



# Vanderbilt Orthopaedic Institute

Musculoskeletal Oncology

## The Musculoskeletal Sarcoma Patient Guide

Skeletal Sarcomas and Process of Treatment

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- ▣ Rehabilitation
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# Vanderbilt Orthopaedic Institute

## Musculoskeletal Oncology

### Skeletal Sarcomas

Sarcoma is a malignancy primary to the musculoskeletal system and can arise in either bone or soft tissue. Cancer that starts in bone is called skeletal sarcoma and examples include osteosarcoma, Ewing's sarcoma, or chondrosarcoma. Cancers that begin in the bone are quite rare and are called primary bone tumors. Tumors that arise elsewhere in the body and travel to the bones are called secondary bone tumors. Secondary bone tumors are more commonly metastases from lungs, prostate, breast or kidney cancer. Sarcomas are rare, constituting 0.5% of the total annual number of new cancers and are 200 times less common than carcinomas. The rarity of sarcomas means most doctors seldom see one which explains why patients are often referred to specialty hospitals where experienced surgeons utilize limb-sparing (no amputation) surgery whenever possible.

Skeletal sarcomas are most often found in legs and arms of children and young adults, but they can occur at any age.

Osteosarcoma is the most common type of bone cancer in young people, usually occurring between ages of 10 and 25 with males more commonly affected than females. It may also occur in the fifth or sixth decades of life. Osteosarcoma starts in the ends of long bones of the arms or legs where new bone tissue rapidly forms.

Ewing's sarcoma is usually found in young people between the ages of 10 to 25. This cancer forms in the mid part or shaft of large bones such as, hip, thigh bones, or upper arm bones and ribs.

Chondrosarcoma is found mainly in adults.

Limb sparing surgery (LSS) is a special operative procedure performed by oncology orthopedic surgeons and has become the accepted standard of care for patients with sarcomas of the extremities. The cancer in the bone or soft tissue is removed surgically and replacement of bones and joints is done with metal prostheses and/or reconstruction of the defect. Even though the salvaged extremity looks and moves in a near-normal manner, function rarely returns to 100% normal. Common causes of prosthesis failure include infection, aseptic loosening, bone resorption and fracture.

Regular follow-up for several years is very important after treatment for bone or soft tissue cancer. Regular check-ups will include physical exams, x-rays, scans, blood tests and other laboratory tests.

Patients who have limb salvage operations with joint replacements will require physical therapy to help regain optimal use of their operated limb. Patients with amputations will also require physical therapy with prosthetic training.

## Process of Treatment for Osteosarcoma:

Referral from the primary care physician/orthopedist is made to a specialty center to an orthopedic oncologist. The specialist will review the referral and will possibly recommend further tests including MRI, CT scan, x-rays and or lab work. A biopsy will be done to determine the type of cancer and after the results are determined a treatment plan will be arranged which will consist of a chemotherapy, limb salvage surgery, followed by more chemotherapy.

When the bone is removed it is replaced with a prosthesis. Prostheses used for limb salvage procedures are called megaprotheses. They are metallic devices designed to replace the diseased bones and joints which are removed during surgery. These devices are modular in design in order to accommodate different lengths of bone and needs of the patient. The prosthesis is fixed to the remaining bones with bone cement or the bone grows into the prosthesis.

Team members for LSS consist of the orthopedic oncologist, medical oncologists, nurses, social workers, physical therapists and occupational therapists. All of these people are there to help the patient throughout the course of their treatments.

Frequent follow-ups are recommended following surgery, since two-thirds of all recurrences will be detected during the first two years following diagnosis. Metastatic tumors to the lung are frequently asymptomatic and can be resected. The rehabilitation process is designed to help patients regain functional ability and independence. The American Cancer Society recommends an exercise regimen of at least moderate activity for thirty minutes per day for five or more days per week. Exercise should begin slowly and gradually increase in time and intensity.

## What is Distal Femoral Replacement Surgery?



Distal femoral replacement surgery is surgery done to remove part of the femur bone which is then replaced with a metal prosthesis. The prosthesis is a hinged artificial knee joint. The hinge mechanism substitutes for the stability which is normally provided by the joint capsule and ligaments which are removed during the limb salvage surgery.

Following surgery your leg will be placed in a knee immobilizer for two weeks. Isometric or non-bending exercises for the leg may be done with the leg in the immobilizer during this two-week time period. Weight bearing is determined at the time of surgery depending on whether the prosthesis is cemented or not. You will either be weight bearing as tolerated or non-weight bearing for six weeks and you will walk with the use of a walker or crutches during this time.

Rehabilitation will continue with either home physical therapy or outpatient therapy for several weeks until you regain satisfactory strength and function. Appointments for physical therapy should precede appointments for radiation therapy if possible so you are able to perform your exercises without fatigue. The therapist can also design an exercise program that you can do at home when you are less fatigued. Goals should be set with you and your family to help achieve your highest level of physical function.

If you require treatment with chemotherapy or radiation your reaction to radiation/chemotherapy will probably be determinants of how quickly you can progress with strengthening exercises. A Home Exercise Program should be set up at first visit and then upgraded to accommodate your progression with exercises. Goal setting should be coordinated with you and your family to help achieve your highest level of physical function. If you have a limited number of physical therapy visits you should have a progressive home exercise program spread out over as long of a period of time as possible.

The prosthesis will last longer if it is treated properly. Activities such as contact sports and running should be avoided. Specific activities should be discussed with the doctor to determine if they are appropriate for the survival of the implant.

There are four stages of tissue healing throughout the course of radiation, limb salvage and chemotherapy; the initial injury, inflammation, regeneration and remodeling. The initial injury phase is immediately post-operative with incision healing. During radiation therapy there is the inflammation period with a lot of skin tenderness similar to deep sunburn. During both of these periods care should be taken not to rub or massage the skin deeply due to possible injury to the underlying tissues until four weeks post radiation therapy.

Limb salvage surgery sometimes leaves long and deep scars, which could cause adhesions of the skin and soft tissues. During regeneration and remodeling of the scar and underlying tissues use of passive stretch and deep massage is indicated to help maintain the elasticity of the skin and muscles. Use of lymphatic drainage with pressure bandages to help prevent edema may be used if approved by MD at this time.

Ultrasound, electrical stimulation and iontophoresis are not recommended for patients who have had cancer surgery due to the possible stimulation of any remaining cancer cells. A TENS unit may be used.

## In Hospital Care

### **I** Preparing for Your Hospital Admission

The following is a list to help you prepare for the day of surgery:

- Stop taking all Aspirin, Ibuprofen, Advil, Motrin, Aleve, Naprosyn (all non-steroidal anti-inflammatories) 5 days before surgery
- You may continue to take the newer anti-inflammatories such as Celebrex and Mobic up to the day of surgery.
- If you take coumadin or other blood thinners such as Plavix or Lovenox, please contact your medical doctor to find out if it is safe to discontinue these drugs. Your surgeon should be informed 7 days prior to surgery if your doctor feels it is unsafe to stop these drugs.
- Oral diabetic medications (Glucophage) should be discontinued 5 days before surgery.
- If you are unsure whether any drugs you take fall into these categories, please ask either your surgeon or your medical doctor.
- All other medications should be continued unless otherwise instructed. Bring a list of your medications and their doses to the hospital with you.
- If you drink alcohol regularly, you must inform your surgeon and your medical doctor.
- Bring a lightweight robe, a nightshirt/gown, shorts, closed back slippers with non-skid soles, toiletries, glasses, etc.
- Do not bring large amounts of money, jewelry or valuable items.
- Do not wear make-up, contact lenses, dentures, hearing aids or nail polish into the operating room.
- Do not eat or drink after midnight the night before your surgery- this includes water and coffee. You may brush your teeth.
- Before surgery, your joint will be cleaned and may also be shaved. Your surgeon will mark their initials on the body part that is being operated on. An IV (intravenous) line is started. If you feel anxious or unable to relax, notify your nurse.
- When the surgeon is ready, you will be transported by stretcher to the operating room. After your surgery, your surgeon will discuss the results of your surgery with your family member or support person.

### **I** What Happens After Surgery

- After surgery you will be moved from the operating room to the recovery room. While in the recovery room, a team of nurses and members of the anesthesia team will care for you, checking vital signs frequently and monitoring your recovery from the anesthetic.
- When you are conscious, you will be encouraged to breathe deeply and cough to clear your lungs. You will be asked to do these breathing exercises several times a day until your office visit after surgery.
- Time spent in the recovery room varies depending upon your individual response to the anesthetic.
- No visitors are permitted in the recovery area.
- Once you are fully awake, you will be transported to your room.
- Initially, you will have several tubes and lines attached to you. These may include an IV line, oxygen tube in your nose, catheter in your bladder, and possibly a drainage tube from your operated area. These tubes and lines will be discontinued over the first and second days following your surgery.
- A Respiratory Therapist will visit you soon after surgery to instruct you in using the Volurex, a breathing device to keep your lungs clear. Your nursing staff will encourage you to use this device and perform breathing and coughing exercises hourly.

## **I** Medical Care

Your surgeon or one of his assistants will see you in the hospital each day. The medical care while you are in the hospital involves:

- Removing your bandage and checking your incision
- Controlling your pain with pills or medicine through an intravenous (IV) line or epidural.
- Following your blood count and replenishing your blood supply if needed.
- Thinning your blood with drugs and pumping your feet with special boots to help prevent clots.
- Receiving antibiotic medicines to help prevent infections.
- Managing your pre-existing medical problems (often with the assistance of medical doctors).

## **I** Physical Therapy

- You will be evaluated by Physical Therapy (PT) and Occupational Therapy (OT) following your surgery. OT will help you with self-care skills such as bathing and dressing and any other activities of daily living. You will receive PT twice a day for instructions in getting in and out of bed, walking using either crutches or a walker and exercises as ordered by your surgeon. Your surgeon and physical therapist will discuss your weight bearing status with you. Before going home, PT will instruct you in going up/down stairs as needed. Therapy sessions are conducted in a one-on-one setting, primarily in your hospital room. Nursing staff will be available to assist you getting in and out of bed and walking as needed. The PT and OT staff will help assess your home needs.

## Returning Home

### **I** Discharge from the hospital

- The hospital stay is usually about three days. If needed, a Social Worker or Nurse Case Manager will determine how much help you need at home, will contact your insurance company to see what help is covered and assist in setting up the appropriate referrals.
- Upon discharge from the hospital you will receive prescriptions for pain medication, blood thinning medications (Coumadin/warfarin or Lovenox/enoxaprin).

### **I** Medications

- If you are taking Coumadin or other blood thinning medications when you leave the hospital, you must have your blood drawn every Monday and Thursday until 3 weeks after surgery.
- The nurse will receive your lab results and adjust your nightly dose accordingly. You should continue your current dose until told otherwise. Do not stop or hold doses unless instructed to do so.

### **I** Incision

- Check incision for 72 hours after surgery for drainage, redness or swelling. May remove dressing if incision is clean and dry. Otherwise change dressing twice daily.
- Do not submerge incision in water. You may shower after 48 hours if incision is dry.

- Staples are removed between 2 and 4 weeks after surgery by a healthcare professional.
- Do not put any creams, lotions, antibiotic ointments, or cleansers on your incision while healing. Wash only with plain soap and water.

## **II** What to watch for

- It is normal for your knee to remain warm, swollen and slightly tender for a number of weeks. Applying icepacks regularly will help decrease the discomfort. Call your doctor if you have any of the following:
  - Temperature above 101.5 degrees.
  - Redness, increased drainage, or separation at your incision.
  - Excessive swelling.
  - Chest Pain.
  - Swelling, tenderness or redness in your calf or thigh of the operated leg.
  - Sustained swelling in operative leg that is not relieved with rest and elevation.

## **II** Increasing your activity

- You should increase your activities gradually, according to your surgeon and physical therapists instructions. Accept offers of assistance from friends and family, especially in the first weeks at home. As you regain strength and confidence, you will gradually progress from a walker/crutches to a cane.

## **II** Practicing infection prevention

- You are never completely safe from the risk of infection. Measures you can take to help prevent infection include:
  - Consulting your doctor immediately regarding any infection, dental problems or procedures or any contemplated surgery.
  - Treating any bacterial infection immediately to prevent infection of the joint.
  - Taking preventative antibiotics for any invasive procedure such as any dental work or urologic procedure. Consult your primary care physician if you have questions about other procedures needing antibiotic coverage.

## **II** Physical Therapy

- All patients receiving joint replacements require follow-up Physical Therapy after they leave the hospital. The orthopedic social worker or case manager will visit with you during your hospital stay. Based upon your surgeon's request and the recommendations of the PT and OT staff, they will make arrangements for equipment needs and follow-up Physical Therapy services before you leave the hospital. You will be notified of these arrangements verbally and in writing on your discharge information sheet, which will be given to you, by your nurse prior to discharge. The hospital staff will make follow-up appointments with your surgeon before you leave and this appointment time and date will also be included on your discharge information sheet.
- Your physical therapy will continue 3-5 times a week for a period of 6-10 weeks. It will consist of range of motion exercises, strengthening exercises, gait and balance training and endurance training.

## Use of Walking Aids

### Use of Crutches

- The top of your crutches should reach 1-1/2 inches below your armpits while you are standing straight. The handgrips of the crutches should be even with the top of your hip. Your elbows should bend a small amount when you press down on the handgrips. Hold the crutches slightly to your sides and use your hands to absorb your weight; do not lean onto the crutches by pressing them into your armpits.
- **Walking:** Lean slightly forward and place your crutches ~about 10-12 inches in front of you. Step forward with your injured or operative leg, shifting your weight onto your hands and opposite leg as you step forward. Your body moves forward between the crutches as you step forward with the stronger leg. Remember to look upward and ahead of you instead of watching your feet.
- **Sitting:** Back up to a chair or surface where you are going to sit until you feel the surface at the back of your knees. Place both crutches in one hand and use the other hand to feel for the surface behind you. Slowly lower yourself into the chair. To stand up, move yourself forward to the front of the chair. Hold both crutches in the hand on your stronger leg side. Push yourself up and stand on your stronger leg while placing the crutches correctly under your arms.
- **Stairs:** If there is a railing/banister, use the railing and place both crutches together on one side. Usually it is easier to use the railing on the side of your weaker/injured leg.
- **Up** – Facing forward, step up with the unaffected leg; next step up with the affected leg, bringing your crutches up at the same time
- **Down** – Facing forward, place the crutches on the lower step; step down onto the Step with your affected leg followed by your unaffected leg.

### Use of a Walker

- A walker provides more help with balance and walking than crutches provide and gives the most stability. Front wheel attachments to your walker may improve your balance more than the standard walker. A walker allows you to use your arms to support part of your body weight and keep some or all of your weight off your lower body as you take steps. The top of your walker should match the crease in your wrist when you stand up straight.
- **Walking:** Move your walker about one step ahead of you. Using both hands, grip the top of the walker (at the handgrips) for support and walk forward into the walker, leading with your injured/operated leg. Next, step forward with your unaffected leg while supporting your body weight through your arms. Do not step all the way forward into the front of your walker. Take small steps when turning; turns are when you are most likely to lose your balance.
- **Sitting** – Step backwards until you feel the chair/surface at the back of your legs. Reach back to feel the seat and grasp the armrests of the chair (if available) before sitting. To get up from a chair, slide yourself forward in the chair; use one hand to push up

from the armrest of the chair and the other hand stabilizing the walker.

- **Stairs** – Do not try to climb stairs or use an escalator with your walker. Your physical therapist will instruct in alternate ways to climb stairs.

#### General Guidelines for Using Walking Aides:

- Rearrange your furniture so you can maneuver with a walker or crutches; you may have to temporarily change rooms to avoid unnecessary stair climbing
- Remove scatter rugs and anything else that may cause you to fall; secure electrical cords around the perimeter of the room
- In the bathroom, use non-slip bathmats, grab bars, a raised toilet seat and a shower/tub seat
- Simplify your household to keep items handy you use most and everything else out of the way. Keep frequently used/needed items such as your phone, remote controls, tissues, wastebasket, glass or cup, reading materials and medications within easy reach
- Use a backpack, fanny pack, apron or walker basket to help carry things



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### Patient Surgical Information:

- 1) Surgical approach...lateral / medial
- 2) Resection of distal femur \_\_\_\_\_centimeters
  - Vastus intermedius
  - Vastus medialis
  - Vastus lateralis
  - Rectus femoris
- 3) Femoral replacement
  - Endoprosthesis
  - Allograft
  - Cemented / non-cemented
- 4) TKA type: hinged or allograft/prosthetic composite or allograft
  - Patellar replacement yes/no
- 5) Muscle flap transfer to cover prosthesis
- 6) Nerve impairment
  - Peroneal nerve palsy
  - Femoral / tibialis posterior nerve palsy
- 7) Leg length discrepancy

### Goals for distal femoral replacement:

- Same as standard total knee replacement if all muscles are intact.
- Ambulation without assistive device.
- ROM= 0-120 degrees
- Quadriceps and hamstring strength = 5/5



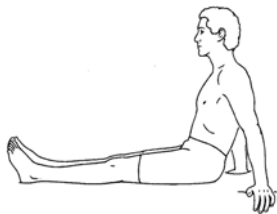
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## Musculoskeletal Oncology

### Early Post Surgery Rehab Distal Femoral Replacement

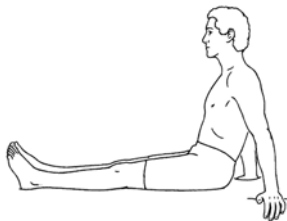
1. Knee immobilizer x 2 weeks with no ROM passive or active
2. Weight bearing status \_\_\_\_ WBAT\_\_\_\_PWB\_\_\_\_NWB
3. Ambulation training /stair training with immobilizer on
4. Upper extremity strengthening
5. Transfer training
6. Quad sets /hamstring sets/ glut sets / abductor /adductor hip strengthening with immobilizer on.

### Exercises



#### Hip/Knee - Strengthening: Quadriceps Set

- Tighten Muscles on tops of thighs by pushing knees down into surface. Hold 10 seconds.
- Repeat 10x per set.
- Do 1 set per session.
- Do 3 sessions per day.



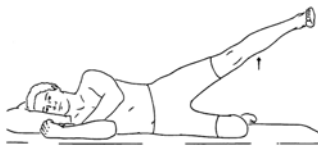
#### Hip/Knee - Strengthening: Hamstring Set

- Tighten Muscles on bottoms of thighs by pushing heels down into surface. Hold 10 seconds.
- Repeat 10x per set.
- Do 1 set per session.
- Do 3 sessions per day.



#### Gluteal/Buttock Set

- Squeeze buttocks together tightly. Hold 10 seconds. Relax
- Repeat 10x per set.
- Do 1 set per session.
- Do 3 sessions per day.



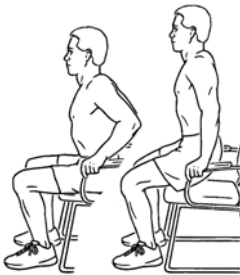
#### **Hip/Knee - Strengthening: Hip Abduction (Side-Lying)**

- With leg immobilizer on, tighten muscles on front of operated thigh, then lift leg 15 in. from surface, keeping knee locked..
- Repeat 10x per set.
- Do 1 set per session.
- Do 3 sessions per day.



#### **Hip/Knee - Strengthening: Hip Adduction (Side-Lying)**

- With leg immobilizer on, tighten muscles on front of operated thigh, then lift leg 5 in. from surface, keeping knee locked.
- Repeat 10x per set.
- Do 1 set per session.
- Do 3 sessions per day.



#### **Hand - Elbow Extension: Chair Stand - Resisted**

- With hands on armrests, push up from chair. Use legs as much as necessary. Return Slowly.
- Repeat 10x per set.
- Do 1 set per session.
- Do 3 sessions per day.



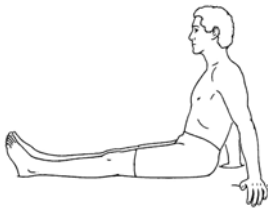
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## Musculoskeletal Oncology

### Two Weeks Post Surgery Rehab Distal Femoral Replacement

1. Quad / hamstring sets
2. Progress ROM as tolerated
3. Independent with transfers
4. AFO if necessary
5. WB if cemented, 6 weeks if non-cemented

#### Exercises:



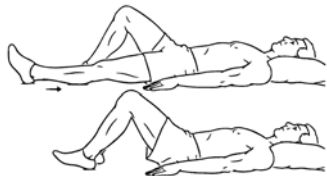
##### Hip/Knee - Strengthening: Quadriceps Set

- Tighten Muscles on tops of thighs by pushing knees down into surface. Hold 10 seconds.
- Repeat 10x per set.
- Do 1 set per session.
- Do 3 sessions per day.



##### Hip/Knee - Strengthening: Hamstring Set

- With foot turned out, tighten muscles on back of thigh by pulling heel down into surface. Hold 10 seconds.
- Repeat 10x per set.
- Do 1 set per session.
- Do 3 sessions per day.



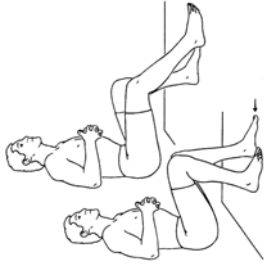
##### Hip/Knee - Self Mobilization: Heel Slide (Supine)

- Slide heel toward buttocks until a gentle stretch is felt. Hold 10 seconds. Relax
- Repeat 10x per set.
- Do 1 set per session.
- Do 3 sessions per day.



##### Hip/Knee - Hip Abduction/Adduction" wit Extended Knee (Supine)

- Slide leg out to side and return. Keep knee straight.
- Repeat 10x per set.
- Do 1 set per session.
- Do 3 sessions per day.



#### Hip/Knee - Knee Wall Slide

- Slowly “walk” or slide feet on wall toward floor until stretch is felt in knees.
- Repeat 10x per set.
- Do 1 set per session.
- Do 2 sessions per day.



#### Hip/Knee - Knee Extension Mobilization: Towel Prop

- With rolled towel under ankle, hold leg straight. Hold 10 min.
- Repeat 1x per set.
- Do 1 set per session.
- Do 2 sessions per day.



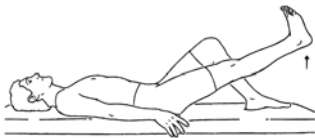
#### Hip/Knee - Strengthening: Terminal Knee Extension (Supine)

- With knees over bolster, straighten knees by tightening muscles on tops of thighs. Keep bottom of knees on bolster.
- Repeat 10x per set.
- Do 1 set per session.



#### Hip/Knee - Strengthening: Knee Extension (Standing)

- With support, bend knee as far as possible.
- Repeat 10x per set.
- Do 2 sets per session.
- Do 1 session per day.



#### Hip/Knee - Strengthening: Straight Leg Raise

- Tighten muscles on front of thigh, then lift leg 15 inches from surface, keeping knee locked.
- Repeat 10x per set.
- Do 3 sets per session.
- Do 2 sessions per day.



#### Hip/Knee - Strengthening: Hip Abduction (Side-Lying)

- With leg immobilizer on, tighten muscles on front of operated thigh, then lift leg 15 in. from surface, keeping knee locked. Hold leg up 15-30 seconds.
- Repeat 10x per set.
- Do 1 set per session.
- Do 1 session per day.



# Vanderbilt Orthopaedic Institute

## Musculoskeletal Oncology

### Advanced Routine - Distal Femoral Replacement

- ▣ Graded progression of exercises
- ▣ Balance training
- ▣ Precautions for tissue compromised by chemo/radiation therapy
- ▣ Upper extremity strengthening
- ▣ Straight leg raises with increasing weights
- ▣ Short arc quads with increasing weights
- ▣ Hamstring strengthening with increasing weights
- ▣ Abductor strengthening
- ▣ Hip extensor strengthening
- ▣ Aerobic strengthening with recumbent / seated bike or elliptical

### Exercises:



#### Hip/Knee - Strengthening: Hip Abduction (Side-Lying)

- ▣ With leg immobilizer on, tighten muscles on front of operated thigh, then lift leg 15 in. from surface, keeping knee locked. Hold leg up 15-30 seconds.
- ▣ Repeat 10x per set.
- ▣ Do 1 set per session.
- ▣ Do 1 session per day.

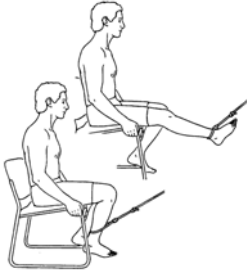
#### Hip/Knee - Strengthening: Straight Leg Raise

- ▣ Tighten muscles on front of thigh, then lift leg 15 inches from surface, keeping knee locked.
- ▣ Repeat 10x per set.
- ▣ Do 3 sets per session.
- ▣ Do 2 sessions per day.



### Hip/Knee - Strengthening: Terminal Knee Extension (Supine)

- With knees over bolster, straighten knees by tightening muscles on tops of thighs. Keep bottom of knees on bolster.
- Repeat 10x per set.
- Do 1 set per session.



### Hip/Knee - Strengthening: Hamstring Curl (Sitting)

- Facing anchor with tubing on ankle, leg straight out, bend knee.
- Repeat 10x per set.
- Do 3 sets per session.
- Do 1 session per day.



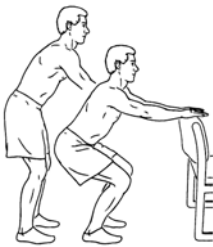
### Hip/Knee - Knee Flexion: Resisted (Standing)

- With support, add progressively increasing weights around ankle. Slowly bend knee up. Return slowly.
- Repeat 10x per set.
- Do 2 sets per session.
- Do 1 session per day.



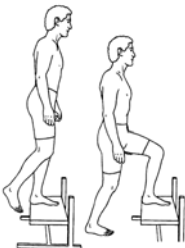
### Hip/Knee - Functional Quadriceps: Sit to Stand

- Sit on edge of chair, feet flat on floor. Stand upright, extending knees fully.
- Repeat 10x per set.
- Do 1 set per session.



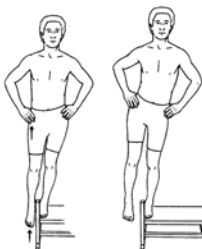
### Hip/Knee - Functional Quadriceps: Chair Squat

- Keeping feet flat on floor, shoulder width apart, squat as low as is comfortable. Use support as necessary.
- Repeat 10x per set.
- Do 1 set per session.
- Do 1 session per day.



### Hip/Knee - Step Down / Step Up

- Stand on stair step or 4-6 inch stool. Slowly bend leg, lowering other foot to floor. Return by straightening front leg.
- Repeat 10x per set.
- Do 1 set per session.



### Hip/Knee - Hip Hike

- Stand on step, one leg off step, knee straight. Raise unsupported hip, keeping knee straight.
- Repeat 10x per set.
- Do 1 set per session.



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## Musculoskeletal Oncology

### Glossary

#### Cancer: Medical Terminology

**Adjuvant therapy:** chemotherapy, radiation therapy or hormone therapy used to kill remaining cancer cells left behind after surgery.

**Benign:** any tumor, growth or cell abnormality that is not cancerous. The growth will not spread to deeper tissues or other parts of the body.

**Biopsy:** removal of a small portion of tissue for examination under a microscope. This test tells whether cancer cells are present.

**Chemotherapy:** therapy that uses drugs to damage cancer cells and make it difficult for them to grow in number.

**Chondrosarcoma:** a cancer that forms cartilage.

**Enchondroma:** a benign bone tumor of cartilage inside the bone.

**Ewing's Sarcoma:** a bone cancer that affects young individuals; most often treated with chemotherapy and surgery.

**Fibrosarcoma:** a form of bone cancer( occasionally soft tissue sarcoma) that occurs mainly in middle-aged and elderly people

**Grade:** low, intermediate, or high designations indicating aggressiveness in cancer.

**Limb salvage surgery:** surgery done to remove a tumor while saving the extremity, thus avoiding an amputation.

**Liposarcoma:** a fatty, soft tissue sarcoma

**Localized:** cancer affecting only the cells of a certain area.

**Malignant:** indicates that cancer cells are present and may spread to other parts of the body.

**Malignant transformation:** the rare occasion when a benign tumor changes into its malignant counterpart, for example a lipoma into a liposarcoma.

**Margins:** the periphery or edges of the surgical resection around the tumor. Clear margins imply the tumor has been completely removed.

**Medical oncologist:** physician who specializes in chemotherapy for cancer.

**Metabolic bone disease:** not a neoplasm but a bone disease that weakens the skeleton. Examples are: osteoporosis, Paget's disease, rickets, renal osteodystrophy, osteogenesis imperfecta, and osteomalacia.

**Metastasis:** the spread of cancer from one area of the body to another. For example: bone cancer may spread to the lungs.

**MFH:** Malignant Fibrous Histiocytoma, the most common soft tissue sarcoma.

**Neo-adjuvant therapy:** chemotherapy given before surgery or radiotherapy.

**Oncologist:** a physician who specializes in cancer.

**Osteomyelitis:** a bone infection.

**Osteoporosis:** decreased bone density. Not a tumor. "Weak bones".

**Osteosarcoma:** the most common cancer of the bone that occurs in children. Also called osteogenic sarcoma.

**Pathologic fracture:** a break in a bone caused by growth of a benign or malignant tumor. The tumor growth weakens the bone sufficiently for it to break.

**Pathologist:** a doctor who identifies diseases (such as cancer) by studying cells under a microscope.

**Prognosis:** the expected outcome of a disease and chances for recovery.

**Prosthesis:** an artificial replacement for a body part.

**Radiation oncologist:** a physician who specializes in radiation treatments for cancer.

**Radiation therapy:** (radiotherapy) therapy that uses high energy rays or radioactive materials to damage cancer cells, making it more difficult for them to grow in number. Side effects are "sunburned" skin, stiffness and swelling.

**Recurrence:** the development of cancerous cells in the same area or another area of the body after cancer treatment.

**Rhabdomyosarcoma:** the most common soft tissue sarcoma of children, occurring in the muscle.

**Sarcoma:** a type of cancer that starts in bone or connective tissue.

**Skeletal sarcoma:** a cancer originating in bone.

**Soft tissue sarcoma:** a sarcoma that begins in the muscle, fat, fibrous tissue, blood vessels, or other supporting tissues of the body. Not a type of bone cancer.

**Stages of cancer:** the progression of cancer from mild to severe. Usually indicates if it has spread to deeper tissues or other parts of the body. One method used by doctors to stage different types of cancer is the TNM classification system. In this system, doctors determine the presence and size of the tumor (T), how many (if any) lymph nodes are involved (N) and whether or not the cancer has metastasized (M). A number (usually 0-4) is assigned to each of the three categories to indicate its severity.

**Staging:** the process of learning about the extent of the tumor and whether the disease has spread from its original site to other parts of the body.

**X-ray:** high-energy radiation. Used in low doses to diagnose diseases and in high doses to treat cancer.



# Vanderbilt Orthopaedic Institute

## Musculoskeletal Oncology

### Web Sites and Links

- [www.mc.vanderbilt.edu/ortho/oncology.html](http://www.mc.vanderbilt.edu/ortho/oncology.html)
- [www.cancer.gov/](http://www.cancer.gov/) National Cancer Institutes website which provides access to the most current information on cancers.
- [www.cancer.gov/cancertopics/pdq](http://www.cancer.gov/cancertopics/pdq) Physician Data Query which is a computerized database designed to give health professionals, patients and the public quick and easy access to:
  - The latest treatment, supportive care, screening, and prevention information for most types of cancer.
  - Description of research studies/clinical trials that are open for enrollment including treatment, supportive care, screening, and prevention studies.
  - Information on organizations and physicians who specialize in cancer care.
- [www.thecancer.info](http://www.thecancer.info) The Cancer Information Network which is the National Cancer Institute(NCI) national information and education network. It is the source for the latest, most accurate information for patients, the public and health professionals. Scientific information is given in understandable language and is available in English and Spanish.



# Vanderbilt Orthopaedic Institute

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