LOW-RISK SPINAL FUSION

Algorithm 1: Preoperative

Pt undergoing or considering undergoing major spinal or chest wall deformity procedure (e.g., spinal fusion or magnetic growing rod insertion)

Pre-Op Surgical Assessment (1-4 months prior to surgery)
- Surgeon/PA, spine nurse, patient/family to attend
- Risk vs. benefit analysis
- Educate about steps prior to surgery and surgical procedure
- Discuss possible sub-specialty consults/evaluations

Spine nurse conducts phone follow up with family to complete assessment (RN Spine Pre-op care coordination call in Epic)

Spine nurse communicates with appropriate care team members to determine appropriate consults/evaluations and scheduling of appointments

Complete additional consults/evaluations as clinically indicated:
- Dermatology
- Nutrition
- Anesthesiology
- Others (if indicated)

Pre-Admission (1-2 weeks prior to surgery)
- Pre-op labs:
  - Hemoglobin
  - Type and screen
  - MRSA (less than 13 years and/or pre-menarchal)
- Pre-op Imaging as indicated
- Determine surgical antibiotic prophylaxis (consult Epidemiology/Infection control physician for patients who are currently on antibiotics or prior surgical site infection)
- Patient/family education
- Spine nurse to complete Safe for Surgery Checklist and review with provider

Day of Surgery
- Skin assessment
- Labs: Urine pregnancy test for 12 and older and/or post-menarchal, confirmatory Type and Screen
- Pre-op medications: Refer to Table 1 and Ortho IP Spinal Fusion Admission Orderset in Epic.

Inclusion Criteria
- Patients having spine surgery without other complex chronic conditions

Exclusion Criteria
- High-risk spinal fusion patients
- Non-ambulatory patients

Assess for mental health concerns and refer to psychology if needed

Spine class is required for patient/family education
- If unable to attend, will get same information at pre-op visit
Algorithm 2: Postoperative

**Orthopedics/Anesthesia team hand off patient to the PACU**

**Orthopedic Team Clinical Management**
- VTE prophylaxis for at risk patients in accordance with VTE Prevention Clinical Pathway. Discuss with surgeons need for enoxaparin if still at risk for VTE.
- Lung expansion protocol (q1 hour incentive spirometry while awake) *nursing to refer to protocol as needed
- Cold therapy as needed for pain
- **Post-op labs:**
  - Hemoglobin as clinically indicated
- **Post-op medications** as shown in Table 2 and the Ortho IP Spinal Fusion Post-Op Orders
- Dressing and incision care per the Surgical Site Infection (SSI) Spine Surgery Bundle
- Ensure adherence to activity and bowel regimen recommendations in green boxes to the right.

**Patient Discharged (see criteria below)**
- Follow up in 4-8 weeks post-op

**Discharge Criteria:**
- Stable respiratory status
- Tolerating oral intake
- Voiding
- Bowel movement not required prior to discharge
- Pain well controlled with oral medications and non-pharmacological approaches to pain control (i.e., cold therapy).
- Patient/parent/caregivers comfortable with discharge
- Cleared by physical therapy (TBD)
- Patient and/or parent/caregiver verbalize understanding of discharge teaching instructions

**Activity:**
- **Day of surgery- ALL patients:**
  - Sit on end of bed and/or get into chair with help from bedside nursing (*morning surgery patients)
  - Elevate head of the bed up to 90° as tolerated
  - Logroll every 2 hours and as needed.
  - Physical therapy twice daily until patient is cleared
- **Postoperative day 1:**
  - Physical therapy to assist patient to dangle legs over edge of bed and/or get into chair
  - Physical therapy to assess swift transferring to bedside chair and begin ambulation in afternoon
- **Postoperative day 2/3 until discharge:**
  - Ambulatory patients: Continue ambulation with physical therapist and practice stairs once cleared by PT.
  - Patient to continue to practice ambulation 3-4 times per day with parents/caregivers or bedside nursing

**Bowel Regimen:**
- See Table 3 for suggested medications for the Post-Operative Period
- Senna/Docusate twice a day
- Polyethylene glycol once a day
- Bisacodyl suppository starting post-op day 2
- Fleets enema PRN

**Inclusion Criteria**
- Patients having spine surgery without other complex chronic conditions

**Exclusion Criteria**
- High-risk spinal fusion patients
- Non-ambulatory patients

*If going to PICU, consult with orthopedic team to determine post-ICU disposition upon transfer to floor*
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Discharge Criteria
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Appendix A. Spine surgery patient algorithm for “Standard” Surgical Prophylaxis
Appendix B. Spine surgery patient algorithm for “Expanded” Surgical Prophylaxis

Table 1. Suggested Medications for the Pre-operative Period- “Standard Infection Risk”
Table 2. Suggested Medications for the Pre-operative Period - “Expanded Infection Risk”
Table 3. Suggested Medications for the Post-operative Period- All Patients

Parent | Caregiver Education

References

Clinical Improvement Team

TARGET POPULATION

Inclusion Criteria

• Patients having spine surgery without other complex chronic conditions

Exclusion Criteria

• High-risk spinal fusion patients
• Non-ambulatory patients

PRE-HOSPITAL MANAGEMENT

Assessment

• Evaluate the learning needs of the patient and caregivers prior to admission
  o Note: Evidence indicates a large portion of parents have limited literacy [Yin, 2009]. Parent health literacy may be linked to child health outcomes [Yin, 2009; DeWalt, 2009]

• Complete a psychosocial assessment prior to admission
  o Note: The psychosocial assessment should include evaluation of the family support system, plan for family post-surgery, school issues/concerns, guardianship, and resources
  o Nutrition assessment by registered dietician for patients with a body mass index (BMI) less than 10% for age or greater than 85% for age
CLINICAL PATHWAY

o Complete sleep assessment prior to surgery by asking the following four questions:
  • Does your child pause in their breathing at night?
  • Does your child struggle to take a breath at night?
  • Does your child feel sleepy during the day?
  • Does your child snore more than half of the night?

Education

• Patients over 11 years: should attend a pre-operative spine class
• Patients less than 11 years of age: should receive 1:1 pre-operative teaching
• Patients unable to attend a spine class: should receive 1:1 pre-operative teaching
  o Note: caregivers should receive education along with the patient
• It is suggested that patients and caregivers receive a tour of the hospital prior to surgery

Nutrition

• Encourage a well-balanced diet during the pre-operative period
  o Note: Adequate pre-operative nutrition has been associated with improved healing and decreased infection
    [Hatlen, 2010]
• Nil per os (NPO) guidelines according to anesthesia guidelines
  o Note: The American Society of Anesthesiologists recommends a minimum fasting period of eight hours for
    solids, 6 hours for nonhuman milk/formula and a minimum of two hours fasting from clear liquids before arrival
    time [Practice guidelines for pre-operative fasting, 2011]

Treatments

Preadmission pre-operative skin assessment

• Parents instructed not to shave or use depilatory on the patient’s back for at least a week prior to surgery
• Assessment of acne, tattoos and piercings

Preadmission pre-operative skin care the night before surgery

• Patient to shower the night before surgery
• After drying off from the shower, patient to use one packet (= 2 cloths) of 2% chlorhexidine gluconate cloths to
  wipe their entire surgical site; do not rinse with water; allow to air dry
  o Posterior surgery: base of neck, entire back from top of shoulders to upper buttocks, including sides
  o Anterior surgery: from midline chest around under the arm to the spine. Should wipe in the direction of
    the curve. Wipe under right arm for right-sided curve, and under left arm for left-sided curve. Spine
    nurses will inform family of proper location to wipe at pre-op appointment.
• Put on clean pajamas and place clean sheets on the patient’s bed

Pre-operative cleanse by pre-op nurse with 2% chlorhexidine gluconate (CHG) antiseptic cloth the morning of
the surgery

• Use one packet (= 2 cloths) to wipe the entire back from top of shoulders to upper buttocks, including sides,
  completely wetting the skin; discard cloths
• Allow skin to completely air dry – do not rinse
• Note: The use of a 2% chlorhexidine gluconate-coated cloth or 4% CHG soap with a standardized, timed
  process before hospital admission is an effective infection prevention strategy for reducing the risk of post-
  operative surgical site infections (SSIs) [Edmiston, 2010]
PRE-OPERATIVE MANAGEMENT

Assessment | Radiographs
- Posterior/Anterior (PA) and lateral standing radiographs in standard EOS prior to surgery
  - Scoliosis patients: PA standing bending radiographs,
  - Kyphosis patients: lateral bolster radiographs of the thoracic spine
  - Other radiographs as clinically indicated
  - MRI as clinically indicated

Assessment | Laboratory
- Nasal culture for methicillin-resistant *Staphylococcus aureus* (MRSA) within 30 days prior to surgery for patients less than 13 years and/or pre-menarchal
  - Note: Pre-operative testing and treatment of patients positive for MRSA has been shown to decrease the incidence of post-operative infections [Epstein, 2011]
- Urine analysis (UA) with microscopy obtained if clinically indicated
- Evaluation of Need for Pre-Admission Urinalysis and/or Culture

Spine Nurses preop screening call questions:
1. Do you have history of urinary tract infections (UTI's)?
   - a. Answer no – no follow up needed
   - b. Answer yes – educate parent/caregiver
     i. Note any signs/symptoms of UTI 1-2 weeks before surgery
     ii. If any frequency, burning, or foul-smelling urine call PCP to evaluate for UTI. PCP will treat if positive findings. Notify spine nurses if symptomatic and taking to PCP.

Preop visit (typically the week before surgery)
1. If answered yes to the above, spine nurse to follow up with parent/caregiver to ensure the patient saw PCP and no current symptoms.
2. If current symptoms send patient to PCP and/or obtain a UA based on provider recommendations
   - a. If UA obtained review results with PCP and ortho provider
      - Note: Pre-operative bacteriuria may increase post-operative complications [Hatlen, 2010]
- Urine pregnancy test for all females 12 years and older and/or postmenarchal
- Day of pre-op visit: Hgb and Type and screen to determine if antigens are present
- Day of surgery: If 72 hours or less confirmatory type and screen. If greater than 72 hours obtain type and screen.

Assessment | Other Tests
- Pulmonary function tests (PFTs) for patients with a thoracic scoliosis curve greater than 70°, kyphosis greater than 70°
- If history of uncontrolled asthma, need pulmonary consult who will then order PFT's.

Assessment | History of Skin Infections
- Assess any history of acne, eczema, rashes, tattoos, piercings, pressure sores
  - If presence of significant acne on back, patient should consult with PCP or dermatologist.
  - Any changes or infections in the past 3 months
  - Any history of wound infection following previous spine surgery
  - If yes needs an infectious disease consult preop
CLINICAL PATHWAY

Assessment | Weight and nutrition
- Concerns about weight or nutrition
- History of consult with GI or nutritionist
- Evaluate BMI < 10% or greater than 85% need nutrition consult; > 95% need expanded prophylaxis

Assessment | Other specialists involved in care
- Ensure other specialists aware and obtain surgical clearance if clinically indicated.
- Family history of clotting or bleeding disorders. If positive for genetic history of clotting or bleeding disorder, discuss with anesthesiologist and/or hematology for further recommendations.

Medications
- Please refer to **Table 1. Suggested Medications for the Pre-operative Period- “Standard Infection Risk”** or **Table 2. Suggested Medications for the Pre-operative Period - “Expanded Infection Risk”**
- Refer to the Order set in Epic: **Ortho IP Spinal Fusion Admission Orders**.

Antibiotics
- Please refer to **Spine Surgery Patient Algorithm for "Standard" Surgical Prophylaxis** for guidance on antibiotic ordering patients with AIS.
- Please refer to **Spine Surgery Patient Algorithm for "Expanded" Surgical Prophylaxis** for AIS patients with BMI greater or equal to 95%; or non AIS patients.

Pain Medications
- For patients who can swallow pills, give acetaminophen tablet on arrival to the pre-op area
- For patients who can’t swallow pills, give acetaminophen oral solution, chewable tablets, or IV acetaminophen will be given in the OR

INTRA-OPERATIVE CLINICAL MANAGEMENT

- All patients will have a specialized Spine Anesthesiologist for their surgery
- All patients will have the following lines placed: at least 2 large bore peripheral IVs, and arterial line, Clinical need for central venous catheter will be determined by anesthesiologist on the day of surgery.

Medications
- Limit use of volatile anesthetic, terminate use as soon as possible
- Antibiotics-
  - Please refer to **Spine Surgery Patient Algorithm for "Standard" Surgical Prophylaxis** and to **Spine Surgery Patient Algorithm for "Expanded" Surgical Prophylaxis**
    - Vancomycin infusion should be started after the arterial line is established
    - Other antibiotics should be administered after the patient is flipped prone
    - Redose antibiotics for blood loss and/or elapsed time per Appendix A.
- Intrathecal morphine
  - 7.5 mcg/kg (maximum dose 500 mcg)
  - If patient has documented obstructive sleep apnea (OSA), decrease dose to 5 mcg/kg (maximum dose 350 mcg)
- Total intravenous anesthetic (TIVA) with propofol (75-200 mcg/kg/min) and remifentanil (0.05-0.3 mcg/kg/min) infusions
• Ketamine infusion 0.1-0.4 mg/kg/hr
• Tranexamic Acid: 10 mg/kg bolus over 30 minutes (maximum 1 gram), then 5 mg/kg/hr
• Ketorolac 0.5 mg/kg (maximum 30 mg) at end of surgery, if approved by surgeons
• Acetaminophen re-dose (15 mg/kg) at 6 hours after initial acetaminophen dose
• Transfusion Management
  o Hemoglobin goal is > 8-9 or hematocrit > 24-27%
  o FFP, platelets, cryoprecipitate- guide use based on thromboelastogram

POST-OPERATIVE MANAGEMENT

Assessment | Monitoring
• Vital signs and neurovascular assessment every 4 hours for 24 hours, then every 8 hours until discharge.
• Continuous pulse oximetry if patient requires supplemental oxygen or is on patient-controlled analgesia
• Record output from indwelling catheter every 4 hours for the first 24 hours and then every 8 hours until discontinued
• Discontinue urinary catheter as soon as the patient can ambulate to the bathroom (post-op day 1 or 2)

Laboratory
• Hemoglobin monitoring (Blood bank has requested that hemoglobin be monitored. Approximate conversion from hemoglobin to hematocrit is multiplication by 3. Hgb 7 = Hct 21%, Hgb 8 = Hct 24%, etc.)
  o POD #1: All patients have hemoglobin checked
  o POD #2: Only check hemoglobin if the hemoglobin from POD #1 is < 10
  o POD #3: Only check hemoglobin if the hemoglobin from POD #2 is < 9
• Decision to transfuse should be based on clinical symptoms and hemoglobin
  o Persistent tachycardia not due to pain
  o Oxygen requirement despite aggressive pulmonary toilet
  o Symptoms of hypotension on standing

Medications
• Please refer to Table 3. Suggested Medications for the Post-operative Period - All patients and refer to the Order set in Epic: Ortho IP Spinal Fusion Post-Op Orders or Ortho IP Spinal Fusion PICU Post-op.

Antibiotics
• Continue antibiotic prophylaxis for 24 hours post-operatively. Please refer to Spine Surgery Patient Algorithm for "Standard" Surgical Prophylaxis for guidance on antibiotic ordering patients with AIS.
• Continue antibiotic prophylaxis for 24 hours post-operatively. Please refer to Spine Surgery Patient Algorithm for "Expanded" Surgical Prophylaxis for AIS patients with BMI greater or equal to 95%; or non AIS patients.

Pain Medication – confirm with Anesthesia
• Patient-Controlled Analgesia (PCA) (Morphine or Dilaudid)
  o No basal rate should be ordered due to intrathecal morphine given in OR. Only demand those ordered.
CLINICAL PATHWAY

- Discontinue PCA after patient has tolerated 2 doses of oral pain medications on post-op day 1
- See Patient-controlled Analgesia (PCA) Set-up, Administration, and Documentation

- Acetaminophen
  - Every 4 hours for 48 hours, then every 4 hours PRN

- Oxycodone
  - Every 4 hours for 48 hours, then every 4 hours PRN
  - First post-op dose to begin first post-op day at 0900 if patient has received IT morphine otherwise consult provider for start time ("Start PRN dose 4 hours after scheduled dose.")

- Ketorolac/Ibuprofen
  - Ketorolac IV scheduled every 6 hours beginning 0900 on the first post-operative day for 48 hours (total of 8 doses), then ibuprofen every 6 hours PRN until discharge
  - Do not give Ketorolac or ibuprofen to patients with underlying kidney disease.

- Diazepam
  - Oral every 6 hours as needed for spasms. Use lowest effective dose

Bowel Regimen

- Senna/Docusate tablets or senna oral syrup twice a day started post-op day 1
- Polyethylene glycol once a day started post-op day 1
- Bisacodyl (Magic Bullet) suppository on post-op day 2 then QD as needed
- Fleets enema every day PRN if no results with suppository

Other Medications

- Nalbuphine every 3 hours as needed for pruritis
- Ondansetron every 6 hours for 24 hours (IV), then every 6 hours PRN nausea (Oral)
- Scopolamine patch every 72 hours, for patients 12 years of age and older
- Famotidine once or twice daily until patient is tolerating food intake/PO

Activity

**Day of surgery- ALL patients:**

- Sit on end of bed and/or get into chair with help from bedside nursing (*morning surgery patients)*
- Elevate head of the bed up to 90° as tolerated
- Logroll every 2 hours and as needed.
- Physical therapy twice daily until patient is cleared

**Post-operative Day 1**

- Physical therapy to assist patient to dangle legs over edge of bed and/or get into chair
- Physical therapy to assess swift transferring to bedside chair and begin ambulation in afternoon

**Post-operative Day 2&3 to Discharge**

- Ambulatory patients: Continue ambulation with physical therapist and practice stairs once cleared by PT.
- Patient to continue to practice ambulation 3-4 times per day with parents/caregivers or bedside nursing
Nutrition

- Regular diet on post-op day 1 is ordered but should only have clear liquids or bland foods (such as crackers, toast, smoothie) as tolerated on the day of surgery.
- Provide a light diet for breakfast on postoperative day 1 and then advance to regular diet as tolerated.
- A well-balanced, high fiber diet with small frequent meals and increased caloric intake should be provided to encourage healing.

Treatments

VTE prevention

- Patients at risk for Venous Thromboembolism (VTE) receive prophylaxis in accordance with the VTE guideline.
- All spine patients receive SCD’s post-op.

Cold therapy

- As needed to decrease pain.
- Cold therapy is provided to patients for comfort and not necessarily to manage swelling or drainage.
- If the patient does not tolerate cold therapy, it does not need to be used.
- Family to take cold therapy unit home upon discharge.

Foley catheter

- Discontinue when the patient is able to ambulate to the bathroom (post-op day 1 or day 2).

Incentive spirometry (14cc/kg)

- 10 times per hour while awake.
- If not able to consistently achieve 14cc/kg on incentive spirometer, EZ pap treatments should be implemented per lung expansion protocol.

Dressing care

- Please refer to the Surgical Site Infection (SSI): Spine Surgery Target Zero Bundle.
- Please consult plastic surgeons for wound care and activity orders if plastics surgery did the wound closure.
- Reinforce dressings if saturated until first dressing change.
- Dressing options (3)
  - Prineo w/Mepilex and Tegaderm
    - Remove mepilex and tegaderm on POD3 (if discharged POD2, caregivers remove at home on POD3).
      - Do not replace mepilex prior to discharge unless incision is draining.
      - Leave prineo intact upon discharge.
    - Parents to remove Prineo 3 weeks after day of surgery.
  - Zipline
    - Remove mepilex and tegaderm on POD3 (if discharged POD2, caregivers remove at home on POD3).
      - Do not replace mepilex prior to discharge unless incision is draining.
      - Leave Zipline intact upon discharge.
    - Caregiver may remove zipline 3 weeks after discharge by applying baby oil along the whole length of the zipline, which will allow for gentle separation from the skin.
  - If patient has Prevena Wound Vac.

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This is left on for 7 days after surgery. It is removed at home by the family or by an RN in the clinic. The wound vac is disposable.

- The family should be sent home with the black charging plug, or the wound vac will run out of battery. Family should be instructed on how to troubleshoot the wound vac prior to discharge.
- When removing the wound vac, care should be taken to leave the Zip surgical closure on the incision.

- The prineo or zipline is allowed to get wet in the shower
- No tub baths, no hot tubs, no swimming in lakes or oceans until your surgeon says it’s OK
- Assess for clinical signs and symptoms of surgical site infection and, if present, report to surgical team
- Discharge teaching includes hand hygiene, dressing/wound care and showering.

**DISCHARGE CRITERIA**

Patient should not be discharged until the following criteria have been met:

- Off oxygen as clinically indicated
- Tolerating oral intake
- Voiding
- Bowel movement (BM) not required prior to discharge if NOT symptomatic (nausea, vomiting, distention)
- Pain well controlled with oral medications
- Cleared by PT
- Patient or caregiver can verbalize understanding of discharge teaching instruction

**FOLLOW-UP**

- Follow up by nurse telehealth visit or phone call (if telehealth not available) within 2 weeks of discharge
- Follow-up visits with provider occur at 4 to 8 weeks post-operatively and annually from the surgical date until discharged from care by the provider.
  - Visits can be virtual or in-person per provider discretion
- Additional visit may be advised per provider discretion
APPENDIX A. SPINE SURGERY PATIENT ALGORITHM FOR “STANDARD” SURGICAL PROPHYLAXIS

**STANDARD INFECTION RISK PATIENT**

All Spine Surgery Patients having Implants
Exceptions: hardware removal

- age 13 years and/or
- Post-menarcheal
- and/or knows MRSA+

**MRSA +**

Screen for MRSA (within 1 month of surgery date)

- age 13 years and/or
- Pre-menarcheal

**MRSA -**

Vancomycin 15 mg/kg (max dose 2000 mg) for gram (+) MRSA / P. aeruginosa coverage
AND
Cefazolin 30 mg/kg (max dose 2000 mg) if greater than or equal to 120 kg, dose is 3000 mg for gram (+) MSSA coverage.

Cefazolin 30 mg/kg (max dose 2000 mg) if greater than or equal to 120 kg, dose is 3000 mg for gram (+) MSSA coverage.

**PRE-OP**

INCISION

Intraoperative Redosing from start of Prep dose*:
- Vancomycin 15 mg/kg (max dose 2000 mg) every 8 hours
- Cefazolin 30 mg/kg (max dose 2000 mg) if greater than or equal to 120 kg, dose is 3000 mg every 4 hours

**ALSO**

For every 50% blood volume loss give half dose as below:
- Vancomycin 7.5 mg/kg (max dose 1030 mg)
- Cefazolin 15 mg/kg (max dose 1000 mg) if ≥ 120 kg, dose is 1500 mg

**INTRA-OP**

Intraoperative Redosing from start of Prep dose*:
- Cefazolin 30 mg/kg (max dose 2000 mg) if greater than or equal to 120 kg, dose is 3000 mg every 4 hours

**ALSO**

For every 50% blood volume loss give half dose as below:
- Cefazolin 15 mg/kg (max dose 1000 mg) if ≥ 120 kg, dose is 1500 mg

**POST-OP**

Vancomycin 15 mg/kg (max dose 2000 mg) every 8 hrs x 3 doses
AND
Cefazolin 30 mg/kg (max dose 2000 mg) if greater than or equal to 120 kg, dose is 3000 mg every 8 hours x 3 doses

Cefazolin 30 mg/kg (max dose 2000 mg), if greater than or equal to 120 kg the dose is 3000 mg every 8 hrs x 3 doses

Discontinue All Antibiotics

**Alternative Antibiotics for Allergies:**
- If Cefazolin allergy = give Vancomycin
- If Vancomycin true allergy (not infusion reaction) = give Cefazolin + Clindamycin
- If allergy to Cefazolin + true allergy to Vancomycin = give Clindamycin

**Antibiotic Dosing for Allergies:**
- Clindamycin 10 mg/kg (max dose 900 mg), Prep dose started and completed within 120 min prior to incision

**Antibiotic Intraop Redosing for Allergies**
- Clindamycin 10 mg/kg (max dose 900 mg)
- Redosing every 6 hrs intrasp.* from start of Prep dose
- For 50% blood volume loss, give 50% of dose (5 mg/kg up to 450 mg). If within 30 minutes of next redose time, give full dose.

*When antibiotic redosing based on time requirement, blood volume loss resets to 6% for that specific antibiotic.
**Applies to patients with normal renal and hepatic function. Otherwise consult Pharmacy.
APPENDIX B. SPINE SURGERY PATIENT ALGORITHM FOR “EXPANDED” SURGICAL PROPHYLAXIS

EXPANDED INFECTION RISK PATIENT

2 age 13 years and/or Post-menarcheal and/or known MRSA

MRSA + or unable to Screen

Vancomycin 15 mg/kg (max dose 2000mg) for gram (+) MRSA / P. aeruginosa coverage
Cefazolin 30 mg/kg (max dose 2000 mg if greater than or equal to 120 kg, dose is 3000 mg) for gram (-) MSSA coverage.

Screen for MRSA

< age 13 years and/or Pre-menarcheal

MRSA -

Cefazolin 30 mg/kg (max dose 2000 mg if greater than or equal to 120 kg, dose is 3000 mg) for gram (+) MSSA coverage.

Ceftriaxone 50mg/kg x 1 dose (max dose 2000 mg) for gram [-] coverage
No regular interval redosing intracpt needed

PRE-OP

INTRA-OP

Intraoperative Redosing from start of Preop dose:
Vancomycin 15 mg/kg (max dose 2000 mg) every 8 hours
Cefazolin 30 mg/kg (max dose 2000 mg if greater than or equal to 120 kg, dose is 3000 mg) every 8 hours

* * * * * * * ALSO * * * * * * *

For every 50% blood volume loss give half dose as below:
Vancomycin 7.5 mg/kg (max dose 1000 mg)
Cefazolin 15 mg/kg (max dose 1000 mg, if ≥ 120 kg, dose is 1500 mg)
Ceftriaxone 25 mg/kg (max dose 1000 mg)

POST-OP

Discontinue All Antibiotics

Vancomycin 15 mg/kg (max dose 2000 mg)
every 8 hrs x 3 doses
Cefazolin 30 mg/kg (max dose 2000 mg if greater than or equal to 120 kg, dose is 3000 mg)
every 8 hrs x 3 doses

Intraoperative Redosing from start of Preop dose:
Cefazolin 30 mg/kg (max dose 2000 mg if greater than or equal to 120 kg, dose is 3000 mg) every 4 hours

* * * * * * * ALSO * * * * * * *

For every 50% blood volume loss give half dose as below:
Cefazolin 15 mg/kg (max dose 1000 mg, if ≥ 120 kg, dose is 1500 mg)
Ceftriaxone 25 mg/kg (max dose 1000 mg)

Alternative Antibiotics for Allergies:
If Cefazolin allergy - give Vancomycin
If Vancomycin true allergy (not infusion reaction) - give Cefazolin
If allergy to Cefazolin + true allergy to Vancomycin - give Ceftriaxone
If allergy to Cefazolin - give Levofloxacin

Antibiotic Intraop Redosing for Allergies:
Ceftriaxone 10 mg/kg (max dose 500 mg)
Redosing every 6 hrs intraop from start of Preop dose
For 50% blood volume loss, give 50% of dose (5 mg/kg up to 500 mg)
If within 30 minutes of next redose time, give full dose

Levofloxacin 10 mg/kg (max dose 500 mg)
Redosing from start of Preop dose: None
For 50% blood volume loss, give 50% of dose (5 mg/kg up to 250 mg)

CURRENT OR ALLERGIC, CONSULT EPIC FOR RECOMMENDED ANTIMICROBIAL PROPHYLAXIS

*When antibiotic redosing based on time requirement, blood volume loss results to 0% for that specific antibiotic.
**Applicable to patients with normal renal and hepatic function. Otherwise consult Pharmacy.
<table>
<thead>
<tr>
<th>Medication</th>
<th>Indication</th>
<th>Dose</th>
<th>Frequency</th>
<th>Route</th>
<th>Maximum Dose</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cefazolin</td>
<td>Pre-operative antibiotic prophylaxis for MSSA</td>
<td>30 mg/kg</td>
<td>ONCE</td>
<td>IV</td>
<td>2,000 mg</td>
<td>Complete infusion within 60 minutes before surgical incision</td>
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<tr>
<td>Vancomycin</td>
<td>Pre-operative antibiotic prophylaxis for beta-lactam allergy, MRSA positive, P. acnes coverage also for age &gt; 13 years and/or post-menarchal</td>
<td>15 mg/kg</td>
<td>ONCE</td>
<td>IV</td>
<td>2,000 mg</td>
<td>Pre-op dose completed within 60 minutes of incision. Patients with documented Red Mans Syndrome should receive diphenhydramine pre-medication and 120 minute infusion of vancomycin</td>
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<tr>
<td>Clindamycin</td>
<td>Pre-operative antibiotic prophylaxis for patients allergic to vancomycin</td>
<td>10 mg/kg</td>
<td>ONCE</td>
<td>IV</td>
<td>900 mg</td>
<td>Complete infusion within 60 minutes of surgical incision</td>
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<tr>
<td>Topical Vancomycin Powder</td>
<td>For topical use only in the OR</td>
<td>Short segments 500 mg Segments that include the thoracic OR lumbar curve: 1000 mg Segments that include the thoracic AND lumbar curve: 2000 mg</td>
<td>ONCE</td>
<td>Topical</td>
<td>2,000 mg</td>
<td></td>
</tr>
<tr>
<td>PRE-MEDICATIONS</td>
<td></td>
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</tr>
<tr>
<td>Diphenhydramine</td>
<td>Vancomycin pre-medication for patients with documented Red Mans Syndrome</td>
<td>1 mg/kg</td>
<td>ONCE</td>
<td>IV</td>
<td>50 mg</td>
<td></td>
</tr>
<tr>
<td>PAIN MEDICATIONS</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Acetaminophen</td>
<td>Pre-operative pain medication</td>
<td>10-15 mg/kg</td>
<td>ONCE</td>
<td>PO</td>
<td>650 mg</td>
<td>For patients who cannot swallow pills give IV acetaminophen 15 mg/kg (max dose 650 mg)</td>
</tr>
<tr>
<td></td>
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</tr>
</tbody>
</table>
Table 2. Suggested Medications for the Pre-operative Period - “Expanded Infection Risk”

<table>
<thead>
<tr>
<th>Medication</th>
<th>Indication</th>
<th>Dose</th>
<th>Frequency</th>
<th>Route</th>
<th>Maximum Dose</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANTIBIOTICS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cefazolin</td>
<td>Pre-operative antibiotic prophylaxis for MSSA</td>
<td>30 mg/kg</td>
<td>ONCE</td>
<td>IV</td>
<td>2,000 mg</td>
<td>(if greater than or equal to 120 kg, dose is 3,000 mg) Complete infusion within 60 minutes before surgical incision</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>Pre-operative antibiotic prophylaxis for beta-lactam allergy, MRSA positive, <em>P. acnes</em> coverage also for age &gt; 13 years and/or post-menarchal</td>
<td>15 mg/kg</td>
<td>ONCE</td>
<td>IV</td>
<td>2,000 mg</td>
<td>Pre-op dose completed within 60 minutes of incision. Patients with documented Red Mans Syndrome should receive diphenhydramine pre-medication and 120 minute infusion of vancomycin</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>Pre-operative antibiotic prophylaxis for gram negative coverage</td>
<td>50 mg/kg</td>
<td>ONCE</td>
<td>IV</td>
<td>2,000 mg</td>
<td></td>
</tr>
<tr>
<td>Clindamycin</td>
<td>Pre-operative antibiotic prophylaxis for patients allergic to vancomycin</td>
<td>10 mg/kg</td>
<td>ONCE</td>
<td>IV</td>
<td>900 mg</td>
<td>Complete infusion within 60 minutes of surgical incision</td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>Pre-operative antibiotic prophylaxis for patient allergic to ceftriaxone</td>
<td>10 mg/kg</td>
<td>ONCE</td>
<td>IV</td>
<td>500 mg</td>
<td>Preop dose started and completed within 120 min prior to incision</td>
</tr>
<tr>
<td>Topical Vancomycin Powder</td>
<td>For topical use only in the OR</td>
<td>Short segments: 500 mg Segments that include the thoracic OR lumbar curve: 1000 mg Segments that include the thoracic AND lumbar curve: 2000 mg</td>
<td>ONCE</td>
<td>Topical</td>
<td>2,000 mg</td>
<td></td>
</tr>
<tr>
<td><strong>PRE-MEDICATIONS</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diphenhydramine</td>
<td>Vancomycin pre-medication for patients with documented Red Mans Syndrome</td>
<td>1 mg/kg</td>
<td>ONCE</td>
<td>IV</td>
<td>50 mg</td>
<td></td>
</tr>
<tr>
<td><strong>PAIN MEDICATIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acetaminophen</td>
<td>Pre-operative pain medication</td>
<td>10 to 15 mg/kg</td>
<td>ONCE</td>
<td>PO</td>
<td>650 mg</td>
<td>For patients who cannot swallow pills give IV acetaminophen 15 mg/kg (max dose 650 mg)</td>
</tr>
</tbody>
</table>
### Table 3. Suggested Medications for the Post-operative Period - All Patients

<table>
<thead>
<tr>
<th>Medication</th>
<th>Indication</th>
<th>Dose</th>
<th>Frequency</th>
<th>Route</th>
<th>Maximum Dose</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANTIBIOTICS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cefazolin</td>
<td>Post-operative antibiotic prophylaxis for MSSA</td>
<td>30 mg/kg/dose</td>
<td>Every 8 hours x 24 hours post-op (3 doses)</td>
<td>IV</td>
<td>2,000 mg (if greater than or equal to 120 kg, dose is 3,000 mg)</td>
<td>Patients with documented Red Mans Syndrome should receive diphenhydramine pre-medication and 120 minute infusion of vancomycin</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>Post-operative antibiotic prophylaxis for beta-lactam allergy, MRSA positive, P. acnes coverage also for age &gt; 13 years and/or postmenarchal</td>
<td>15 mg/kg/dose</td>
<td>Every 8 hours x 24 hours post-op (3 doses)</td>
<td>IV</td>
<td>2,000 mg</td>
<td></td>
</tr>
<tr>
<td>Clindamycin</td>
<td>Post-operative antibiotic prophylaxis for patients allergic to vancomycin</td>
<td>10 mg/kg/dose</td>
<td>Every 8 hours x 24 hours post-op (3 doses)</td>
<td>IV</td>
<td>900 mg</td>
<td></td>
</tr>
<tr>
<td><strong>PAIN MEDICATIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acetaminophen</td>
<td>Mild pain</td>
<td>10 to 15 mg/kg/dose</td>
<td>Every 4 hours x 48 hours, then every 4 hours prn</td>
<td>Oral</td>
<td>650 mg</td>
<td>Tablet or suspension</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>Moderate to severe pain</td>
<td>0.1 to 0.15 mg/kg/dose</td>
<td>Every 4 hours x 48 hours, then every 4 hours prn</td>
<td>Oral</td>
<td>10 mg/dose</td>
<td>Tablet or solution. Start on post-op day 1 at 0900. Use conservative dosing for patients with OSA (start on the low end of the dosing range)</td>
</tr>
<tr>
<td>Ketorolac</td>
<td>Post-operative, around-the-clock analgesia</td>
<td>0.5 mg/kg/dose</td>
<td>Every 6 hours x 48 hours, then ibuprofen every 6 hours prn pain</td>
<td>IV</td>
<td>30 mg/dose</td>
<td>Maximum duration: 48 hours. Start on post-op day 1 at 0900. Do not use in patients with underlying kidney disease</td>
</tr>
<tr>
<td>Ibuprofen</td>
<td>Mild to moderate pain&lt;br&gt;Adjunct for more severe pain</td>
<td>10 mg/kg/dose</td>
<td>Every 6 hours prn</td>
<td>Oral</td>
<td>800 mg/dose</td>
<td>Tablet or suspension. Start 6 hours after last ketorolac dose. Do not use in patients with underlying kidney disease</td>
</tr>
<tr>
<td>Diazepam</td>
<td>Muscle spasms</td>
<td>0.05 to 0.1 mg/kg/dose</td>
<td>Every 6 hours prn</td>
<td>Oral</td>
<td>4 mg/dose</td>
<td>Tablet or solution</td>
</tr>
<tr>
<td><strong>OTHER</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nalbuphine</td>
<td>Opioid related pruritis</td>
<td>0.05 mg/kg/dose</td>
<td>Every 3 hours prn</td>
<td>IV</td>
<td>5 mg</td>
<td></td>
</tr>
<tr>
<td><strong>ANTIEMETICS</strong></td>
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<td></td>
</tr>
<tr>
<td>Ondansetron</td>
<td>Post-operative nausea/vomiting (PONV)</td>
<td>0.1 mg/kg</td>
<td>Every 6 hours x 24 hours, then q6h prn</td>
<td>Oral/IV</td>
<td>4 mg/dose</td>
<td>May be given undiluted over 2 to 5 minutes when used as a single dose for prevention of PONV</td>
</tr>
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<td>----------------------------------------</td>
</tr>
<tr>
<td>Scopolamine patch</td>
<td>Post-operative nausea/vomiting (PONV)</td>
<td>1 patch</td>
<td>Every 72 hours</td>
<td>Transdermal</td>
<td>1 patch</td>
<td>For patients 12 years and older</td>
</tr>
</tbody>
</table>

**ACID BLOCKERS**

| Famotidine | Stress ulcer prophylaxis | <3 months: 0.5 mg/kg every 24 hours 3 months and older: 0.5 mg/kg every 12 hours | Start post-op day 1 | PO | 20 mg/dose | Discontinue after patient starts tolerating PO |

**LAXATIVES**

<table>
<thead>
<tr>
<th>Bisacodyl (Magic Bullet)</th>
<th>Constipation</th>
<th>2 to &lt;12 years: 5 mg 12 years and older: 10 mg</th>
<th>Once daily</th>
<th>Rectally</th>
<th>10 mg/dose</th>
<th>Give on post-op day 2, then QD PRN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleets enema</td>
<td>Constipation</td>
<td>2 to &lt;4 years: 33 mL 4 to &lt;10 years: 66 mL 10 years and older: 133 mL</td>
<td>Once daily</td>
<td>Rectally</td>
<td>2 to &lt;4 years: 33 mL/dose 4 to &lt;10 years: 66 mL/dose 10 years and older: 133 mL/dose</td>
<td>Start post-op day 2. May repeat x1 if needed.</td>
</tr>
<tr>
<td>Senna-docusate (8.6-50mg/tablet)</td>
<td>Constipation</td>
<td>2 to &lt;6 years: ½ tablet 6 to &lt;12 years: 1 tablet 12 years and older: 2 tablets</td>
<td>Twice daily</td>
<td>Oral</td>
<td>2 to &lt;6 years: 1 tablet twice daily 6 to &lt;12 years: 2 tablets twice daily 12 years and older: 4 tablets twice daily</td>
<td>Start on post-op day 1</td>
</tr>
<tr>
<td>Sennosides 8.8mg/5ml syrup</td>
<td>Constipation</td>
<td>2 to &lt;6 years: 4.4 mg (2.5 mL) 6 to &lt;12 years: 8.8 mg (5 mL) 12 years and older: 17.6 mg (10 mL)</td>
<td>Twice daily</td>
<td>Oral</td>
<td>2 to &lt;6 years: 6.6 mg (3.75 mL) twice daily 6 to &lt;12 years: 13.2 (7.5 mL) mg twice daily 12 years and older: 26.4 mg (15 mL) twice daily</td>
<td>Start on post-op day 1</td>
</tr>
<tr>
<td>Polyethylene glycol 3350 oral powder</td>
<td>Constipation</td>
<td>0.5-1.5 g/kg/dose Standard dosing: 4.25 g, 8.5 g, 17 g</td>
<td>Once daily</td>
<td>Oral</td>
<td>17 g</td>
<td>Start on post-op day 1</td>
</tr>
</tbody>
</table>
CAREGIVER EDUCATION MATERIALS

See the Spine Program book given to the patient at the pre-operative visit.
REFERENCES

Health Literacy

Pre-operative, Intra-operative, and post-operative measures
2. Practice guideline for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: application to healthy patients undergoing elective procedures: an updated report by the American Society of Anesthesiologists Committee on Standards and Practice Parameters. Anesthesiology 2011; 114:495-511.
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