



**Standard of Care: Total Hip Replacement**

Inpatient Physical Therapy management of the patient following total hip arthroplasty, hemiarthroplasty, hip resurfacing, or revision total hip arthroplasty.

**ICD 9 Codes:**

Choose the primary diagnosis for the first ICD9 when entering charges. Use secondary supporting ICD9 codes depending upon impairments per individual patient.

*Table 1: ICD 10 Codes: may include, but are not limited to:*

M16.9 Hip Osteoarthritis	M08.059 Juvenile Rheumatoid Arthritis affecting the hip
M08.059 Rheumatoid Arthritis with Rheumatoid factor affecting the hip	M08.859 Rheumatoid Arthritis without Rheumatoid Factor affecting the hip
M87.059 Osteonecrosis affecting the hip	M16.300A Hip Osteoarthritis secondary to hip dysplasia
S72.009A Femoral Neck Fracture	M84.453A Pathological femoral neck fracture
M93.259 Osteochondritis Dissecans affecting the hip	S73.006A Hip Dislocation

**Case Type / Diagnosis:**

This standard of care applies to patients following hip hemiarthroplasty, total hip arthroplasty (THA), and hip resurfacing as a result of disorders that include, but are not limited to:

- Osteoarthritis (OA)
- Rheumatoid arthritis (RA)
- Avascular necrosis (AVN)
- Congenital hip dysplasia
- Tumors/Osteosarcoma
- Traumatic joint injuries
- Rotrusio Acetabuli
- Arthritis associated with Paget's Disease
- Ankylosing Spondylitis
- Juvenile Rheumatoid Arthritis

This standard of care serves as a guide for clinical decision-making for physical therapy (PT) management of this patient population at Brigham and Women's Hospital (BWH) acute care PT services.

**Standard of Care: Total Hip Replacement**

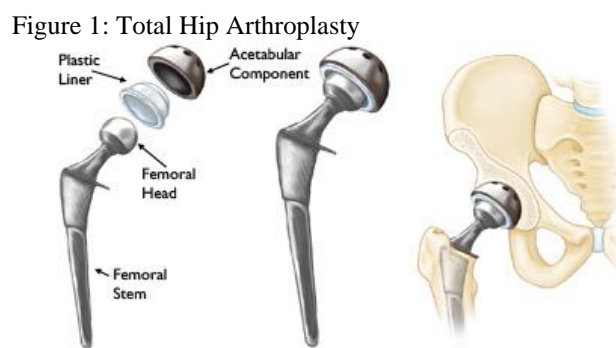
The purpose of hip hemiarthroplasty, THA, and hip resurfacing is to reduce pain, restore function and correct deformity by improving the biomechanics of the hip joint. This is done by replacing the damaged joint with a prosthetic implant, realigning the soft tissues, and eliminating structural and functional deficits. The Center of Disease Control and Prevention (CDC) reports that each year in the United States 332,000 total hip replacements are performed<sup>1</sup>. In 2013 approximately 500 total hip replacements were performed at BWH<sup>2</sup>. The demand for primary total hip arthroplasties is estimated to grow by 174% by the year 2030, with the demand for revision procedures to grow by 137% within the same time frame<sup>3</sup>.

## **Surgical Techniques:**

### **Total Hip Arthroplasty**

If both the acetabulum and the femoral head are damaged then a THA may be indicated. A THA consists of a femoral and acetabular component. During a THA the hip is dislocated exposing the joint cavity and femoral head. The deteriorated femoral head is removed. The acetabulum is prepared by cleaning and enlarging it with circular reamers of gradually increasing size<sup>1</sup>. The new acetabular shell is implanted securely within the prepared hemispherical socket. The acetabular socket can be made of metal, ultra-high molecular-weight polyethylene, or a combination of polyethylene backed by metal. The plastic inner portion of the implant is placed within the metal shell and fixed into place. Next, the femur is prepared to receive the stem. The stem portions of most hip implants are made of titanium- or cobalt/chromium-based alloys. They come in different shapes and some have porous surfaces to allow for bone in growth. A femoral neck osteotomy is performed, and the hollow center portion of the bone is cleaned and enlarged, creating a cavity that matches the shape of the implant stem. The top end of the femur is smoothed allowing the stem to be inserted flush with the bone surface. If the ball is a separate piece, the proper size is selected and attached. Cobalt/chromium-based alloys or ceramic materials (aluminum oxide or zirconium oxide) are used in making the ball portions, which are polished smooth to allow easy rotation within the prosthetic socket. The ball is seated within the cup allowing proper alignment of the joint.

Hip replacements may be cemented, cementless, or hybrid (a combination of cemented and cementless components), depending on the type of fixation used to hold the implant in place. Cemented THA are more commonly recommended for older patients, for patients with conditions such as RA, and for younger patients with compromised health or poor bone quality and density. These patients are less likely to put stresses on the cement that could lead to fatigue fractures<sup>4</sup>.



<http://orthoinfo.aaos.org/topic.cfm?topic=a00377>

## **Standard of Care: Total Hip Replacement**

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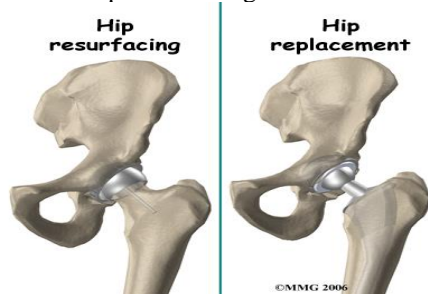
### Hip Hemiarthroplasty

If only one part of the joint is damaged or diseased, a partial hip replacement, or hip hemiarthroplasty, may be recommended. In most instances, the acetabulum is left intact and the head of the femur is replaced, using components similar to those used in a total hip replacement. A hip hemiarthroplasty can be either a unipolar or bipolar prosthesis. The most common form of partial hip replacement is unipolar<sup>1</sup>. In a unipolar prosthesis the head is fixed to the stem. In a bipolar prosthesis there is an additional polyethylene bearing between the stem and the endoprosthesis head component<sup>5</sup>.

### Hip Resurfacing

Hip resurfacing is a technique for hip arthroplasty that has recently emerged. BWH is one of the few New England Hospitals that offers hip resurfacing. The acetabular component is replaced similar to a total hip replacement, however the head of the femur is covered or "resurfaced" with a hemispherical component. This fits over the head of the femur and spares the bone of the femoral head and the femoral neck. It is fixed to the femur with cement around the femoral head and has a short stem that passes into the femoral neck<sup>1</sup>. Hip resurfacing conserves bone, restores the proximal femoral anatomy, and has lower wear rates. A meta-analysis found that patients following hip resurfacing have better functional outcomes on the Western Ontario and the McMaster Universities Osteoarthritis Index (WOMAC) and Harris hip score (HHS) than those following THA<sup>6</sup>. Indications for hip resurfacing can include osteoarthritis, developmental dysplasia of the hip and avascular necrosis<sup>7</sup>. Hip resurfacing is an option for younger patients with more demanding lifestyles that would put them at higher risk for earlier failure of a THA. Certain patients, however, are at greater risk for requiring revision of resurfacing, including those with smaller femoral head size, older patients, and patients with developmental dysplasia<sup>7</sup>.

Figure 2: THA vs. Hip Resurfacing



<http://www.methodistorthopedics.com/hip-resurfacing-arthroplasty>

### Revision Total Hip Arthroplasty:

Primary total hip arthroplasties have a 95% survivorship at 10 years or greater. With life expectancy growing and younger patients with higher activity levels undergoing THA, revision total hip arthroplasties are an unfortunate necessity<sup>8</sup>. The incidence of revision THA in a fourteen month span of October 2005 to December 2006 was 51,345 patients in the United States<sup>9</sup>. The reasoning for revision varies and can be due to complications following THA along with other causes. These reasons for hip revision can be separated into three main categories: implant-related factors, patient related factors, and failures related to surgical technique. The most common indications may include the following:

### **Standard of Care: Total Hip Replacement**

Table 3: Reasons for Hip Revisions

<b>Implant-related factors:</b>	<b>Surgical technique factors:</b>
Periprosthetic fracture	Recurrent dislocation/instability*
Delamination of the porous coating	Infection*
Osteolysis	Malpositioning of components
Aseptic loosening*	

\*= leading factors requiring revision

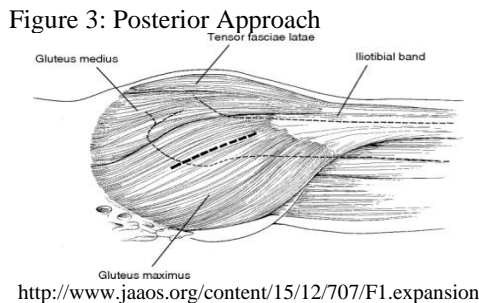
Certain risk factors put patients at jeopardy for adverse events requiring revision THA. Patients with RA have a higher baseline risk for infectious disease compared to the general population. Patients with RA were found to have higher risk of prosthetic joint infections compared to patients with OA, resulting in a need for revision<sup>10</sup>. Sickle cell anemia, poor bone density, obesity, the male gender, and younger age are also risk factors that result in complications requiring revision total hip replacement<sup>8</sup>.

**Surgical Approach:**

There are different approaches that can be used in order to perform a THA. The approach that is chosen is based on the surgeon’s experience and patient factors. Knowing which approach was used in addition to the specifics of the patient’s operating room report will help guide the therapist in postoperative rehabilitation management. Each approach has a specific location for the incision that is defined by its relation to the gluteus medius.

**Posterior Approach:**

The posterior (Moore) approach accesses the hip by splitting the gluteus maximus posterior to the gluteus medius. The posterior capsule and external rotators are divided. The femur is then flexed and internally rotated to complete exposure of the hip joint<sup>11</sup>. This approach gives excellent access to the acetabulum and preserves the hip abductors. The external rotators and the posterior capsule are repaired at the end of the procedure.

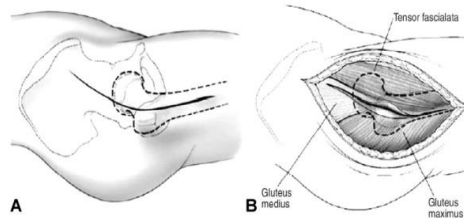


**Anterior Lateral Approach:**

The anterolateral (Watson-Jones) approach accesses the hip joint through the interval between the tensor fasciae latae and the gluteus medius. The hip is dislocated anteriorly and a femoral neck osteotomy is performed or the neck osteotomy is made in situ. The anterior fibers of gluteus medius are often reflected from the greater trochanter and repaired at the conclusion of the surgery<sup>12</sup>.

**Standard of Care: Total Hip Replacement**

Figure 4: Anterior Lateral Approach

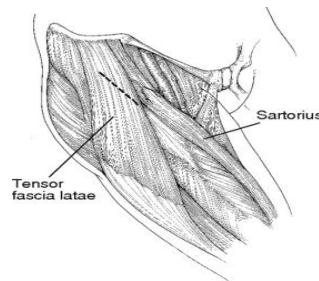


<http://synapse.koreamed.org/DOIx.php?id=10.5371/jkhs.2011.23.2.95&vmode=PUBREADER>

**Direct Anterior Approach (DAA):**

The direct anterior (Heuter) approach is a modification of the Smith-Peterson (Anterior) approach. The incision is made lateral to the anterior superior iliac spine and is carried down through the skin and subcutaneous tissues to the fascia. The fascia over the tensor fascia lata muscle is then split. An interval is made between the tensor fascia lata and rectus femoris muscles. The leg is then externally rotated and the rectus femoris muscle is detached from the anterior capsule and the femoral neck is divided. The capsule is then released. Traction is applied to the femur to expose the acetabulum, the femoral head is removed, and the acetabular component is placed. The femur is exposed by external rotation, extension and abduction in order for the femoral stem to be placed. The subcutaneous tissue and fascia are sutured and the skin is closed at the end of the procedure<sup>13</sup>.

Figure 5: Direct Anterior Approach

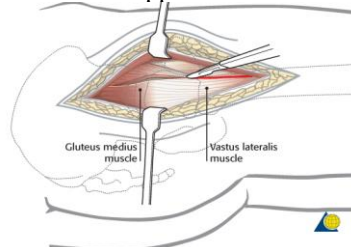


<http://www.jaaos.org/content/15/12/707/F4.large.jpg>

**Lateral Approach:**

The lateral (Bauer's) approach requires elevation of the hip abductors (gluteus medius and gluteus minimus) in order to access the joint. The abductors may be lifted up by osteotomy of the greater trochanter and reappplied afterwards using wires. The hip abductors could also be divided at their tendinous portion or through the functional tendon and repaired using sutures.

Figure 6: Lateral Approach



<http://www.jaaos.org/content/15/12/707/F4.large.jpg>

**Standard of Care: Total Hip Replacement**

### Trochanteric Osteotomy:

This may be an additional aspect of the surgery for any of the above procedures. This allows for additional exposure of the hip joint by lifting the hip abductors off the greater trochanter with an osteotomy.

## **Peri-Operative Medical Management:**

### Anticoagulation Therapy

Patients undergoing THA are often started on anticoagulants such as warfarin, heparin, low molecular weight heparin (Lovenox), or aspirin the night before surgery to decrease risk for blood clots. This dose is adjusted after surgery depending on the patient's international ratio (INR) hematology values. At the time of discharge, patients who are at a high risk for deep vein thrombosis (DVT) will remain on anticoagulation therapy for approximately 3 weeks. High-risk patients include those who have undergone bilateral THA, have a history of prior DVT, are on estrogen therapy, have a recent history of cancer, or have undergone THA secondary to hip fracture<sup>14</sup>.

### Pain Management

There are different modes of analgesia used during and after a THA. Either general or spinal anesthesia is used during surgery. A local anesthetic pericapsular injection is also commonly used, however not all the time, for additional pain control. General anesthesia is a combination of intravenous (IV) drugs and inhaled gasses to produce unconsciousness and an inability to feel pain during surgery. Spinal anesthesia is a spinal block that forms regional anesthesia. An injection of local anesthetic is placed into the subarachnoid space typically at the level of T8. Patients that receive spinal anesthesia are under conscious sedation during their surgery. The pericapsular injection most commonly consists of Clonidine®, Toradol®, Epinephrine®, and Ropivacaine® used for pain control. Clonidine® is an antihypertensive that decreases blood pressure. Toradol® is a nonsteroidal anti-inflammatory drug (NSAID) that treats pain and inflammation. Epinephrine® is a sympathomimetic agent that relaxes muscles and tightens blood vessels. Ropivacaine® is a local anesthetic that blocks pain by causing decreased sensation and numbness. A study of 325 patients found that a pericapsular injection is effective in decreasing post-operative pain and allows for early mobilization with resulting earlier discharge<sup>15,16</sup>. After surgery, the patient is brought to the post anesthesia care unit (PACU) where anesthesiologists and nurses assist with pain control. Patient's pain is treated with IV narcotics, most often Dilaudid® and/or Morphine®. IV pain management is often discontinued on post-operative day 1 (POD#1) and the patient is then transitioned to oral (PO) pain medication consisting of short and long acting narcotics. Short-acting narcotics such as Oxycodone® or oral Dilaudid® are used as needed for breakthrough pain control. If necessary, IV infusions of Morphine® or Dilaudid® are also provided to the patient for additional breakthrough pain relief. Long-acting narcotics such as Oxycontin® are slow release and are used to treat pain around-the-clock.

Pain management is necessary to allow patient comfort and to facilitate mobility following THA. At BWH PT is coordinated with the nursing staff to allow for patients to receive pain medication approximately 30-45 minutes prior to mobility. This allows for the medication to be effective during treatment sessions. While pain management plays an important role in assisting with mobility, there are negative side effects that narcotics can have limiting PT treatment. Nausea, vomiting, dizziness, and drowsiness as a result of narcotics can restrict PT intervention in the

## **Standard of Care: Total Hip Replacement**

acute care setting<sup>15</sup>. These side effects should be assessed by the physical therapists during their examination of the patient and should be communicated with the nurse and responding clinician.

**Indications for Treatment:**

The typical length of stay at BWH for patients following THA is two to three days excluding the day of surgery. Due to the short length of stay following THA, the focus of PT management begins on POD#1 with initial evaluation and an afternoon treatment session. Patients are then seen by PT once a day for a treatment session on POD#2 and POD#3. The PT evaluation includes patient education, mobility, and functional training as well as increasing ROM and motor control of the articular and peri-articular structures of the hip joint. It is important to keep in mind that ROM, along with proper soft tissue balance, is required to ensure proper biomechanics in the hip joint. Therefore, PT must address both impairments in order to ensure good outcomes.

The World Health Organization developed the International Classification of Functioning Disability and Health (ICF) as a framework to define the spectrum of problems that patients face with different diagnoses, including OA. Osteoarthritis causes musculoskeletal pain and is one of the primary reasons why patients elect for THA. One study found that the ICF core set for OA allows there to be focus on aspects of patient’s everyday life that may not have been taken into account otherwise in their treatment when following up at three weeks, three months and six months post THA<sup>17</sup>. A study of 64 patients looked at their desired functional improvements before and after THA. The study found that a majority of the patients were concerned with activities and partition such as walking, moving around, and recreation/leisure activities. However at three months post THA majority of their concern was regarding dressing<sup>18</sup>. Therefore PT treatment should focus on the full picture of the patient’s health, using the ICF model as guide when tailoring treatments for patients following THA. The following are lists of potential body structures, body functions, activities and participation limitations that may indicate treatment in patients following THA.

Table 4: ICF: Total Hip Arthroplasty<sup>19</sup>

<b><u>Body Structure/Function(s):</u></b>	<b><u>Activity Limitations:</u></b>	<b><u>Participation Restrictions:</u></b>
<ul style="list-style-type: none"> <li>• Range of motion (ROM)</li> <li>• Muscle performance (including strength, power, and endurance)</li> <li>• Motor control</li> <li>• Balance</li> <li>• Gait</li> <li>• Tissue integrity</li> <li>• Pain</li> <li>• Sensation</li> <li>• Knowledge deficit</li> <li>• Aerobic capacity/endurance</li> <li>• Ventilation/gas exchange</li> </ul>	<ul style="list-style-type: none"> <li>• Bed mobility</li> <li>• Transfers</li> <li>• Ambulation</li> <li>• Stair climbing</li> <li>• Functional activities</li> <li>• Basic/instrumental activities of daily living (B/IADLs)</li> <li>• Quality of life</li> </ul>	<ul style="list-style-type: none"> <li>• Community Mobility</li> <li>• Driving</li> <li>• Working</li> </ul>

**Standard of Care: Total Hip Replacement**

## **Contraindications / Precautions for Treatment:**

The following post-operative activity recommendations are often included in the PT consults for patients following THA in the acute care setting. Specific orders regarding precautions and the approach used, however is not always included in the PT consult. It is important to review the operative note along with the patients chart to ensure the proper activity restrictions and precautions are followed. It may be necessary to contact the responding clinician to clarify orders if the operative note or chart are not clear. Orders and precautions can include but are not limited to the following:

- Weight bearing Status:
  - Weight bearing as tolerated (WBAT) to full weight bearing (FWB)
  - WBAT with bilateral upper extremity support
  - Partial weight bearing (PWB)
  
- Hip Dislocation Precautions: based on the surgical approach used:
  - Posterior Precautions: No hip flexion greater than ninety degrees, no hip adduction or internal rotation beyond neutral, and none of the above motions combined.
  - Limited Posterior Precautions: No combination of hip flexion greater than ninety degrees, no hip adduction or internal rotation beyond neutral.
  - Anterior Precautions: No lying flat, no prone lying, no bridging and no hip external rotation.
  - Modified Anterior Precautions: No prone lying, no bridging and no hip external rotation.
  - Direct Anterior Precautions: no bridging
  - Lateral Precautions: The patient will likely have hip abduction restrictions.
  - Global Precautions: most often ordered for a patient following a hip resurfacing surgery or a revision hip surgery following multiple dislocations. This set of precautions are a combination of both posterior and anterior dislocation precautions. This is due to the large incision into both the posterior and anterior hip capsule to expose the femoral head.
  
- Trochanteric osteotomy: If a trochanteric osteotomy is performed the orders may include restrictions for hip abduction. It may be stated as, “passive abduction only” or “functional abduction only.” This is to allow for bone healing and to prevent a non-union<sup>20</sup>.
  
- Positioning of the operative extremity: Positioning recommendations may include:
  - Positioning the operative extremity in neutral rotation with a towel roll proximal to the knee to prevent external rotation
  - Locking the foot control of the bed in extension to prevent the operative knee from resting in a flexed position
  - Use of a hip abduction pillow or folded pillow between the patient’s lower extremities to prevent the operative extremity from adducting

## **Standard of Care: Total Hip Replacement**

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### **Early Post-Operative Complications:**

It is important to recognize signs and symptoms of early post-operative complications and consult with other health care providers as appropriate. The common acute care complications following THA are:

- Blood loss requiring transfusion<sup>15</sup>
  - Decreased blood pressure, pallor appearance, fatigue, shortness of breath, dizziness<sup>21</sup>
- Deep vein thrombosis (DVT)<sup>22</sup>
  - calf pain or tenderness, swelling with pitting edema, increased skin temperature, cyanosis<sup>21</sup>
- Pulmonary embolism<sup>22</sup>
  - Chest pain, chest wall tenderness, back pain, upper abdominal pain, syncope, shoulder pain, shortness of breathing, hemoptysis, new onset of wheezing, painful respiration, new cardiac arrhythmia<sup>21</sup>
- Excessive joint bleeding
  - Excessive swelling, discoloration, pain<sup>21</sup>
- Hematoma<sup>23</sup>
  - Excessive swelling, discoloration, pain<sup>21</sup>
- Joint infection<sup>8</sup>
  - Swelling, warmth, fatigue, temperature, wound drainage, erythema<sup>21, 24</sup>
- Joint dislocation<sup>23, 25</sup>
  - Pain, limb shortening and internal rotation, decreased hip ROM<sup>21</sup>
- Sciatic nerve injury<sup>24, 26</sup>

If a patient presents during the first few days post-operatively with increased pain not consistent with surgical pain, excessive swelling, decreased muscle strength or sensation along a motor and/or sensory nerve distribution, sudden shortness of breath and decreased oxygen saturation along with increased resting heart rate, PT interventions must be stopped, and the medical team consulted.

### **Late-Onset Post-Operative Complications:**

- Skin necrosis:
  - Devitalized tissue that consists of necrotic cells called eschar. Eschar is dry, leathery and rigid. This requires drainage and potentially surgery to correct the defect<sup>24</sup>.
- Persistent joint drainage in the weeks following THA:
  - This complication is often treated with joint aspiration, antibiotics, and at times debridement and joint lavage. A wound vacuum may be placed.
- Large hematoma formation:
  - Patients are often advised by the surgeon to rest the hip joint, use ice to help decrease the size of the hematoma, and stop taking anticoagulants. If the hematoma does not resolve, patients may need surgical evacuation<sup>21</sup>.
- Wound healing complications in the first few weeks after surgery:
  - This typically occurs in patients who are on chronic steroids or chemotherapy, have RA, obesity, diabetes, or are active smokers. The signs and symptoms

### **Standard of Care: Total Hip Replacement**

include increased joint swelling, pain, and redness in the joint or at the site of the incision<sup>21</sup>.

- **Dislocation:**
  - A systematic literature review found that rates of hip dislocation vary depending on the surgical approach: anterior lateral 0.70%, lateral 0.43%, and posterior lateral with soft tissue repair 1.01%<sup>27</sup>. Reported dislocation rates following the direct anterior approach were found to be 0.96% in 1037 procedures, 0.61% in 437 procedures, 1.3% in 2132 procedures and 1.5% in 1374 procedures<sup>23</sup>.
- **Heterotrophic ossification:**
  - Abnormal bone growth in the muscle or other connective tissue that causes swelling, warmth near the hip joint, and erythema along with elevated serum alkaline phosphatase levels. Heterotrophic ossification can lead to decreased ROM and stiffness<sup>24</sup>.

## **Evaluation:**

**Medical History:** A patient's past medical history should be reviewed detailing both pre-existing medical conditions and past surgical interventions. It should be noted if additional consults were requested prior to surgery for medical clearance. Some co-morbid conditions that can affect outcomes are:

- Diabetes<sup>22</sup>
- asthma
- medication-controlled hypertension
- coronary artery disease or prior myocardial infarction
- stroke with residual neurological deficits
- cancer
- renal disease requiring dialysis
- peripheral vascular disease with claudication
- Parkinson's disease
- Rheumatoid arthritis<sup>22</sup>
- systemic disorders
- obesity<sup>28</sup>

**History of Present Illness:** Attention to pre-operative ROM, hip muscle strength, and functional mobility are among the most important data for the physical therapist during the medical history review. It is also imperative to review relevant diagnostic imaging and other tests that lead to the current diagnosis and decision to pursue surgical management. Inquire about presenting signs and symptoms, including: duration/severity, impact on function, and any prior management of symptoms via PT, medication, or other conservative means.

**Hospital Course:** Read the operative report and note positioning, approach used, if the surgeon needed to perform a trochanteric osteotomy, or additional fixation was required. Record the surgeon, date of surgery, type of anesthesia used and note any complications or additional procedures intra-operatively in the initial evaluation.

## **Standard of Care: Total Hip Replacement**

When reviewing the chart and orders, note any consults that were placed, post-operative complications, and the trend of lab values, along with post-operative precautions based on approach. Post-operative laboratory workup, especially hematocrit and INR level, need to be monitored when evaluating a patient following THA in the acute care setting. INR levels should not exceed 3.0 or higher and appropriateness of treatment must be discussed with the medical team. Please refer to the General Surgery Standard of care for further details on hematocrit and INR parameters.

**Social History:** Include general demographics of age, sex, and primary language. This also consists of a review of the patient's home environment, family/caregiver support, occupation, patient's goals, use of assistive devices, possession of durable medical equipment (DME) and prior level of function considering self-care and home management activities. For patients following THA this may also include previous exercise routines or programs, activity levels, history of falls and participation in PT.

**Medications:** Review current pharmacological management of existing medical conditions. Common pain medications used in the acute management of patients following THA are:

- Dilaudid
- Hydromorphone
- Oxycodone
- Oxycontin

Take note of the route of administration for medications (i.e. via IV, PO, etc), as this will help guide the examination. Record the type of pain medication the patient is receiving and when it was last administered in the initial evaluation. Patients are also often on the anticoagulant medication, such as Warfarin, to prevent DVT.

### **Examination:**

**Observation:** Upon observation note the patient position, appearance, and lines/drains/tubes. Foley catheters are typically discharged by 6am on POD#1 prior to the patient being seen by PT. The following is a list of common lines/drains/tubes and positioning devices that may be seen with patients following THA:

- Nasal Cannula for oxygen therapy
- Pneumatic (compression) boots for DVT prophylaxis
- Telemetry/cardiac depending on if there is specific co-morbid conditions
- Continuous oxygen saturation monitors
- Towel roll next to the distal thigh to prevent lower extremity external rotation
- Hemovac or Jackson Pratt (JP) drain to extract excess fluid from the operated hip joint
- Hip abduction pillow placed between the patient's lower extremities
  - This may be removed POD #1. See posture under Musculoskeletal examination for more details.

## **Standard of Care: Total Hip Replacement**

Communication, Affect, Mental Status/Cognition, Language, and Learning Style:

The patient's level of arousal/alertness, orientation, ability to follow commands, communicate/make needs known, primary language and learning preferences is taken into account and documented in the examination.

Pain:

Intensity of pain is documented at every inpatient encounter using the visual analogue scale (VAS) or verbal report scale (VRS) if possible. Plan of action such as pre-medication or cryotherapy is also included in the systems review. Other qualitative details of pain that are important to obtain include the frequency, alleviating/aggravating factors, and descriptors of pain. Pain assessment should be made pre, during and post PT.

Musculoskeletal:

- Anthropometrics: Body Mass Index (BMI) and/or height and weight of the patient should be included in the systems review to assist with guiding your examination and proper fit of necessary assistive devices.
- Range of Motion: Observation or goniometric measurement of ROM of all lower extremity (LE) joints and gross assessment of ROM of the upper extremity (UE) joints are to be documented in the systems review. Active and passive ROM of the operative hip is measured in supine, seated and standing. Hip flexion, extension and abduction are measured in the supine position, flexion in the seated position, and extension in the standing position. Limitations in ROM are also documented to further describe the end-feel of the joint (i.e. firm, bony, empty/painful).
- Strength: Manual muscle test (MMT) or gross measurement of the LE and UE muscles is assessed and documented. Special attention is given to assess quadriceps, hip abductor and hip flexor strength, and the quality of an isometric quad contraction of the quadriceps, and gluteals (i.e. trace, poor, fair, and good) via palpation and observation. Even though joint surgery is successful at eliminating many joint related factors, reduced muscle mass, muscle length, and weakness are not addressed by surgical interventions. Therefore, attention to these impairments is important in developing an appropriate treatment plan and achieving good outcomes.
- Posture: Assessment and documentation of posture and positioning in supine, sitting, or standing are included in a systems review. Special attention should be paid to the degree of hip rotation of the lower extremities to maintain hip precautions according the patients specific surgical approach. If the patient has posterior precautions they may have a hip abduction pillow between their legs that can be removed on POD #1 and a folded pillow can be placed between the patient's lower extremities while in supine to assist in preventing the patient from adducting their operative leg.
- Leg length: Patients will often have a shortened extremity pre-operatively secondary to degenerative changes. Equal leg length is difficult to achieve after THA and the surgeon will perform systematic and reproducible perioperative steps to minimize major leg length discrepancy. Post-operatively, if the operative extremity was lengthened, the patient may experience hip flexor tightness and pain. If a leg length discrepancy is found after THA it can result in limping, neurological damage, patient

## Standard of Care: Total Hip Replacement

dissatisfaction, lumbar pain and the need for contralateral shoe lifts. A study of twenty patients found that a leg length inequality from 1-20 mm at follow up of 16 months post-operatively does not impair the symmetry of hip kinematics and kinetics during gait and stair climbing<sup>29</sup>. The patient may perceive a leg length discrepancy in the early post-operative phase secondary to soft tissue tightness. This may take time to resolve.

- **Gait:** Qualitative gait assessment is detailed with comments on the type, pattern, and biomechanics of gait, as well as the type of assistive device used and amount of assistance provided. Changes in stride and step length, as well as cadence should be documented in patients with hip OA both before and after THA.

#### Neuromuscular:

- **Sensation:** Sensation testing along peripheral nerve distributions in bilateral LE for light touch is assessed on POD#1-2 to ensure that there is no nerve damage. Peripheral nerve palsy after primary THA ranges from 0.09% to 3.7% and in revision THA from 0% to 7.6%. In addition to sensation changes patients may present with other symptoms if nerve damage did occur during surgery. The following is a list of possible nerves that may be damaged and associated symptoms<sup>26</sup>:
  - *Sciatic Nerve:* the incidence of sciatic nerve palsy related to THA ranges from 0.05% to 1.9%. Patients may present with foot drop if the sciatic nerve is injured during surgery and further neurological evaluation may be warranted to assess both divisions of the sciatic nerve<sup>26</sup>. The sciatic nerve is most often injured with use of a posterior approach for THA<sup>30</sup>.
    - *Peroneal Nerve:* the incidence of peroneal nerve injury is 0.3% to 2.1%<sup>26</sup>.
  - *Femoral Nerve:* the incidence of femoral neuropathy related to THA is 0.01% to 2.3%. Patients will present with thigh pain, quadriceps weakness, and anteromedial and medial paresthesias of the leg<sup>26</sup>. The femoral nerve can be damaged when the direct anterior approach or anterolateral approach is used for THA<sup>23, 30</sup>.
  - *Obturator Nerve:* the incidence of obturator nerve injury is 0.01%. Injury to the obturator nerve can present as hip adductor weakness, and groin or thigh pain<sup>26</sup>. Injury to the obturator nerve with use of the lateral approach for THA<sup>30</sup>.
  - *Superior Gluteal Nerve:* There is no reported cases of injury to the superior gluteal nerve following THA, however it is important to note that postoperative pain and weakness of the abductors of the hip may mask injury to this nerve<sup>26</sup>. Use of the lateral approach for THA puts the superior gluteal nerve at risk for injury<sup>30</sup>.
- **Proprioception:** Hip joint proprioceptive testing may be indicated depending on where the patient is in their post-operative course, as this may impact balance, gait, strength and functional mobility.
- **Balance:** Following THA qualitative observations should be documented:
  - Static and dynamic sitting balance. This may include with and without UE support.

### Standard of Care: Total Hip Replacement

- Static and dynamic standing balance. This may include use of an assistive device, wide and narrow base of support, and level and uneven surfaces as appropriate.

Particularly in the acute post-operative phase, sitting and standing balance may be impaired, thereby impacting the overall plan of care. In the sub-acute period, patients after THA should be examined in their ability to perform static and dynamic standing without assistive devices, as well as unilateral standing as appropriate.

Cardiovascular/Pulmonary:

- Vital Signs: Blood pressure, heart rate, respiratory rate, and peripheral oxygen saturation should be assessed and documented as appropriate during PT evaluation/treatments based on the patient's symptomatology, particularly in the early post-operative days. As previously referenced, anemia and concomitant orthostatic hypotension are common complications immediately after THA. They can cause clinical symptoms such as shortness of breath, lightheadedness or dizziness, blurred vision, and nausea. The clinical signs include drop in blood pressure with positional changes, tachycardia, diaphoresis, and vomiting. Attention to these signs and symptoms including appropriate documentation is important during the patient examination following THA, in addition to communication with the clinical team<sup>21, 24</sup>.
- Pulmonary Status: Assess and document auscultation of breath sounds, breathing pattern, cough quality and cough production<sup>24</sup>
- Endurance: Examination of activity tolerance by utilizing the rate of perceived exertion (RPE) scale or a gross subjective and objective assessment of fatigue level should be documented in patients following THA. This should detail the amount of functional activities the patient was able to tolerate during the exam<sup>24</sup>.

Integumentary:

- Dressing/Incision: The surgical incision is closed with either staples or dermabond and covered with a clean sterile dressing of gauze held in place with tegaderm while the patient is in the operating room. This dressings remains in place for 3-5 days to decrease risk of infection. After 3-5 days the dressing is removed, if the incision is draining then the gauze is replaced until it becomes clean and dry. Once the incision is clean and dry then it will be left open to air. If the sterile dressing that placed in operating room becomes saturated, then the dressing will be changed by the medical team while the patient is admitted to BWH.
- Skin: Skin assessment is noted, including observation of presence/absence of dressing, surgical incision location, discoloration/erythema, drainage, or ecchymosis. Any pressure points due to immobility or bracing should also be assessed.
- Edema: Soft tissue edema commonly occurs immediately after THA, as well as in the sub-acute phase. Therefore, the amount of LE edema is documented by gross qualitative assessment, or via circumferential measurements as appropriate.

Functional Tests and Outcome Measures:

The following functional tests and measures may be used in the acute care setting and

## Standard of Care: Total Hip Replacement

during the home or outpatient phase of rehabilitation to assess locomotor and functional capacity of patients status post THA:

- Timed Get Up and Go (TUG)<sup>31</sup>
  - To assess balance, fall risk, and walking ability
- Six Minute Walk Test (6MWT)<sup>31, 32</sup>
  - To assess aerobic capacity/endurance
- Hip and Knee Satisfaction Scale<sup>33</sup>
  - To assess patient satisfaction following hip/knee replacement
- Harris Hip Score (HHS)<sup>6, 18, 32</sup>
  - To assess patient satisfaction following hip/knee replacement
- Oxford Hip Score<sup>31</sup>
  - To assess patient satisfaction following hip/knee replacement
- The Hip Dysfunction and Osteoarthritis Outcome Score (HOOS)<sup>18, 34</sup>
  - To assess patient satisfaction following hip/knee replacement
- Western Ontario and the McMaster Universities Osteoarthritis Index (WOMAC)<sup>6, 17, 31, 32, 34, 35</sup>
  - To assess pain, physical function and stiffness in patients with hip/knee OA
- Lower Extremity Functional Scale (LEFS)<sup>36</sup>
  - To assess impairment and set functional goals
- Short-Form-36 (SF-36)<sup>17, 31</sup>
  - To assess quality of life

## Assessment:

### PT Diagnosis:

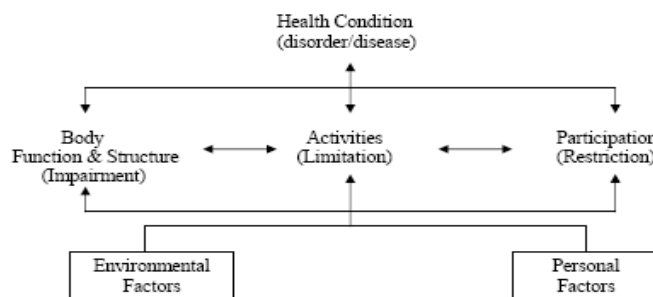
Based on the Guide to Physical Therapist Practice<sup>19</sup>, patients following THA are classified into the following practice pattern:

- 4H: Impaired Joint Mobility, Motor Function, Muscle Performance, and Range of Motion Associated with Joint Athroplasty<sup>19</sup>.

### Problem List:

In the first days following THA patients impairments will result in decreased independence with bed mobility, transfers, ambulation, functional activities, basic/instrumental activities of daily living and quality of life. Please refer to *Rehabilitation Management* under **Indications for Treatment** for further details.

Figure 7: ICF Model



<http://www.canchild.ca/en/canchildresources/internationalclassificationoffunctioning.asp>

## Standard of Care: Total Hip Replacement

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Table 4: ICF: Total Hip Arthroplasty<sup>19</sup>

<p><b><u>Body Structure/Function(s):</u></b> Potential impairments in body structure may include but are not limited to:</p>	<p><b><u>Activity Limitations:</u></b> Potential functional limitations may include but are not limited to:</p>	<p><b><u>Participation Restrictions:</u></b> Potential participation restrictions may include but are not limited to:</p>
<ul style="list-style-type: none"> <li>• Range of motion (ROM)</li> <li>• Muscle performance (including strength, power, and endurance)</li> <li>• Motor control</li> <li>• Balance</li> <li>• Gait</li> <li>• Tissue integrity</li> <li>• Pain</li> <li>• Sensation</li> <li>• Knowledge deficit</li> <li>• Aerobic capacity/endurance</li> <li>• Ventilation/gas exchange</li> </ul>	<ul style="list-style-type: none"> <li>• Bed mobility</li> <li>• Transfers</li> <li>• Ambulation</li> <li>• Stair climbing</li> <li>• Functional activities</li> <li>• Basic/instrumental activities of daily living (B/IADLs)</li> <li>• Quality of life</li> </ul>	<ul style="list-style-type: none"> <li>• Community Mobility</li> <li>• Driving</li> <li>• Working</li> </ul>

**Prognosis:**

Most patients are expected to ambulate without assistive devices within three to six weeks after their surgery. Patients should exhibit operative hip strength  $\geq 4+/5$  MMT within 3 months following THA. The overall long-term goal for the patient is to at least return to their pre-operative level of function with less pain; however most tend to see an overall improvement when compared to their pre-operative function.

The degree to which patients reach these projected goals depends in part on the reason for the THA, prior functional level, co-morbidities and post-op complications. Patients with lower pre-operative function may require more intensive PT intervention. This may extend recovery times because the patient is less likely to achieve functional outcomes similar to those of patients who have less pre-operative dysfunction<sup>37</sup>. A review of publications on the recovery of physical functioning after THA showed improvements in: perceived physical functioning, functional capacity such as walking and rising from a chair, and actual daily activity as measured by WOMAC-PF, SF-36-PF and walking speed with gait analysis, 6-8 months post-surgery<sup>31</sup>. A study of 437 patients found that the largest improvements for physical impairment, activity limitations, and social participation restrictions occurs within 3 months post-surgery. There is a rapid improvement in physical impairment seen within the first two weeks post-surgery. Participation restrictions worsen early after THA and then quickly improve over the next 3 months post THA. Patients that are male, non-obese, that do not

**Standard of Care: Total Hip Replacement**



have low back pain, and that are of younger age were found to have statistically significant better outcomes over time post THA. This study also found that although the greatest improvements occurs by 3 months post-operatively, a 28% of total improvements in ICF constructs occurs between 3 and 12 months post THA<sup>34</sup>.

**Goals:** Typical goals following THA are as follows and should be tailored/individualized based on the unique characteristics of each individual patient:

Short Term Goals: The short term goals for this patient population during their hospital course are:

Within 2-3 days:

1. The patient will be independent and able to demonstrate knowledge of safety and compliance with hip precautions and positioning with all mobility.
  2. The patient will perform all bed mobility and transfers with least amount of assistance and devices.
  3. The patient will ambulate household distances (50-100 feet) and negotiate stairs with a step-to or step-through pattern, with least amount of assistance and devices.
  4. The patient will demonstrate a fair to good isometric quad contraction and MMT of  $\geq 3/5$  to increase independence with bed mobility, transfers, and ambulation.
  5. The patient will be independent with home exercise program and activity precautions.
- \*These short term goals will vary depending on the patient's prior level of function, as well as the patient's own personal goals.

Long Term Goals: The long term goals for this patient population are:

Within 2-4 weeks:

1. Independent gait with unilateral upper extremity support of a crutch/cane for greater than or equal to three hundred feet.
2. Initiation of standing and balance therapeutic exercise program.
3. Initiation of use of stationary bicycle within precautions if one is available.

Within 4-6 weeks:

1. Ambulate greater than or equal to five hundred feet with least restrictive device.
2. Progression to use of no assistive device by home/outpatient PT.
3. Initiation of outpatient PT program.

Within 8-10 weeks:

1. Return to work as applicable.
2. Ambulate community distances with no assistive device.

## Treatment Planning / Interventions

Established Pathway                      \_\_\_ Yes, see attached.                      X No

Established Protocol                      X Yes, see attached.                      \_\_\_ No

## Standard of Care: Total Hip Replacement

### **Interventions most commonly used for this case type/diagnosis:**

A study of 57 patients following primary THA randomly assigned twice daily PT and showed earlier achievement of functional milestones than those of the control group who received PT only once-daily<sup>38</sup>. At BWH patients receive PT twice on POD#1 and are educated on independent therapeutic exercise program and encouraged to complete the program 3-5 times a day. Their independent therapeutic exercise program typically consists of exercise that target muscles of the hip, knee and ankle and are focused on increasing strength and ROM. Treatments that may be initiated in a patient following THA as deemed appropriate by the evaluating PT are as follows:

- Flexion, extension, abduction (if indicated), and adduction Active/Active Assisted/Passive ROM of operative hip<sup>32, 39</sup>.
- Therapeutic exercise/strength training with focus on isometric and functional hip flexor and quadriceps control, hamstrings, as well as hip abductors, adductors, and gluteal muscles<sup>32, 39</sup>.
- Respiratory and circulatory exercises starting POD#1, to include deep breathing, coughing, and ankle pumps. A systematic review that looked at a study of 14 patients found that a progressive arm-interval exercise program with an arm ergometer improved patient's distances with the 6-minute-walk test following THA<sup>32</sup>.
- Seated closed chain exercises progressing to standing closed chain exercises when the patient demonstrates good pain control, muscle strength, and balance<sup>32, 40</sup>.
- Resistive Exercises for the quadriceps and hamstrings are generally not used in the acute phase of rehabilitation. However a study of 36 patients found that a progressive resistive training program for the first 12 weeks post operatively improved maximal dynamic muscle strength by 30% and improved stair climbing power by 35% when compared to use of electrical stimulation and standard rehabilitation<sup>32, 41</sup>.
- Gait training on even surfaces, stair training and uneven terrain as indicated
- Balance and coordination activities
- Body mechanics and postural exercises

### **Functional Training in Self-Care and Home Management:**

Starting on POD#1 bed mobility and transfer and basic/instrumental activities of daily living training is started in order to promote the patient's independence. Patients are educated on the use of proper assistive devices and equipment as indicated. This can include use of a bedrail, or transfer devices. The goal is to gradually progress patient's mobility without assistive equipment by POD#2-3 to allow them to function safely and independently in their home environment. Vehicle transfers are also introduced and reviewed with the patient prior to discharge home.

### **Prescription and Application of Appropriate Assistive Devices/Durable Medical Equipment:**

Patients are measured, fit, and trained with the most appropriate assistive device to increase safety and independence during ambulation and transfers. The most common ambulatory devices used in patients immediately following THA are walkers (standard or

## **Standard of Care: Total Hip Replacement**

rolling), axillary crutches, and in some cases, only a straight cane or a single crutch. As patients mobility improves and as safety allows they will be progressed to the least restrictive assistive devices. Other durable medical equipment (DME) generally used or recommended to facilitate safe and independent transfers include commodes, raised toilet seats, ADL equipment, and tub/shower seats.

**Frequency & Duration:**

Patients are generally in the hospital for 2-3 days post-operatively. Patients are followed at a frequency of five to seven times per week and are reassessed every 7-10 days if they remain in BWH. Most patients do not stay in the acute care hospital greater than 3 days unless there are post-operative complications. The expected number of visits per episode of care ranges from 12 to 60. The various episodes of care following THA consist of inpatient acute care PT, short-term rehabilitation or home PT, and outpatient PT (when indicated). Based on the *Guide to Physical Therapist Practice*, it is anticipated that 80% of patients will achieve their anticipated goals and expected outcomes during this time frame of visits<sup>19</sup>. During the acute care stay, THA patients are typically seen once daily, except on POD#1 when they are seen for their initial evaluation and an afternoon treatment session. The focus of treatment during this time is on improving hip joint ROM, muscle control and balance, and functional independence. If outpatient care is required, ROM, strength, proprioception, gait, balance, and swelling impairments should be assessed and treatment should be progressed as appropriate in order to maximize functional outcomes.

**Patient / family education:**

Education for patients undergoing a THA is an integral component of the clinical pathway for these patients. Pre-operative joint class is available for patients to prepare them for their surgery and recovery. Most orthopedic surgeons at BWH refer and highly recommend that their patients attend joint class to obtain knowledge in preoperative preparation, hospital stay, surgical procedure, expectations following surgery and rehabilitation. Interdisciplinary handouts and educational videos are offered as part of BWH's pre-operative education and are available on the [orthopedic website](#). Pre-operative education can reduce a patient's hospital stay by twenty four hours by promoting early functional recovery and improving functional outcomes<sup>15</sup>. Pre-operative exercise programs are also beneficial for patient outcomes after surgery. A systematic review of randomized control studies found that exercise-based intervention prior to a total hip replacement reduces pain and improves physical function<sup>35</sup>.

**Standard of Care: Total Hip Replacement**

Education for patients and their families/caregivers is continued throughout their stay at the hospital. On POD #1 they are educated on:

- Correct positioning of the operative LE
- Hip dislocation precautions
- Importance of initiating early mobility
- Safety with mobility and use of appropriate assistive devices
- Weight bearing precautions (if indicated)
- PT plan of care: including independent exercises, and the expected discharge goals and outcomes.

Patients are provided with education handouts that outlines the above information for future reference and for use at home after discharge. The white boards located in each patient room can also be utilized to write down goals and recommendations for nursing staff.

### **Recommendations and referrals to other providers:**

- Occupational Therapy (OT): Patients who are in need of assistance for B/IADL are referred to occupational therapy for training with appropriate adaptive equipment. OT is generally consulted immediately post-operatively in conjunction with PT. Occupational therapy will assess a patient if the patient's plan is to discharge home, or if a patient may potentially have specific OT needs secondary to pre-existing co-morbidities. Occupational therapy is consulted to assess a patient's ability to comply with dislocation precautions during activities such as toileting, dressing, and ADL's. OT generally evaluates a patient on POD#2 to maximize participation and independence with B/IADL's. OT can provide a patient with special equipment to optimize a patient's independence with ADL's. Equipment could include: sock donner, long handled sponge, shoe horn, grabber, elastic shoe laces, leg lifter etc. If the patient's plan is to discharge to a rehab facility generally OT is deferred while in the inpatient setting to the rehab setting to optimize ability to participate.
- Ortho Tech: Ortho techs are consulted on a case by case basis to place a bed frame and trapeze on the beds of patients following a THR to allow the patient to perform bed mobility and weight shifting as appropriate. Ortho techs will also be consulted if a hip abduction brace is indicated. A hip abduction brace is used if a patient has had previous hip surgery with multiple dislocations, or during the surgery the surgeon assessed that the patient was going to require external support to prevent dislocation. Fitting a hip abduction brace can be performed the day that the order is placed and the physical therapist should accompany the ortho tech for the initial fitting. It is the physical therapists role to clarify ROM orders for the brace and a wearing schedule, as well as progress the patient's bed and transfer mobility. Please see the hip abduction procedure guide on the T drive for additional information.
- Social Work: Social workers may be consulted in complicated situations where patients may have difficulty coping with recovery and have limited social supports.

### **Standard of Care: Total Hip Replacement**

- ***Care Coordination:*** An appointment is made for most patients prior to their THA with a Care Coordinator at the Preoperative Clinic. A Care Coordinator is a registered nurse that specializes in discharge planning. Since the length of stay following a THA is short it is important to initiate discharge planning prior to surgery. A Care Coordinator will screen patients based on their living situation, social supports, prior level of function, and home environment to help create safe discharge plans based on each patient's individual needs. They will meet with patients following THA on POD#1 and facilitate all discharges both to home and rehabilitation facilities, provide clinical updates to insurance companies, and arrange transportation to another facilities as needed.

## **Re-evaluation**

The average inpatient length of stay following THA is 3 days. Patients are re-evaluated on a daily basis with respect to their ROM, quality of movement, muscle contraction, pain intensity, gait quality, and functional independence. If the patient's hospital course is prolonged due to complications, a formal re-evaluation will be performed every 7-10 days to re-assess progression towards the previously outlined goals and outcomes. In the outpatient setting, the patient is to be formally re-evaluated every 30 days; however impairments such as ROM should be monitored each visit. A re-evaluation is also indicated if there has been a significant change in signs and symptoms.

## **Discharge Planning**

### **Commonly expected outcomes at discharge:**

It is expected that most patients following THA will be discharged home after the inpatient acute care phase. Several factors including age, co-morbidities, living situation and support at home all may contribute to a patient's discharge to short term rehabilitation versus home. Commonly expected outcomes for discharge home are the ability to comply with hip dislocation precautions with all mobility, the ability to perform bed mobility and functional transfers independently, safely ambulate household distances of 50-100ft on even and uneven surfaces with an assistive device, and improve hip ROM and strength as identified in the goals.

### **Transfer of Care:**

Discharge planning is often started at the patient's pre-operative visit with Care Coordination. During the initial PT evaluation discharge recommendations are established from a PT perspective. Communication with care coordination and patient's multidisciplinary team will help to ensure successful transition of care and should be documented in the patient's medical record. Discharge recommendations should be documented in the initial physical therapy evaluation and any other encounter notes as appropriate. The selection of a discharge destination takes planning and careful consideration of multiple factors such as patient's social supports, living environment, and their functional mobility progress with skilled PT while at BWH. Proper documentation and communication of discharge recommendations will facilitate in the patient's transfer of care to either home with services or to an extended care facility.

## **Standard of Care: Total Hip Replacement**

**Patient's discharge instructions:**

- Review with the patient and family/caregivers dislocation precautions, safety, assist needed at home, use of proper assistive devices and equipment, proper gait and stair climbing techniques, positioning and home therapeutic exercise.
- Provide patients and their family/caregivers with education handouts that outline importance information that has been reviewed throughout PT sessions while at BWH.

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December, 2015

**Reviewed by:**

Brendan Connor, PT  
Carolyn Beagan, PT

**PUT ON ELLUCID AWAITING LINDA'S FINAL APPROVAL**

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### **Standard of Care: Total Hip Replacement**

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