in operating theatre appears to be only marginal (1, 5-6).

6. Among the well accepted measures to prevent surgical site infection, the Institute for Healthcare Improvement highlights several imperatives for reducing surgical site infection. It is called bundle of care and although consists of four evidence-based components, is grouped as a single intervention and standard of care for patients undergoing surgical procedures. These components include appropriate use of antibiotics, appropriate hair removal, postoperative glucose control in patients undergoing major cardiac surgery and postoperative normothermia in colorectal surgery patients (7).

7. A multidisciplinary team work approach is necessary to successfully implement the preventive measures and improvement in surgical site infection. The team may include anyone who has a role in the surgical care process, e.g. surgical staff, anaesthesiologists, operating room assistants, infection control personnel, pharmacists, supporting staff, quality control officers, engineers, etc. All direct care healthcare workers should be educated of the risks of surgical site infection and preventive measures.

## Recommendations on Prevention of Surgical Site Infection

1 Preparation of Surgical Patients (4)

1.1 Eradicate or control all infections remote to the surgical site before elective surgery whenever possible (8, 9).

1.2 Screen patients for presence of hyperglycaemia and implement protocol to adequately control the serum blood glucose level (less than 11.1mmol/L) perioperatively and during the first 48 hours postoperatively (10-12). There is evidence for such measures to be applied in patients undergoing cardiothoracic operations, most notably coronary artery bypass graft (CABG).

1.3 Minimize the preoperative length of stay of the patients in the hospital, such as completing presurgical assessments and correcting underlying conditions before admission to hospital for operation and performing elective surgery, where possible, in ambulatory day centres (13).

1.4 Educate the patients about the increased risk of smoking on postoperative surgical site infection and encourage patients to stop smoking or taking any tobacco consumption at least 30 days before the operation (14).

1.5 Maintain normothermia (core temperature of 36-38$^{o}$C) perioperatively in colorectal surgery patients. The supportive measures include a combination of warmed blankets, warming devices, warmed intravenous fluids, increase ambient temperature in the operating room, and a consistent method and equipment for monitoring patients' temperature. They may prove valuable for other surgical patients as well (15, 16).

2 Preoperative Care of the Operation Site (4)

2.1. Remove hair only when it interferes with the operation. Perform hair removal immediately before surgery and preferably with a clipper (17, 18). Razors are not recommended.

2.2. Educate and assist patients in taking shower wash or bath at least the night before the operation. Preoperative showers reduce the skin's microbial colony counts but studies did not show reduction in SSI rates (4, 58-61).

2.3. Chlorhexidine is a more effective skin disinfectant (19,20) and repeated applications with this agent may be indicated for cardiac thoracic and orthopaedic surgical patients with known MRSA in hospitals and units where there is a high incidence of postoperative wound infections by MRSA or MRSE (27,62-63).

2.4. Colonic preparation and lavage perioperatively is unnecessary in colorectal surgery for preventing anastomotic leaks and wound infections (21, 22).

2.5. Inspect and clean gross contamination of skin at and around the incision site before performing preoperative antiseptic skin preparation in the operating theatre.
2.6. Do not perform preoperative antiseptic skin preparation of the incision site in the clinical areas, such as in the ward or patient's bedside.
2.7. Antiseptic skin preparation should include surgical incision and drain sites.

3 Preoperative Surgical Hand Preparation of Surgical Team (23)

3.1 Nails should be kept short. Artificial fingernails are prohibited. Rings, wrist-watch and bracelets should be removed before surgical hand preparation.
3.2 The design of sinks should reduce risk of splashes.
3.3 If hands are visibly soiled, wash hands with plain soap before performing surgical hand preparation. Debris from underneath fingernails should also be removed. Use of nailbrushes is not recommended.
3.4 The surgical hand antiseptic product should be either an antimicrobial soap or an alcohol based handrub (23). Alcoholic Chlorhexidine was found to have greater residual antimicrobial activity (4, 64-66). However, no clinical trials have evaluated the impact of scrub agent choice on SSI risk (4, 67-69).
3.5 When using surgical antimicrobial soap, scrub hands and forearms for 2 to 5 minutes as recommended by the manufacturer. Long scrub times, such as 10 minutes, are not necessary.
3.6 When using alcohol-based surgical handrub product, follow the manufacturer's instructions and observe the following guidance:
  3.6.1 Apply alcohol-based product on dry hands only.
  3.6.2 Use sufficient amount of product to keep hands and forearms wet throughout the procedure.
  3.6.3 After alcohol-based surgical handrub procedure, hands and forearms should be allowed to dry thoroughly before donning sterile gloves.
  3.6.4 Do not combine surgical hand antimicrobial soap with alcohol-based surgical handrub sequentially.

4 Antimicrobial Prophylaxis (24-26)

4.1 Administer surgical antimicrobial prophylaxis as indicated, such as in some operations classified preoperatively as clean surgical wounds and clean-contaminated surgical wounds. Operations classified as contaminated or dirty surgical wounds are frequently receiving therapeutic antimicrobial agents preoperatively to treat related infections. They are not regarded as surgical antimicrobial prophylaxis.

4.2 Select antimicrobial agents according to antimicrobial efficacy against the common pathogens most likely encountered in the specific surgical sites.

4.3 Antimicrobial dosage modification may be necessary for the elderly, the very obese individuals, those with renal failure and / or liver failure. Please refer to the latest edition of "Sanford Guide to Antimicrobial Therapy" or consult hospital microbiologist for dosage adjustment.

4.4 Avoid using newer broad-spectrum antibiotics whenever possible. Relatively narrow spectrum antibiotics, such as Cefazolin and Cefuroxime are preferred.

4.5 Do not use Vancomycin as a routine surgical antimicrobial prophylaxis.

4.6 Consider using perioperative intranasal Mupirocin and take shower wash or bath as listed in item 2.2, in known carriers of Methicillin Resistant *Staphylococcus aureus (MRSA)* undergoing cardiothoracic and orthopaedic surgeries where morbidity and mortality due to surgical infections are significant (28).

4.7 The duration of antimicrobial prophylaxis should not routinely exceed 24 hours.

4.8 For many prophylactic antimicrobial agents, the administration of an initial dose should be given within 30 minutes before surgical incision (coinciding with the induction of anaesthesia) to achieve an adequate tissue concentration at the time of initial incision. Administer additional intraoperative doses if the operation time exceeds two serum half-lives of the antimicrobial agent, or massive intraoperative blood losses occur.

4.9 Whenever a proximal tourniquet is required, complete the infusion of the prophylactic antimicrobial agents before the tourniquet is inflated.

4.10 For cesarean section, administer the initial dose of antimicrobial prophylaxis immediately after the umbilical cord is clamped.

4.11 Laparoscopic cholecystectomy carries a low rate of postoperative infection, attributable to the relative minor trauma, earlier patient mobilization and prompt resumption of nutrition (29, 30). Antimicrobial prophylaxis does not seem to lower the incidence of postoperative infective complications, as demonstrated by several randomized controlled trials (30, 31, 32). At present the use of antibiotic prophylaxis in elective laparoscopic cholecystectomy is still controversial.

4.12 For suggestions on indications and choice of prophylactic antimicrobial agents and protocol for MRSA screening and decolonization, please refer to Appendix 1.

5 Ventilation and Environment in the Operating Theatre (1, 4)

5.1 Exert traffic control of operating room by restricting the number of people allowed in the operating room, closing the doors to the operating room to prevent in and out traffic, and limiting unnecessary movement and talking once in the operating room (1, 4, 33, 35).

5.2 Maintain positive-pressure ventilation for operating rooms with respect to corridors and adjacent areas (1,4). A programme for periodic checking and system maintenance assessment is important to ensure that the target pressure gradient is maintained and that out of range performance can be detected (33-36). A device or a simple visual method which requires a minimum differential pressure to indicate airflow direction is desirable.

5.3 Maintain the ventilation at a minimum of 15 air changes per hour (ACH) of which at least 3 ACH should be fresh air (1,4). Airflow monitoring device(s) with alerting feature for out of range performance should be in place. A programme for periodic checking and system maintenance assessment is important to ensure that the target airflow is maintained (33, 34).

5.4 Filter all recirculated and fresh air through HEPA filters at 99.97% efficiency (34). There are documents suggesting that HEPA filters are not generally required in the setting of general operating theatres (36); however, further studies into this subject are required.

5.5 Introduce air at the ceiling and exhaust air near the floor (4, 33, 35).

5.6 Laminar flow ventilation systems (ultraclean air) and ultraviolet irradiation are not necessary to decrease overall surgical site infection risk, even for orthopaedic implant operations, if appropriate antiseptic precautions and prophylactic antibiotic policy are implemented (1, 4, 33, 37, 38, 39).

5.7 Maintain relative humidity at 30-60% and temperature at 20-23°C (34).

5.8 Do not shut down the heating, ventilation and air conditioning systems for purposes other than required maintenance, filter changes and construction (33, 34).

5.9 Allow adequate time for commissioning including microbiological assessments by the hospital infection control team before an operating theatre is first used and after any substantial modifications that may affect airflow patterns in pre-existing theatres (40). As microbiological sampling is time consuming, the use of particle counters may be of value (41); however, high particle counts may not necessarily be associated with increase in air microbiological counts in conventionally ventilated operating theatres. The clinical significance of high particle counts is to be further studied (42).

5.10 Do not perform microbiological air sampling routinely, provided that engineering parameters such as air distribution, air change rates, pressure differentials and airflow, etc. are satisfactory and regularly monitored. Such sampling should be done as part of an epidemiological investigation, validation of changes in products e.g. HEPA filters, maintenance of operating theatres or as advised by the hospital infection control team (4, 40, 41).

5.11 Do not use tacky mats at the entrance to the operating room suite or individual operating rooms for infection control (4).

6 Surgical Attire and Drapes (4)

6.1 Wear surgical mask to fully cover mouth and nose.

6.2 Wear cap to fully cover head and face hair.

6.3 Surgical gowns and drapes should be sterile and resistant to liquid penetration and remain effective barriers when get wetted.

6.4 Scrubbed surgical team members should wear masks, caps, sterile gowns and gloves. Wearing additional glove barriers, such as double latex gloves or orthopaedic gloves is recommended during procedures that have a high risk of glove perforation (45).

6.5 Other personnel in the operating theatre should wear surgical masks if an operation is being performed or if sterile instruments are exposed.

6.6 Use sterile surgical drapes to create a barrier between the surgical field and the environment or potential source of bacteria.

6.7 Change surgical gowns and scrub suit if visibly soiled or penetrated by blood or body fluids.

6.8 Shoe covers are not necessary for prevention of surgical site infection.

7 Sterilization of Surgical Instruments

7.1 All surgical instruments, especially those with long and narrow lumens, must be clean and decontaminated adequately before sterilization process (46).

7.2 Heat resistant surgical instruments should receive steam sterilization. Heat sensitive instruments can use low temperature sterilization technology (not greater than 60$^{o}$C), such as hydrogen peroxide plasma, peracetic acid and ethylene oxide sterilization (47).

7.3 Laparoscopes, arthroscopes, cystoscopes and other scopes that enter normally sterile tissue should ideally be sterilized. When it is not feasible, they should at least be treated with high level disinfection after thorough cleansing (48).

7.4 Flash sterilization[1] of surgical instruments should only be used for emergency or unplanned cases. Flash sterilization of implant devices should be avoided (49).

[1] Flash sterilization: steam sterilization of unwrapped items

7.5 Standard procedures and staff proficiency of flash sterilization should be monitored.
7.6 Flash sterilization record should be maintained and updated.
7.7 To assure sterility and proper handling of instruments, a quality control programme should be established and documented.

8 Asepsis (4)
8.1 The principle of aseptic technique should be complied during operations, when inserting intravascular devices, administration of admixture and medication, or placing anaesthetic devices.
8.2 Sterile surgical instruments, medications and solutions should be assembled just prior to use.

9 Surgical Technique (1, 4, 50)
9.1 Maintain good operative techniques during the operation, such as, gentle tissue handling to minimize trauma, minimal use of cautery, careful haemostasis, adequate debridement and removal of dead, devitalized tissue and foreign bodies.
9.2 If the surgical site is heavily contaminated, leave the incision open to close later when it is clean.
9.3 Use close suction drain and insert through a separate incision if surgical drainage is necessary. Remove the drain as soon as possible.

10 Postoperative Incision Site Care (1, 4)
10.1 Cover the primarily closed clean surgical wound with sterile dressing and keep it intact for 24-48 hours postoperatively. If excess oozing is noted, the dressing should be replaced (51, 52).
10.2 Use normal saline to cleanse and remove surface bacteria and discharge from wound.
10.3 Perform hand hygiene before and after touching the surgical site or changing dressing.
10.4 Teach the patients and their carers how to care and monitor the incision site, signs and symptoms of surgical site infection and to report if any problems occur.

11 Surgical Site Infection Surveillance
Surgical Site Infection Surveillance with feedback of surgical infection rates to surgeons is one of the successful strategies to help reduce surgical site infection (53, 54). All hospitals with surgical services are recommended to undertake surveillance of surgical site infection.

The main components include:

11.1 Select certain categories of operations in the scope of the surgical site infection surveillance based on risk and volume of procedures in local hospitals.

11.2 Use standardized methods and definitions for data collection and analysis (4).

11.3 Trained personnel with knowledge and understanding of epidemiology, surveillance and plan of the programme should be responsible for case-finding.

11.4 Perform consistent post discharge surveillance of surgical site infection to capture the infection incidence that occurs outside the hospitals, which was essential to make the surveillance data more accurate and complete (55, 56).

11.5 Stratify operations according to the surgical site infection risk index determined by wound class, ASA score and duration of operation (57).

11.6 Report the stratified, operation-specific surgical site infection rates periodically to the surgical team members (4).

11.7 Benchmark the surveillance data with local and international benchmark data like the NHSN (National Healthcare Safety Network) system.

11.8 Periodically evaluate and validate the data and process of the surgical site infection surveillance to ensure high quality and accuracy.

11.9 Investigate outbreak or abnormal clustering of surgical site infection ascribing to, such as clustering of organisms, healthcare personnel or airborne source and make recommendations to frontline staff (4).

11.10 A SSI surveillance protocol and relevant materials published by Infection Control Branch, CHP are available at Hospital Authority Intranet: http://ssi.home/prod/Login2.asp

12 Quality Measures

Quality measures should be established to assess the effectiveness of implementing the recommendations.

The following parameters can be used as performance indicators:

12.1 Surgical site infection rate

12.2 Percentage of surgical cases with appropriate timing, selection, dosage and duration of prophylactic antibiotic in accordance with item 4 above.

12.3 Ventilation and environmental parameters of the operating theatres as listed in item 5 above.

13 Other Relevant Issues

Management of surgical patients suspected or confirmed of pulmonary tuberculosis (TB) or other airborne infections (33, 43).

13.1 A system of detection and communication should be established to evaluate surgical patients prior to surgery and communicate to relevant departments.

13.2 There is no recommendation for changing pressure in operating room from positive to negative or setting it to neutral.

13.3 Perform only emergency operations or diagnostic procedures as indicated. Postpone elective surgery until after the infectious period or after effective therapy if delaying the operation does not cause increased risk to the patients.

13.4 Schedule patient as the last case of the day to provide maximum time for adequate air changes if the delay of operations does not cause increased risk to the patients.

13.5 HEPA filters should be installed in the exhaust duct leading from the operating room into the general circulating system if air is to be re-circulated (44).

13.6 Install high-efficiency filters between the anaesthesia breathing circuit and the patients. The entire breathing circuit should be changed after used. Close suctioning system is preferred.

13.7 N95 respirators without exhalation valves should be worn for respiratory protection of surgical personnel in the operating theatre.

13.8 Perform aerosol generating procedures, such as intubation and extubation, in an airborne isolation room if feasible.

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## Appendix 1: Suggested Guidelines for Surgical Antimicrobial Prophylaxis (27, 70-79)

### General principles in surgical prophylaxis

1. **Duration of prophylaxis**:
The duration of antimicrobial prophylaxis should not routinely exceed 24 hours (1 dose at induction and 2 more doses postoperatively, i.e. 3 doses in total).
There is wide consensus that only a single dose of intravenous antimicrobial agent is needed for surgical prophylaxis in the great majority of cases. Published evidence shows that antimicrobial prophylaxis after wound closure is unnecessary and could lead to emergence of resistant bacteria. Most studies comparing single- with multiple-dose prophylaxis have not shown benefit of additional doses.

2. **Timing**:
For many prophylactic antimicrobial agents, the administration of an initial dose should be given within 30 minutes before incision (coinciding with the induction of anesthesia) to achieve an adequate tissue concentration at the time of initial incision. This can be facilitated by having the anesthesiologist administer the drug in the operating room at induction.

3. **Antimicrobial dosing**:
The dose should be adequate based on the patient's body weight. An additional dose of antimicrobial agent should be given (intraoperatively) if the operation is still continuing after two half-lives of the initial dose or massive intraoperative blood losses occur.

**Suggested initial dose and time to re-dose for selected antimicrobial agents used for surgical prophylaxis**

| Antimicrobial agent | Standard intravenous dose* | Recommended Re-dosing interval (hour) |
|---|---|---|
| Cefazolin | 1-2 g | 2-5 |
| Cefuroxime | 1.5 g | 3-4 |
| Clindamycin | 600-900mg | 3-6 |
| Amoxicillin-clavulanate | 1.2 g | 2-3 |
| Ampicllin-sulbactam | 1.5 g | 2-3 |
| Metronidazole | 500 mg | 6-8 |
| Vancomycin | 1g over >= 60 min | 6-12 |

*In patient with normal renal function and not morbidly obese.

## Antimicrobial prophylaxis in clean operations

| Type of Operation | Indications | Recommended drugs[a] |
|---|---|---|
| Cardiac[c] | - Prosthetic Valve<br>- Coronary Artery Bypass<br>- Pacemaker Implant<br>- Open Heart Surgery | - iv Cefazolin 1g[b] then every 4 hours.<br><br>**note:** The duration of antimicrobial prophylaxis should not be longer than 48 hours. |
| Thoracic[c] | - Pulmonary Resection<br>- Closed Tube Thoracostomy for chest trauma | - iv Cefazolin 1g[b]<br>OR<br>- iv Cefuroxime 1.5g<br>OR<br>- iv Amoxicillin-clavulanate 1.2g[e] |
| Vascular | - Abdominal Aortic Operations<br>- Prosthesis<br>- Groin Incision<br>- Lower Extremity Amputation for ischaemia | |
| Neurosurgery[c] | - Craniotomy<br>- V-P Shunt | - iv Cefazolin 1g[b] OR<br>- iv Cefuroxime 1.5g |
| | - Re-exploration or Micro-surgery | - iv Cefuroxime 1.5g OR<br>- iv Amoxicillin-clavulanate 1.2g[e] |
| Orthopaedic & Traumatology[c] | - Total Joint Replacement with Prosthesis<br>- Internal Fixation of closed fractures | - iv Cefazolin 1g[b] OR<br>- iv Cefuroxime 1.5g<br><br>**note:** Antimicrobial agents should be completely infused before inflating the tourniquet. |
| | - Open fractures with soil contamination or farm injuries | - iv Ceftriaxone 2 g or other 3rd generation cephalosporin +/- iv Penicillin G for better anaerobic coverage<br><br>**note:** The recommended duration is 3 days for Gustilo-Anderson grade I and II open fractures and up to 5 days for grade III wounds. |
| Thyroid & Parathyroid Gland | | - Antimicrobial prophylaxis is not indicated. |

**Antimicrobial prophylaxis in clean-contaminated operations**

| Type of Operation | Indications | Recommended Drugs[a] |
|---|---|---|
| Oral-Pharyngeal/ Nasal | - Tonsillectomy<br>- Maxillofacial<br>- Rhinoplasty<br>- Turbinate/Septoplasty | - iv Amoxicillin-clavulanate 1.2g[e]<br>OR<br>If pseudomonas is suspected:<br>- iv Amoxicillin-clavulanate 1.2g[e] + iv Gentamicin<br>OR<br>- iv Amoxicillin-clavulanate 1.2g[e] + iv Ceftazidime 1-2 g |
| Ear | - Myringotomy<br>- Tympanostomy Tube Insertion | - Quinolone or Sofradex eardrop |
| Upper Gastro-Intestinal Tract | Gastro-duodenal (High Risk):<br>- Obstruction<br>- Haemorrhage<br>- Gastric Ulcer<br>- Malignancy<br>- $H_2$ Blocker<br>- Proton Pump Inhibitor<br>- Morbid Obesity<br>- Gastric Bypass<br>- Percutaneous Endoscopic Gastrostomy | - iv Cefuroxime 1.5g<br>OR<br>- iv Amoxicillin-clavulanate 1.2g[e] |
| | - Oesophageal operation with manipulation of pharynx | - iv Cefuroxime 1.5g OR<br>- iv Cefazolin 1g[b] +/- Metronidazole 500mg |
| Hepato-Biliary System<br><br>Laparoscopic Gall Bladder Surgery | High Risk:<br>- Age more than 70 years<br>- Acute Cholecystitis / Pancreatitis<br>- Obstructive Jaundice<br>- Common Bile Duct Stones<br>- Morbid Obesity<br>- Intraoperative Cholangiogram<br>- Bile Spillage<br>- Pregnancy<br>- Immuno-suppression<br>- Insertion of Prosthetic Devices<br>- Laparoscopic converts to Laparotomy | - iv Cefuroxime 1.5g + iv Metronidazole 500mg<br>OR<br>- iv Amoxicillin-clavulanate 1.2g[e] |
| Endoscopic Retrograde Cholangio-pancreatography (ERCP) | - Biliary Obstruction | - po Ciprofloxacin 500-750 mg 2 hours prior to procedure<br>OR<br>- iv Tazocin 4.5 g 1 hour prior to procedure |

| | | |
|---|---|---|
| Appendectomy | | - iv Cefuroxime 1.5g + iv Metronidazole 500mg OR<br>- iv Amoxicillin-clavulanate 1.2g[e] |
| Colorectal | - Most procedures require parenteral ± oral prophylaxis | *Parenteral*<br>- iv Cefuroxime 1.5 g + iv Metronidazole 500mg OR<br>- iv Amoxicillin-clavulanate 1.2g[e]<br><br>*Oral*<br>- po Neomycin and erythromycin base 1g each tds (three times a day) the day before operation |
| Abdominal/ vaginal Hysterectomy | | - iv Cefazolin 1g[b]<br>OR<br>When vaginal wound is present:<br>- iv Cefuroxime 1.5 g + iv Metronidazole 500mg OR<br>- iv Amoxicillin-clavulanate 1.2g[e]<br><br><u>note:</u> For Cesarean Section, the initial dose of antimicrobial agents should be given immediately after clamping the umbilical cord. |
| Cesarean Section | - Emergency procedures (e.g. premature rupture of membrane) | |
| Abortion[d] | | - Antimicrobial prophylaxis should be based on individual clinical condition. |
| Urology | - Significant bacteriuria<br>- TURP, TURBT, TUR,<br>- Stone Operations,<br>- Nephrectomy<br>- Total Cystectomy | - Treat according to mid-stream urine culture result prior to elective procedures. |
| | - Trans-Rectal Prostate Biopsy/ FNA | - po Ciprofloxacin/ Levofloxacin 500mg +/- po Metronidazole 400mg given 2 hours before procedure |
| Hernia Repair[f] | - Non Mesh Hernia Repair | - Antimicrobial prophylaxis is not indicated. |
| | - Adult Hernia Mesh Repair | - iv Cefazolin 1g[b] OR<br>- iv Cefuroxime 1.5g |

| | | |
|---|---|---|
| Mastectomy | - Without implant | - Antimicrobial prophylaxis is not indicated. |
| | - With implant / foreign body | - iv Cefazolin 1g[b] OR<br>- iv Cefuroxime 1.5g |

**Antimicrobial prophylaxis in contaminated-infected operations**

| Type of Operation | Indications | Recommended drugs[g] |
|---|---|---|
| Ruptured Viscus | For treatment of established infection | - iv Cefuroxime 1.5g + iv Metronidazole 500mg OR<br>- iv Amoxicillin-clavulanate 1.2g[e]<br><br>( Therapy is often continued for about five days) |
| Bite Wound | For treatment of established infection | iv or po Amoxicillin-clavulanate[e] |
| Traumatic Wound | For treatment of established infection | - iv Cefazolin 1-2 g[b] OR<br>- iv Cefuroxime 1.5 g OR<br>- iv Amoxicillin-clavulanate 1.2g[e] |

**Remarks:**

[a]The dose of antimicrobial agents recommended in the guidelines is based on adult patient with normal renal function. Special attention should be paid to patient with renal impairment, on renal replacement therapy, or if there is potential drug-drug interaction.

- Consultation to Clinical Microbiologist, Infectious Disease Physician and Clinical Pharmacist is required in complicated cases.

[b]Give Cefazolin 2g for patients with body weight greater than 80 kg.
For patients allergic to Cefazolin, Vancomycin 1 g infused over at least 1 hour should be given after premedication with an antihistamine. Rapid IV administration may cause hypotension, which could be especially dangerous during induction of anesthesia.

[c]For hospitals or units with a high incidence of postoperative wound infections by MRSA or MRSE, screening for MRSA may be indicated to identify patients for additional preoperative measures such as Chlorhexidine bath, 2% Mupirocin nasal ointment [Bactroban Nasal] and / or the use of Vancomycin as preoperative prophylaxis. (*Bratzler, DW, Hunt, DR. The Surgical Infection Prevention and Surgical Care Improvement Projects: National initiatives to improve outcomes for patients having surgery. Clin Infect Dis 2006; 43:322* and *Antimicrobial prophylaxis for surgery. Treat Guidel Med Lett 2006; 4:83*)

[d]The optimal antibiotic and dosing regimens for abortion are unclear. The recommended antimicrobial prophylaxis for abortion stated in ROCG clinical guidelines is level C recommendations and may be suitable. They include: Metronidazole 1g rectally at the time of abortion plus Doxycline 100mg orally twice daily for 7 days, commencing on the day of abortion; OR Metronidaozle 1g rectally at the time of abortion plus Azithromycin 1g orally on the day of abortion.

[e]Amoxicillin-clavulanate and Ampicillin-sulbactam are similar in spectrum coverage and centers may choose to use Ampicillin-sulbactam.

[f]Amoxicillin-clavulanate may be used if the operation is such that anaerobic coverage is needed, such as in diabetic foot, hernia repair with bowel strangulation or incarcerated/ strangulated hernia or mastectomy with implant or foreign body.

[g]Antimicrobial agents should be considered postoperatively for operations with suppurative, ruptured and gangrenous conditions.

**NOTICE**

Appendix 1 contains information relating to general principles of medical care, which should not be construed as specific instructions for individual patients. Manufacturers' product information and package inserts should be reviewed for the latest information, including contraindications, dosages and precautions. The Scientific Committee on Infection Control and the working group are not responsible for errors or omissions or for any consequences from the application of the information in the Appendix 1 and make no warranty, express or implied, with respect to the currency, accuracy, or completeness of the contents of Appendix 1. Application of this information in a particular situation remains the professional responsibility of the health care professionals. Readers are reminded that some products may not be available in their institutes.

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