Clinical Guideline

This guideline serves as a guide and does not replace clinical judgment.

Surgical Site Infection (SSI) Bundle

CHoR – Pediatrics

Purpose

To ensure that optimal procedures are followed to reduce the risk of surgical site infections in patients undergoing invasive procedures. Surgical site infection (SSI) is a potential complication of surgery that can lead to significant morbidity and mortality for patients. The Centers for Disease Control and Prevention (CDC) and Children's Hospitals' Solution for Patient Safety (SPS) have published evidence-based SSI prevention bundles that provide recommendation for practice.

Children's Hospital of Richmond (CHoR) practice aligns with these prevention bundles, the elements of which are summarized in the following table:

CHoR SSI Bundle

	SSI Prevention Bundle Element	Evidence
1	Alcohol-containing skin preparation	*1A
2	Prophylactic antibiotic timing	*1B/**Scenario 1

*CDC Modified Recommendation Category
1A- A strong recommendation supported by high to moderate quality evidence suggesting net clinical benefits or harms.
1B- A strong recommendation supported by low quality evidence suggesting net clinical benefits or harms, or an accepted practice (i.e., aseptic technique) supported by low to very low-quality evidence.
**SPS Evidence
Scenario 1: Reliably implementing element is associated with statistically significant improvement.

It is the practice of CHoR to implement actions that reduce the risk of SSIs, referred to as a Surgical Site Infection Bundle (SSI Bundle).

1. Specific action techniques used are directed at reducing opportunities for microbial contamination of the patient's tissues and/or sterile instrumentation based on evidence-based practice.
2. All approved anti-microbial agents are used according to the manufacturer's instructions for use. Surgical antimicrobial prophylaxis will be used as a critical adjunctive technique.
3. Adherence to principles of aseptic technique.

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Procedure

1. Alcohol-containing Skin Preparation
   A. Alcohol-containing skin preparation should be used unless contraindications exists (*See Appendix A*).
      I. Follow manufacturer's instruction for use for application. Use drip towels to prevent pooling of the solution.
      II. Follow manufacturer's instructions for use and dry time.
      III. Upon completion of the skin preparation, all prepping materials are disposed of in the trash receptacle and placed 6 feet or greater from the surgical field.
   B. If alcohol-containing skin preparation cannot be used due to patient allergy and/or contraindication(s) (i.e., location of surgical procedure, emergent case), confirm the surgical prep solution with the surgeon and follow manufacturer's instruction for use for application and dry time.

2. Prophylactic Antibiotic Timing
   A. Perioperative intravenous antibiotics will be administered to all patients undergoing selected invasive procedures, within 60 minutes before the incision is made and re-dosed appropriately.
   (See Appendix B & C for surgical prophylaxis recommendations and dosing in pediatric patients)
      I. Exceptions:
         i. Vancomycin and Fluoroquinolones, which is given 60-120 minutes prior to incision.
         ii. Special consideration for procedures involving a tourniquet: the prophylactic antibiotic should be administered prior to tourniquet inflation opposed to incision unless the patient's condition warrants the tourniquet to go up before antibiotic administration.
   B. It is the responsibility of the Attending Operative Physician and the Attending Anesthesiologist to ensure appropriately timed intravenous prophylactic antibiotics.
   C. If the patient is allergic to the recommended agent, the Anesthesia provider will consult the Attending Operative Physician.
   D. Antibiotics should be re-administered every 2 half-lives for the duration of the procedure (*See Appendix C*).
   E. Post-operative prophylactic antibiotics must be stopped within 24 hours, based on the surgery end time.

Definitions

- **Surgical Site Infection (SSI)** – Infection that can develop within 30 days (in some cases up to 90 days) after an operation, at the site where the tissue is manipulated during the procedure, per NSQIP, NHSN and/or SPS criteria.
- **Aseptic Technique** – Method used in surgical procedures to prevent contamination of the wound and operative site with microorganisms.
- **CHG** – Chlorhexidine gluconate
- **Prep** – A process to reduce microorganisms of the skin at the surgical site.
- **Scrub** – The initial portion of the surgical prep which utilizes a soapy anti-microbial solution to prepare the skin for surgery.
- **Paint or Solution** – The final stage of the prep utilizing an anti-microbial agent which is allowed to dry on the skin for continued anti-microbial action.

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APPENDIX A – Surgical Skin Prep Chart

Surgical Specialty	Anatomic Location	Suggested Skin Prep	Alternate Skin Prep	Notes
 GENERAL SURGERY	TORSO	ChloraPrep		Use Betadine scrub & paint: • <2 months of age & allergy to CHG • Internal genitalia
	ABDOMEN +1- GROIN	ChloraPrep		
	PERINEUM/GENITALIA +/- GROIN	ChloraPrep		
	EXTREMITIES	ChloraPrep		
 NEUROSURGERY*	SCALP	ChloraPrep	Chlorohexidine wash (4% chlorohexidine) Alcohol Betadine scrub and paint ChloraPrep	Use Betadine scrub & paint: • <2 months of age & allergy to CHG
	FACE	Betadine scrub & paint		
	SPINE	ChloraPrep		
	TORSO	ChloraPrep		
	ABDOMEN +/- GROIN	ChloraPrep		
 CARDIOTHORACIC	CHEST	ChloraPrep	Betadine scrub and paint Alcohol ChloraPrep	Use Betadine scrub & paint: • <2 months of age & allergy to CHG
	ABDOMEN	ChloraPrep		
 ENT & EYES	SCALP	ChloraPrep	Discuss with surgeon	Use Betadine scrub & paint: • <2 months of age & allergy to CHG
	FACE	Betadine scrub & paint		
	EYES	Betadine		
	EARS	Betadine scrub & paint		
	NECK	ChloraPrep		
 ORTHOPEDICS	SPINE	ChloraPrep		Use Betadine scrub & paint: • <2 months of age & allergy to CHG • Internal genitalia
	PERINEUM/GENITALIA +/- GROIN	ChloraPrep		
	EXTREMITIES	ChloraPrep		
 PLASTIC SURGERY	SCALP/CRANIOFACIAL	Betadine scrub & paint	Skin graft case; confirm prep with surgeon	Use Betadine scrub & paint: • <2 months of age & allergy to CHG • Near eyes, ears, mouth
	SCALP NON-CF/SOFT TISSUES	ChloraPrep		
	FACE	Betadine		
	NECK	ChloraPrep		
	BREAST	PurPrep		
	TORSO	ChloraPrep		
	ABDOMEN +/- GROIN	ChloraPrep		
	EXTREMITIES	ChloraPrep		
 UROLOGY	ABDOMEN +/- GROIN	ChloraPrep		Use Betadine scrub & paint: • <2 months of age & allergy to CHG • Internal genitalia
	PERINEUM/GENITALIA +/- GROIN	Betadine		

Evidence Based Practice – Alcohol-containing preparation should be used unless contraindications exists.
ChloraPrep – Use caution on children less than 2 months of age (consider using clear ChloraPrep). Do not use on open wound(s).
*Neurosurgery – Separate preps are used on the head and the body

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APPENDIX B: Recommended Antibiotic Prophylaxis Based on Body Site and Procedure

Surgery	Antibiotic	Beta-lactam Allergy
Cardiac, Neurosurgery, Orthopedic, Thoracic, Vascular		
Cardiac, Neurosurgery, Orthopedic, Thoracic, Vascular	Cefazolin **Posterior Spinal Fusion**: Cefazolin **PLUS** Gentamicin^^ ^^Note different gentamicin dosing	Clindamycin **OR** Vancomycin Posterior Spinal Fusion: See above **PLUS** Gentamicin^^ ^^Note different gentamicin dosing
Endocarditis Prophylaxis*	Oral: Amoxicillin IV: Cefazolin	Oral: Clindamycin$$ IV: Clindamycin$$ $$Note different clindamycin dosing
Gastrointestinal/Biliary		
Esophageal, **NON-obstructed** gastroduodenal and jejunal, Biliary	Cefazolin	Clindamycin **PLUS** Gentamicin
Obstructed gastroduodenal and jejunal	Cefazolin **PLUS** Metronidazole Alternative Cefoxitin	Metronidazole **PLUS** Gentamicin
Ileal and Colorectal		Clindamycin **PLUS** Gentamicin
Appendectomy for Uncomplicated Appendicitis	Cefazolin +/- Metronidazole[a] +/- Ceftriaxone[b] Alternative Cefoxitin [a]If 30 mg/kg/dose not given in the past 24 hours or 10 mg/kg/dose not given in the past 8 hours [b]If 50 mg/kg/dose not given in the past 24 hours	Clindamycin **PLUS** Gentamicin
Head and Neck		
Clean	None	None
Clean with placement of prosthesis (excludes tympanostomy tubes)	Cefazolin	Clindamycin
Clean-contaminated (entry into aerodigestive tract OR major intraoral surgery)	Ampicillin-sulbactam	Clindamycin
Urologic		
Clean **WITHOUT** entry into urinary tract (hernia repair, orchiopexy, circumcision)	None **Risk factors (complex medical history, heart disease, ect):** Cefazolin	Clindamycin **OR** Vancomycin
Clean **WITH** entry intro urinary tract (hypospadias repair, partial nephrectomy, ureteral re-implant, pyeloplasty)	Cefazolin	Clindamycin **PLUS** Gentamicin
Procedure with entry into intestine (MACE, Monti, augmentation cystoplasty)	Cefazolin **PLUS** Metronidazole	Metronidazole **PLUS** Gentamicin
Lower tract instrumentation with risk factor for infection	Cefazolin	Gentamicin

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APPENDIX C: Recommended Antibiotic Prophylaxis Dosing

Age/Weight	Dosing	Intra-operative re-dosing interval for prolonged procedures or major blood loss (>20 mL/kg)[c]
Amoxicillin		
Infants > 1 month, children, and adolescents	50 mg/kg/dose (max = 2000 mg)	No re-dose
Ampicillin-Sulbactam		
Neonates ≤ 1 month	50 mg/kg/dose of ampicillin component (max = 2000 mg)	12 hours
Infants > 1 month, children, and adolescents	50 mg/kg/dose of ampicillin component (max = 2000 mg)	2 hours
Cefazolin		
Neonates ≤7 days **OR** ≤2 kg	25 mg/kg/dose	12 hours
Neonates >7 days **AND** >2 kg	25 mg/kg/dose	8 hours
Infants > 1 month, children, and adolescents	30 mg/kg/dose (max = 2g; if >120kg: 3g)	4 hours
Cefoxitin		
Neonates ≤ 1 month	30 mg/kg/dose (max = 2000 mg)	4 hours
Infants > 1 month, children, and adolescents	40 mg/kg/dose (max = 2000 mg)	2 hours
Ceftriaxone		
Infants > 1 month, children, and adolescents	50 mg/kg/dose (max = 2000 mg)	12 hours
Ciprofloxacin		
Children ≤ 40 kg	10 mg/kg/dose (max = 400 mg)	8 hours
Children > 40 kg	400 mg	8 hours
Clindamycin		
Neonates ≤7 days **OR** ≤2 kg	7.5 mg/kg/dose	12 hours
Neonates >7 days **AND** >2 kg	7.5 mg/kg/dose	6 hours
Infants > 1 month, children, and adolescents	10 mg/kg/dose (max= 900mg)	6 hours
[$$]Endocarditis Prophylaxis Only[$$]		
Infants > 1 month, children, and adolescents	ORAL/IV: 20 mg/kg/dose (max 600 mg)	No re-dose

[c] All intervals provided are based on normal renal function for age and weight – intervals should be adjusted for renal impairment. Contact CHoR pharmacy at 804-628-9566 for guidance.

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APPENDIX C: Recommended Antibiotic Prophylaxis Dosing

Age/Weight	Dosing	Intra-operative re-dosing interval for prolonged procedures or major blood loss (>20 mL/kg)[c]
Gentamicin		
Neonates PMA ≤ 29 weeks and ≤ 7 days	5 mg/kg/dose	No re-dose
Neonates PMA 30-34 weeks and ≤ 7 days	4.5 mg/kg/dose	No re-dose
Neonates, all other	4 mg/kg/dose	No re-dose
Infants > 1 month, children, and adolescents	2.5 mg/kg/dose	8 hours
^^Posterior Spinal Fusion ONLY^^		
Infants and children	7 mg/kg/dose	No re-dose
Adolescents	5 mg/kg/dose	No re-dose
Metronidazole		
Neonates	15 mg/kg/dose	No re-dose
Infants >1 month, children, adolescents and adults	15 mg/kg/dose (max = 500mg)	8 hours
Piperacillin-Tazobactam		
Neonates ≤7 days **OR** ≤2 kg	100 mg/kg/dose of piperacillin component	12 hours
Neonates >7 days **AND** >2 kg	100 mg/kg/dose of piperacillin component	8 hours
Infants >28 days to 9 months	80 mg/kg/dose of piperacillin component	2 hours
Infants >9 months, children, adolescents	100 mg/kg/dose of piperacillin component (max = 3000 mg)	2 hours
Vancomycin		
Neonates ≤7 days **OR** ≤2 kg	15 mg/kg/dose	No re-dose
Neonates >7 days **AND** >2 kg	15 mg/kg/dose	12 hours
Infants > 1 month and children ≤ 50 kg	15 mg/kg/dose (max = 1g)	12 hours
Children > 50 kg	15 mg/kg/dose (max = 1g)	12 hours

[c] All intervals provided are based on normal renal function for age and weight – intervals should be adjusted for renal impairment. Contact CHoR pharmacy at 804-628-9566 for guidance.

Executive Summary

Pediatric Surgical Site Infection (SSI) Bundle

CHoR – Pediatrics

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