



# AHRQ Safety Program for Improving Surgical Care and Recovery (ISCR)

## ISCR Hip Fracture Pathway Worksheet

Use this worksheet to develop an enhanced recovery pathway for hip fracture operations at your hospital. The information in this tool is based on a recent evidence review conducted by the national project team at the American College of Surgeons and Johns Hopkins Armstrong Institute for Patient Safety and Quality.<sup>1-2</sup> The evidence review included literature search, followed by review of relevant articles including meta-analyses and systematic reviews when available as well as review of relevant published guidelines. This worksheet should be used by your team, in conjunction with the evidence review and local experts, to develop a clinical pathway that incorporates the principles of enhanced recovery (patient education and engagement, opioid-sparing multimodal analgesia, and early restoration of functional status) and best practices for preventable harms (surgical site infection, venous thromboembolism and urinary tract infection). This worksheet includes some common approaches for incorporating these principles in your pathway but there may be other approaches that are also appropriate. We anticipate that pathways will vary from hospital to hospital because certain skills or medications may not be available but it is important to try to adhere to as many of the principles as possible. There may be other components that you want to standardize in your pathway – especially related to some of the intra-operative elements of the procedure and the underlying disease leading to the fracture.

### Disclaimer:

**The findings and recommendations in this document are those of the authors, who are responsible for its content, and do not necessarily represent the views of AHRQ. No statement in this report should be construed as an official position of AHRQ or of the U.S. Department of Health and Human Services.**

**Any practice described in this document must be applied by health care practitioners in accordance with professional judgment and standards of care in regard to the unique circumstances that may apply in each situation they encounter.**

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## ISCR Hip Fracture Pathway

Drugs and dosages are given as examples.  
Please consult with a pharmacist as you develop your pathway.  
All medications have side effects that should be taken into consideration on an individual patient basis prior to administration.

### PREOPERATIVE

#### Patient Education

After surgery is planned, patients and/or family should receive preoperative education, including detailed information on the surgical procedure and components of the enhanced recovery pathway in which patients are expected to participate (early ambulation and ongoing active rehabilitation, venous thromboembolism (VTE) prophylaxis, possible use of regional anesthesia, avoiding or minimizing opioid pain medication, and discharge planning). While there is minimal objective evidence on the impact of preoperative education on postoperative outcomes, there is little downside to these efforts and they should be incorporated into any clinical pathways.

#### Goals and Decision-Making for Geriatric Patients

The Coalition for Quality in Geriatric Surgery recommends pre-surgery discussion of the patient's overall health goals, as well as those related to the current condition and treatment options, risk of the operation including patient-centered outcomes, and advanced care planning.<sup>3</sup>

### PREOPERATIVE: RISK FACTOR ASSESSMENT

#### Preoperative Medical Assessment

Preoperative malnutrition, diabetes mellitus, tobacco use and anemia have been associated with worse clinical outcomes after hip fracture surgery. These factors should be included in the preoperative risk counseling with patients. Patients who smoke should be counseled to cease smoking for at least 4 weeks after discharge to promote healing.

#### Delirium Prevention Protocol for Geriatric Patients

A standardized delirium prevention protocol should be used to assess, prevent and/or treat both preoperative and postoperative delirium in geriatric patients.

### IMMEDIATE PREOPERATIVE

#### Timing of Surgery

Patients with hip fractures should undergo surgical intervention within 24 hours of fracture as the patient's condition allows. Surgery should not be delayed for patients taking anti-platelet agents.

### **Preoperative Bathing**

Patients should undergo bathing or wipe-down before surgery with either soap or antiseptic agent as their condition allows.<sup>4</sup>

### **Multimodal Medication**

This approach should be undertaken as quickly as possible after presentation to the hospital

- a. Regional analgesia: Assuming no contraindications and availability of resources, the use of a peripheral nerve block prior to surgery may be beneficial to help control pain, reduce opioid use and minimize delirium.
- b. Analgesics: Routine administration of multiple analgesics in the immediate preoperative period is recommended but care should be taken with regards to contraindications in older, frail patients. Recommended medications include acetaminophen, except in patients with liver disease. The role of non-steroidal anti-inflammatory agents in orthopedic surgery is controversial due to concerns over the long-term impact on bone healing. However, for short-term use, the potential benefits may outweigh the risks. Care should be taken in patients with renal insufficiency.
- c. Anti-emetics and adjunct agents: Routine administration of anti-emetic agents and other adjuncts should be considered in patients without contraindications.

## **INTRAOPERATIVE**

### **Glycemic Control:**

Glucose control should be considered in all patients regardless of diabetic status, beginning in the immediate preoperative period and continuing until discharge to prevent hyperglycemia. Hyperglycemia is prevalent in both diabetic and non-diabetic hospitalized patients and has been associated with surgical site infections and complications. A 2017 Centers for Disease Control and Prevention guideline recommends target blood glucose levels less than 200 mg/dL.<sup>4</sup>

### **Prophylactic Antibiotics**

Prophylactic antibiotics should be administered prior to incision. First-generation cephalosporins are the most commonly studied in hip fracture surgery and are recommended due to ease of administration, low cost, and safety profile. Alternative regimens may be needed for institutions with highly resistant organisms, such as methicillin resistant *Staphylococcus aureus* (MRSA) or *C. difficile*. Vancomycin should be included with cefazolin or used as an alternative agent in institutions that have a high prevalence of MRSA SSIs and for patients who are known to be colonized with MRSA. Intra-operative redosing and weight-based dosing should follow guideline recommendations. There is no evidence to support the use of prophylactic antibiotics more than 24 hours postoperatively.<sup>6</sup>

### **Skin Preparation**

Skin preparation should be done with an alcohol-based antiseptic unless contraindicated.<sup>4</sup>

**Standard Intraoperative Anesthesia Pathway**

A standardized approach to intraoperative anesthesia is a core component of enhanced recovery pathways. The choice of regional versus general anesthesia should be made by the anesthesiologist in conjunction with the perioperative team and should be tailored to the individual patient and skill set of the providers. Intrathecal hydrophilic opioids such as morphine may provide prolonged post-operative analgesia but require coordination with the post-operative care team to ensure appropriate monitoring is available. Adjuncts to avoid strong long-acting opiates should be considered, such as intravenous (IV) infusions of non-opioid analgesics where appropriate.

**Postoperative Nausea and Vomiting Prophylaxis**

Standardized pathways should include multimodal strategies to prevent post-operative nausea and vomiting in the perioperative period.

**Tranexamic Acid**

Tranexamic acid (TXA) is an anti-fibrinolytic drug that has been associated with reduction in perioperative blood loss and the need for transfusion. Available studies in hip fracture surgery are limited and there is insufficient data to determine if tranexamic acid will promote a hypercoagulable state.

**Ventilation**

A lung-protective ventilation strategy is recommended. Tidal volumes of 6-8 mL/kg predicted body weight may decrease pulmonary complications. There is insufficient evidence to recommend routine perioperative hyperoxia.

**Normothermia**

Normothermia should be maintained throughout the preoperative, intraoperative, and immediate postoperative period. Preoperative warming maybe helpful in maintaining intraoperative normothermia and should be especially considered for patients who are elderly, patients with cardiopulmonary disease, and long procedures.

**Euvolemia**

Intraoperative fluid management should be individualized to minimize fluid and maintain euvolemia. However, current evidence does not support use of a specific protocol or advanced hemodynamic monitoring to guide fluid resuscitation beyond usual care.

**Surgical Drains**

Routine use of surgical drains in hip fracture surgery is not recommended.

## POSTOPERATIVE

### **Venous thromboembolism (VTE) Prophylaxis**

Patients should be placed on VTE prophylaxis with an appropriate regimen for an extended duration. No consensus exists regarding optimal regimen and duration of therapy, but at least 28 days total duration is a common target. Options include low molecular weight heparin, vitamin K antagonists, direct oral anticoagulants or aspirin (at least 325 mg a day).

### **Multimodal Pain Management**

A standard, multimodal anti-emetic and opioid-sparing analgesic regimen is recommended for all patients. Medications should be administered orally with cessation of IV medication as early as tolerated by the patient.

- a. Regional analgesia (e.g., peripheral nerve blocks/catheters)
- b. Core non-opioid analgesic regimen
- c. Optional analgesic adjuncts
- d. Optional opioid analgesic agents only as PRN (as needed) dosing

### **Early Alimentation**

Early postoperative feeding with a well-balanced diet is recommended for patients unless they experience nausea or vomiting. There is currently no evidence supporting the use of nasogastric or parenteral nutrition or supplementation with respect to morality or complications.

### **Early Ambulation**

Early postoperative mobilization with weight bearing as tolerated is recommended. Patients should be mobilized within 24 hours of surgery with the aim of patients unless a significant contraindication exists.

### **Early Urinary Bladder Catheter Removal**

Routine urinary bladder catheter removal by postoperative day 1 is recommended for patients undergoing hip fracture surgery.

### **Discharge Planning**

Discharge planning should begin before surgery and should involve a multidisciplinary approach including physical therapists, case managers, and social workers. The use of standardized discharge criteria assessing medical stability as well as functional recovery and strength is recommended.



**References:**

1. Siletz A, et al. Technical Evidence Review for Hip Fracture – Surgery. Under Review.
2. Wu C et al. Technical Evidence Review for Hip Fracture Surgery – Anesthesia. Under Review.
3. Berian, J. R., et al. "Hospital Standards to Promote Optimal Surgical Care of the Older Adult: A Report From the Coalition for Quality in Geriatric Surgery." *Ann Surg.* 2017.
4. Berríos-Torres SI, Umscheid CA, Bratzler DW, Leas B, Stone EC, Kelz RR, Reinke CE, Morgan S, Solomkin JS, Mazuski JE, Dellinger EP, Itani KMF, Berbari EF, Segreti J, Parvizi J, Blanchard J, Allen G, Kluytmans JAJW, Donlan R, Schechter WP; Healthcare Infection Control Practices Advisory Committee. Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017. *JAMA Surg.* 2017 May 3. doi: 10.1001/jamasurg.2017.0904. [Epub ahead of print] PubMed PMID: 28467526.
5. Ban KA, Minei JP, Laronga C, Harbrecht BG, Jensen EH, Fry DE, Itani KM, Dellinger EP, Ko CY, Duane TM. American College of Surgeons and Surgical Infection Society: Surgical Site Infection Guidelines, 2016 Update. *J Am Coll Surg.* 2017 Jan;224(1):59-74. doi: 10.1016/j.jamcollsurg.2016.10.029. Epub 2016 Nov 30. Review. PubMed PMID: 27915053.
6. Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, Fish DN, Napolitano LM, Sawyer RG, Slain D, Steinberg JP, Weinstein RA; American Society of Health-System Pharmacists (ASHP); Infectious Diseases Society of America (IDSA); Surgical Infection Society (SIS); Society for Healthcare Epidemiology of America (SHEA). Clinical practice guidelines for antimicrobial prophylaxis in surgery. *Surg Infect (Larchmt).* 2013 Feb;14(1):73-156. doi: 10.1089/sur.2013.9999. Epub 2013 Mar 5. PubMed PMID: 23461695.

The table below lists some options and examples that hospitals can consider in developing their pathway. The information is intended to be adapted by a hospital based on collective review of the pathway by all local stakeholders. Important stakeholders include surgeons, anesthesia providers, nurses, pharmacists, physical therapists, technicians among other health care providers. As a team, review each component of the pathway and discuss what approach best fits your hospital. Any practice described in this tool must be applied by health care practitioners in accordance with professional judgment and standards of care in regard to the unique circumstances that may apply in each situation they encounter.

Most hospitals find it easiest to agree on a single pathway that best fits the majority of their hip fracture surgery patients, recognizing that there will be patients that require exceptions.

Component	Example Processes to Consider As a team, go through each component and discuss what approach best fits your hospital. It may be an option other than what is listed below.	Team Decisions/Notes As a team, note exceptions and contraindications to the treatment or medications.	Resources/Tips *Resources can be found on ISCR Web site	Corresponding Variable
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## PREOPERATIVE

<b>Patient Education</b>	Recommended approach: <ul style="list-style-type: none"> <li>• If patient's cognitive status allows, it is helpful to have preoperative education to set patient and family expectations about surgery and recovery</li> <li>• Adapt the provided patient education booklet template as needed to your hospital and use it to counsel and educate patients and families on what to expect with the procedure and recovery.</li> <li>• Identify staff (surgeons, hospitalists, advanced practice providers and/or nurses) who will ensure the information is shared.</li> </ul>	Sample ISCR Hip Fracture Patient Education Booklet	<b>Presurgery Counseling</b>
<b>Goals and Decision-Making for Geriatric Patients</b>	Recommended approach: <ul style="list-style-type: none"> <li>• The Coalition for Quality in Geriatric Surgery recommends pre-surgery discussion of the patient's overall health goals, as well as those related to the current condition and treatment options, risk of the operation including patient-centered outcomes, and advanced care planning.</li> </ul>		<b>Evidence of Advanced Care Planning</b>

Component	Example Processes to Consider As a team, go through each component and discuss what approach best fits your hospital. It may be an option other than what is listed below.	Team Decisions/Notes As a team, note exceptions and contraindications to the treatment or medications.	Resources/Tips *Resources can be found on ISCR Web site	Corresponding Variable
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### PREOPERATIVE RISK ASSESSMENT

<b>Preoperative Medical Assessment</b>	<p>Recommended approach:</p> <ul style="list-style-type: none"> <li>Review patient's malnutrition, diabetes mellitus, tobacco use and anemia status.</li> <li>These factors should be included in the preoperative risk counseling and anticipated recovery with patients.</li> <li>Patients should be counseled to cease smoking for at least 4 weeks after discharge to promote healing.</li> </ul>			<p><b>Diabetes Mellitus Requiring Therapy</b></p> <p><b>Preop Albumin and Hematocrit</b></p> <p><b>Current Smoker</b></p> <p><b>BMI (calculated from height and weight)</b></p>
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<b>Delirium Prevention Protocol for Geriatric Patients</b>	<p>Recommended approach:</p> <ul style="list-style-type: none"> <li>A standardized delirium prevention protocol should be used to assess for preoperative delirium and to prevent postoperative delirium in geriatric patients.</li> </ul>		<p>Look in the sharing library for examples of delirium protocols from other hospitals and develop one for your hospital. The most successful protocols are multidisciplinary with nursing and medicine.</p>	<p><b>Preop Delirium</b></p> <p><b>Postop Delirium</b></p>
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### IMMEDIATE PREOPERATIVE

<b>Timing of Surgery</b>	<p>Recommended approach:</p> <ul style="list-style-type: none"> <li>Surgical intervention should be performed within 24 hours of fracture as patient's condition allows.</li> <li>Surgery should not be delayed for patients taking anti-platelet agents.</li> </ul>			<b>ER Registration Time</b>
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<b>Preoperative Bathing</b>	<p>Recommended approach:</p> <ul style="list-style-type: none"> <li>Patients should undergo bathing or wipe-down before surgery with either soap or antiseptic agent (either washcloths with chlorhexidine gluconate or soap with chlorhexidine gluconate, such as Hibiclens) if their condition allows.</li> </ul>			<b>Preoperative Bathing</b>

<b>Multimodal Pre-Anesthesia Medication</b>	<p>Recommended approach:</p> <p>If no contraindications, <b>choose among the following analgesics</b>, dosing should be adjusted per hospital:</p> <ol style="list-style-type: none"> <li>Regional analgesia prior to surgery (peripheral nerve blocks)</li> <li>Acetaminophen [500 mg, 650 mg or 1g] PO once</li> <li>Nonsteroidal anti-inflammatory drug [e.g., Celecoxib 200mg or 400mg] PO once may be given on an individualized basis in patients with adequate renal function based on physician discretion</li> </ol>		<b>TIP:</b> Partner with anesthesiology and even the hospitalists and emergency room physicians to help expedite care and ensure non-opioid analgesia is prioritized.	
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## INTRAOPERATIVE

<b>Glycemic Control</b>	<p>Recommended approach:</p> <ul style="list-style-type: none"> <li>Check glucose in preoperative area</li> <li>2017 Centers for Disease Control and Prevention guideline recommends target blood glucose levels less than 200 mg/dL</li> </ul>		<p>If your hospital chooses to do this, see Glucose Example Control Protocols from other hospitals for ideas (multiple documents in ISCR sharing library on ISCR website). Implementation can be complex and should include endocrinology, nursing, nutrition amongst other disciplines.</p> <p><b>TIP:</b> Include sliding scale insulin in order set to help maintain glucose levels</p>	6
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<b>Prophylactic Antibiotics</b>	<p>Recommended approach (see guideline for details):</p> <p>Choose your prophylactic antibiotics approach*:</p> <ol style="list-style-type: none"> <li>1. Cefazolin 2g (patient &lt;120 kg) or 3 g (patient ≥ 120 kg) q4h during procedure</li> <li>2. Vancomycin weight-based dosing or cefazolin plus vancomycin in institutions that have a high prevalence of MRSA SSIs and for patient who are known to be colonized with MRSA</li> </ol> <p>Alternative agents for patients with beta-lactam allergy:</p> <ol style="list-style-type: none"> <li>1. Vancomycin weight-based dosing</li> <li>2. Clindamycin</li> </ol> <p>*First dose should be administered within 60 minutes before incision (120 minutes for vancomycin). Intraoperative redosing for longer cases and those with significant blood loss should be done as described in the Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery.</p>		<p>Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery</p> <p><b>TIP:</b> For vancomycin, coordinate with anesthesia providers and pre-operative area nurses to ensure administration in ample time before incision.</p>	
<b>Skin Preparation</b>	<p>Choose your approach (all regimens should be alcohol based):</p> <ol style="list-style-type: none"> <li>1. Chloraprep</li> <li>2. Duraprep</li> <li>3. Other: _____</li> </ol>		<p><b>TIP:</b> Train nurses in operating room to do preparation to standardize approach</p>	
<b>Standard Intraoperative Anesthesia Pathway</b>	<p>Recommended approaches: Below are <u>three elements</u> which you should consider when building your protocol:</p> <p>A. Type of anesthesia and analgesia to allow rapid awakening, return of function and minimize opioids:</p> <ol style="list-style-type: none"> <li>1. Regional anesthesia [e.g. neuraxial (epidural/ intrathecal/spinal) or peripheral nerve blocks]</li> <li>2. General anesthesia [e.g. inhalational anesthetics, total intravenous anesthesia (e.g., propofol)]</li> </ol>		<p>See recommended doses in ISCR Hip Fracture Anesthesia Evidence Review</p>	<p><b>Use of Regional Anesthesia</b></p> <p><b>Use of Anti-emetic Prophylaxis</b></p>

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	<p>B. Non-opioid analgesia adjuncts (one or more of the following)*:</p> <ol style="list-style-type: none"> <li>1. IV Lidocaine</li> <li>2. Other: _____</li> </ol> <p><i>*Consensus dosing recommendations not available. Confer with local anesthesia providers, other perioperative healthcare providers, and pharmacists to develop standardized approach</i></p> <p>C. Postoperative nausea and vomiting prophylaxis:</p> <ol style="list-style-type: none"> <li>1. Ondansetron 4–8 mg IV</li> <li>2. Dexamethasone 4 mg IV</li> <li>3. Other: _____</li> </ol>			
<b>Tranexamic acid</b>	<p>Recommended approach:</p> <ul style="list-style-type: none"> <li>• Consider for intraoperative bleeding or high bleeding risk patients on an individual basis</li> </ul>			<b>Tranexamic Acid (TXA) Use</b>
<b>Ventilation</b>	<p>Recommended option:</p> <ul style="list-style-type: none"> <li>• Intraoperative tidal volume 6-8 mL/kg predicted body weight</li> </ul>			
<b>Normothermia</b>	<p>Choose your approach:</p> <ol style="list-style-type: none"> <li>1. Forced air warmer in preoperative area and operating room</li> <li>2. Warmed intravenous fluids in the operating room</li> <li>3. Other: _____</li> </ol>		<p><b>TIP:</b> Place blanket warmers in pre-operative area and include in order set/policy. Let all know that blanket warmers also increase patient satisfaction</p>	
<b>Euvoemia</b>	<p>Recommended approach:</p> <ul style="list-style-type: none"> <li>• Intraoperative fluid management should be individualized to minimize fluid and maintain euvoemia</li> </ul>			
<b>Avoid Drains</b>	<p>Recommended approach:</p> <ul style="list-style-type: none"> <li>• No routine use of drains at end of procedure</li> </ul>			



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## POSTOPERATIVE (INPATIENT)

<b>VTE Prophylaxis</b>	<p>Recommended approach:</p> <ul style="list-style-type: none"> <li>• Patients should receive VTE prophylaxis with an appropriate regimen for an extended duration (e.g. &gt;28 days total)</li> <li>• Options include low molecular weight heparin, vitamin K antagonists, direct oral anticoagulants or aspirin (at least 325 mg a day)</li> </ul>		<p><b>TIP:</b> Include VTE prophylaxis in admission order sets and have policy in place to prescribe VTE prophylaxis for a total of 28 days after surgery if that is indicated by the patient's diagnoses and operation.</p>	<p><b>Medical DVT Prophylaxis Continued 28 Days Postoperatively</b></p>
<b>Multimodal Pain Management</b>	<p>Recommended approaches:</p> <p><b>If local expertise or resources are available, use:</b></p> <ol style="list-style-type: none"> <li>1. Regional analgesia using a local anesthetic regimen [minimize opioids]</li> </ol> <p>Non-opioid analgesics</p> <p><b>Scheduled (pick at least 2 if no contraindications):</b></p> <ol style="list-style-type: none"> <li>1. Acetaminophen [3-4g PO per day divided q6 hr or q8 hr]</li> <li>2. Nonsteroidal anti-inflammatory drug (e.g., ibuprofen [400–600mg PO q6 hr], ketorolac [15–30 IV q6 hr]) should be considered on an individual basis</li> </ol> <p><b>If available, adjuncts to consider:</b></p> <ol style="list-style-type: none"> <li>1. Lidocaine topical patch (4% or 5%) placed for up to 12 hours in a 24-hour period</li> <li>2. NMDA antagonists (e.g., dextromethorphan 20-30 mg q6 hr or q8 hr)</li> </ol> <p><b>PRN (or as needed dosing):</b></p> <ol style="list-style-type: none"> <li>1. Tramadol [can be given 25–50 mg PO q 4-6 hrs as needed]. Try before giving opioids.</li> </ol>		<p>Example Electronic Health Record Order Sets</p> <p><b>TIP:</b> Standardize multi-modals in order sets and have timing of medications conducive to patient sleep patterns</p>	<p><b>Use of Multimodal Pain Management</b></p> <p>10</p> <p>10</p>

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	<ol style="list-style-type: none"> <li>2. Opioids (IV for breakthrough pain, PO for when tolerating liquids). May give as a last option for analgesia if other analgesics are insufficient.</li> </ol>			
<b>Early Alimentation</b>	Choose your approach: <ol style="list-style-type: none"> <li>1. Clears POD 0</li> <li>2. Regular diet POD 0</li> <li>3. Other: _____</li> </ol>			
<b>Early Ambulation/ Weight Bearing As Tolerated</b>	Choose your approach: <ol style="list-style-type: none"> <li>1. OOB to chair on POD 0</li> <li>2. Ambulate WBAT on POD 0</li> <li>3. Ambulate WBAT on POD 1</li> <li>4. Other: _____</li> </ol>		<b>TIP:</b> Partner with physical therapy and nursing to design an early mobility strategy.	<b>Weight Bearing As Tolerated on POD 1</b>
<b>Early Urinary Bladder Catheter Removal</b>	Choose your approach: <ol style="list-style-type: none"> <li>1. DC Foley on POD 0</li> <li>2. DC Foley on POD 1</li> <li>3. Other: _____</li> </ol>		<b>TIP:</b> Have instructions placed in standardized order sets	<b>Foley Removal</b>
<b>Discharge Planning</b>	Recommended approach: <ul style="list-style-type: none"> <li>• Multi-disciplinary approach to discharge planning to begin prior to surgery and including patient and family.</li> <li>• The use of standardized discharge criteria assessing medical stability as well as functional recovery and strength is recommended.</li> </ul>			

Abbreviations:

DC = discontinue; DVT = Deep vein thrombosis; IV = intravenous; OOB = out of bed; POD = postoperative day; PO=by mouth; hrs=hours; NMDA = N-methyl-D-aspartate; WBAT = weight bearing as tolerated ; MRSA = Methicillin-resistant Staphylococcus aureus

