

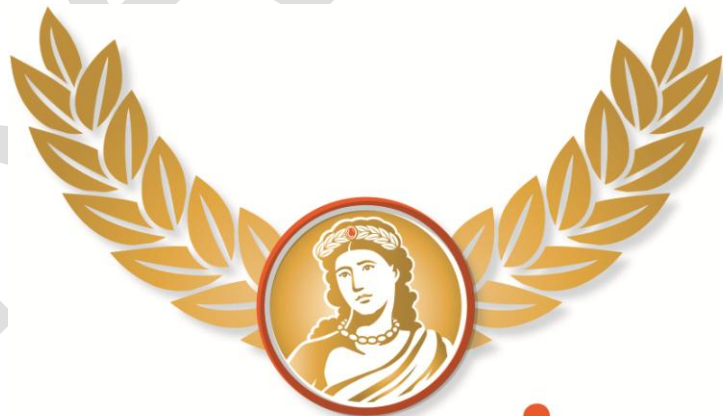
Soteria Strains

Safe Patient Handling and Mobility Program Guide

Section 4 – Special Considerations

Section 4.3 - Orthopedics

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soteria

STRAINS

A provincial strategy for healthcare workplace musculoskeletal injury prevention.

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Section 4 – Special Considerations sub-sections will be expanded and/or modified as required based on input from experience and observations during program implementation.

4.3 Orthopedics

Introduction

Every patient population presents unique challenges for safe handling and mobilization. Orthopedic patients present particular challenges; there are hazards exclusive to this population, tasks that have elevated risk compared to similar tasks performed in non-orthopedic settings, and occasions where standard approaches to safe patient handling are contraindicated due to specific medical restrictions. This section contains additional high-risk tasks to consider when assessing orthopedic units. (Refer to “Section 2.2 – Unit Hazard Identification and Risk Assessments.”)

Refer to Appendix 4.3.1 – Orthopedic Algorithms (1-4) for Safe Patient Handling and Mobility to assist with decision-making for the following high-risk tasks.

Turning an orthopedic patient in bed (side to side)

Turning patients with orthopedic impairments from side to side in bed is a common activity. Patients are often repositioned to maintain alignment of the spine, limbs, and other body parts that have been injured or undergone surgical procedures. Individuals may have equipment attached to their body such as halo vests or external fixators to stabilize fractures. This can make turning in bed difficult, especially if the patient is experiencing pain, has altered levels of consciousness, or is uncooperative. Health care workers need to move and turn individuals several times a day. It is imperative that health care workers remain safe while moving patients. The combined weight of patients and added equipment may increase the risk for injury.

Vertical transfer of a post-operative total hip replacement (THR) patient

Moving a patient who has had a THR from a supine position to sitting on the side of the bed is a common activity performed by health care workers. This task requires adherence to positional constraints identified by the surgeon so that the hip does not become dislocated. Orthopedic precautions need to be followed that may include weight-bearing limits on the lower extremities, abduction of the legs, prevention of internal rotation, and avoidance of hip flexion less than 90 degrees. This may limit the use of mechanical aids such as sling lifts, or require specialized slings.

Vertical transfer of a patient with an extremity cast/splint

Moving a patient with a cast or splint on an extremity is commonplace in health care facilities. The patient's level of pain, fatigue, and ability to cooperate and support the limb are all variables that make this task high risk. Additional risks to the health care worker are posed by heavy casts, traction weights, awkward postures, pushing/pulling, and twisting. During cast application, the limb must be held for a long period of time increasing difficulty because the limb must be supported as the cast is wrapped.

Ambulation

Ambulation of an orthopedic patient is an intervention critical to reducing post-operative complications, including complications due to immobility. Limitation of weight-bearing status, inability to grasp with the hand and the use of various immobilization devices such as splints can make this task more difficult. The risk of patient falls is also a primary concern that must be mitigated.

Assisting a patient to ambulate is considered a high-risk task because of physical demands associated with weight support as well as sudden and unpredictable movements associated with loss of balance or a fall, increasing risk of injury for health care workers. It is important to determine when ambulation should be performed with manual assistance versus patient-handling technology.

Traditionally, ambulation has been carried out with gait belts and ambulation devices such as walkers and crutches. Health care workers perform bending, pulling, and lifting as they assist the patient to a standing position. Health care workers may have to reposition the ambulation device or a wheelchair while supporting the patient. This may require the health care worker to hold the patient up with the gait belt in one hand while bending and pulling the chair along with the other hand. The patient may also require assistance for advancing a walker or other ambulation devices. At times, two health care workers are available to assist with ambulation, but often a single health care worker performs all of these tasks. The risks are magnified if there are other devices such as intravenous poles or catheters that need to be towed and monitored; this diverts the health care worker's attention and hands from the ambulation task.

Orthopedic patients benefit from ambulation, but it is also important to consider orthopedic precautions when deciding on what tools to assist with this task. Lifts and slings need to be evaluated for their ability to accommodate positional precautions, immobilized limbs, or external fixation devices.

Ambulation is never entirely a risk-free activity. The level of risk should be carefully assessed as the effects of a fall within an orthopedic population can be very damaging to the patient and the care provider who is attempting to prevent the fall. The health care team will need to determine the risks and the appropriate time to begin ambulation without a supporting sling and lift in order to functionally advance the patient in this task.

Lifting/holding a limb (with or without a cast/splint)

Lifting and holding limbs during casting or splinting is often performed in the orthopedic setting. This activity can expose health care workers to static loads, poor postural positions and excessive forces/torque (weight of the limbs, horizontal distance) for durations that significantly increase risk of injury. Additional help or some type of assistive technology may be needed to perform the task. refer to Appendix 4.3.2 – Ergonomic Tool: Lifting and Holding Legs or Arms in an Orthopedic Setting or Appendix 4.3.3 – Alternate Method for Determining Safe Lifting and Holding of Limbs with Casts for guidance on recommended limits based on patient weight.

Individual health care workers must also respect their own physical limitations when performing any task and may choose to request help and/or use an assistive device.

Appendix 4.3.1 – Orthopedic Algorithms (1-4) for Safe Patient Handling and Mobility

Weight bearing is characterized by three levels as defined below:

1. Non-weight bearing: No weight is to be borne by the affected limb.
2. Partial weight bearing: A percentage of body weight less than 100% may be borne on the affected extremity. The specific percentage is dictated by the orthopedic surgeon.
3. Full weight bearing: Full body weight may be borne on the affected extremity.

If weight bearing is contraindicated through both lower extremities, then ambulation should not be performed. If partial or full weight bearing of at least one lower extremity is deemed by orthopedic surgeon to be acceptable, then the health care worker follows the downward pathway of the tool.

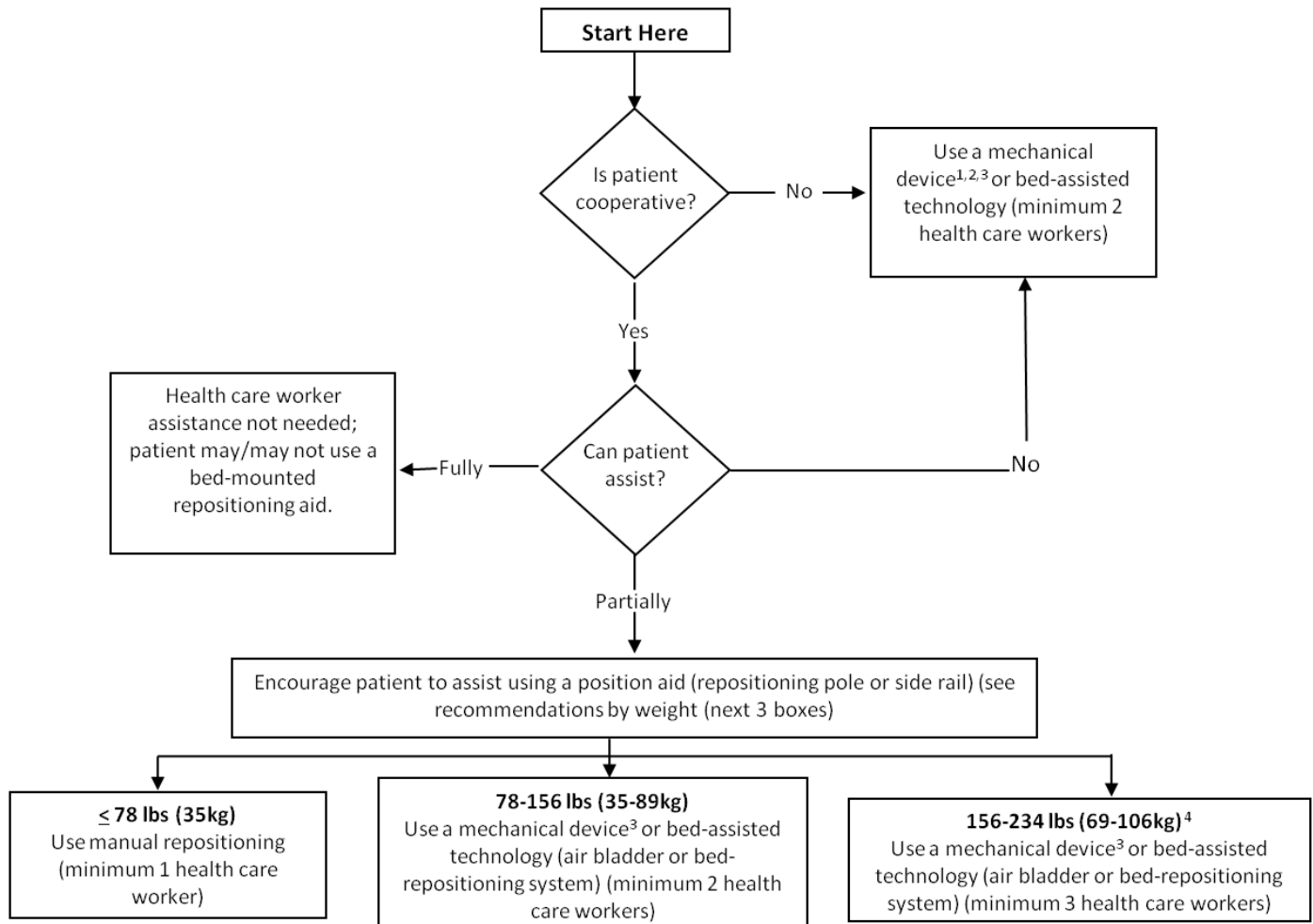
Selection of the appropriate sling accessory for movement/lift/transfer must include the following considerations:

- Decision to transfer patient in sitting vs. supine position – choose correct functionality of the sling
- Select appropriate size
- Maintain alignment of the affected body part(s) according to pre-op/post-op guidelines
 - Consider the patient's body size, shape and features (e.g., very large abdominal girth can limit degree of hip flexion)
 - Features of sling
 - consider where material covers patient
 - strap options for seated slings: The length of material for strap supports of the lower extremities can often be modified by selecting differing loop-attachment points of the sling onto the hanger bar (e.g., providing more material length will allow lower extremity to be in less flexed position)
 - seated slings: Back height can vary from supporting the whole trunk and head to covering pelvis/waist only. When upper extremities are involved, consider height of the sling – high-back slings will wrap around and enclose an upper extremity, while a low-back sling will allow the upper extremity to be free.

If alignment/positioning guidelines cannot be met with the available sling accessory, transfer the patient in a supine position with a sheet-style sling or anti-friction methods, and then sit upright.

The *Patient Care Sling Selection and Usage Toolkit* is available for download at:
<http://www.visn8.va.gov/patientsafetycenter/safePtHandling/toolkitSlings.asp>

Orthopedic Algorithm #1: Turning Patient in Bed (Side-to Side)
 Patient with Orthopedic Impairments
 September 25, 2008



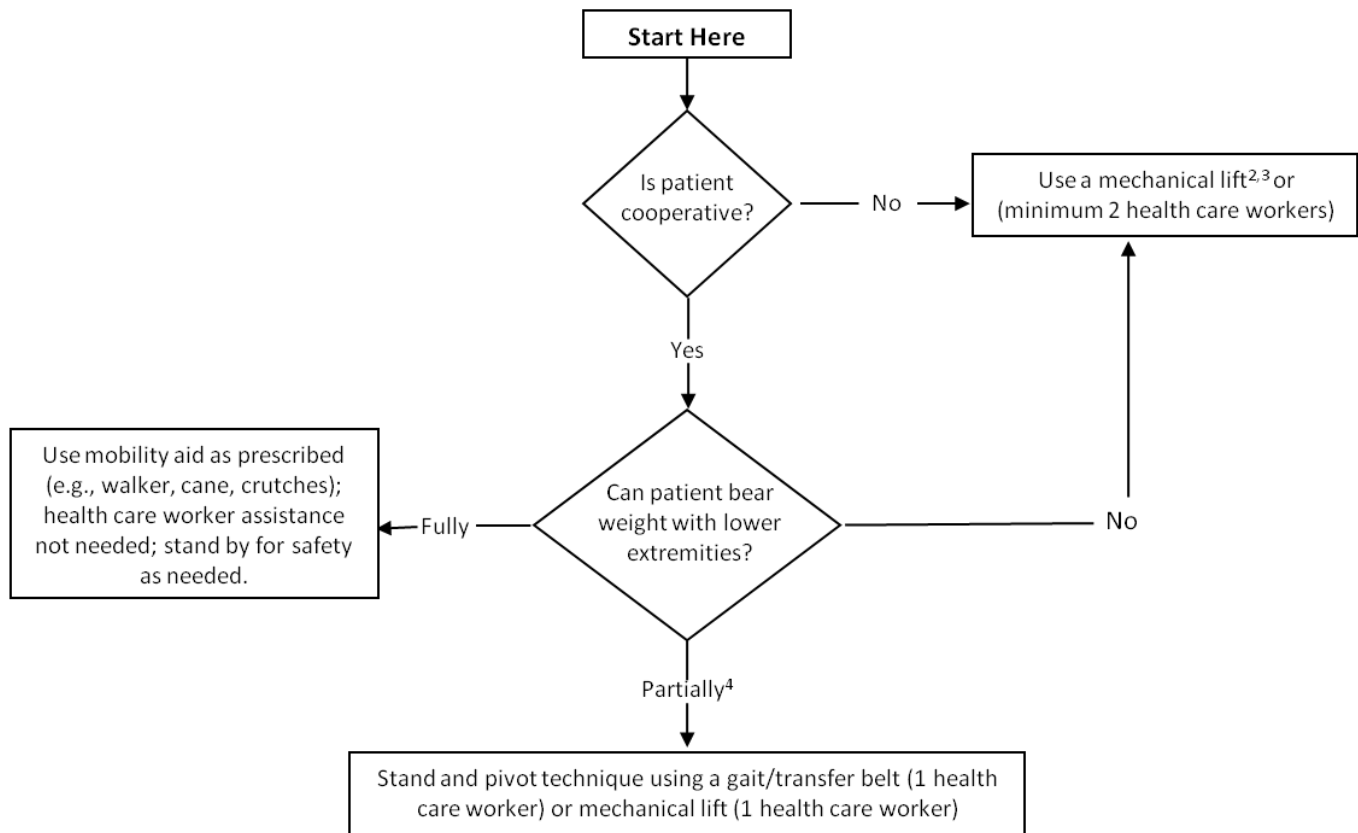
FOOTNOTES

1. Maintain orthopedic precautions as prescribed while performing this activity such as total hip, knee, shoulder or spine precautions
2. Select sling to meet and maintain the patient's pre-op or post-op positioning guidelines/precautions for the affected limb/body part
3. Example of repositioning mechanical device are: turning clips: these simple slips attach to a bed sheet and can be used with floor-based lift or ceiling-based lift to facilitate turning a patient. Turning straps/slings: one end of these straps or slings is connected to the bed and the other end is attached to either a ceiling or floor-based lift to facilitate turning the patient. Friction reducing devices: either tubular in design, or two separate pieces of material are placed under the patient to assist in turning the patient in bed or moving the patient to the head of the bed. Pulley systems: these devices work by use of a pulley system and an overhead frame. The user turns a crank, which engages the pulley system to retract straps that are connected to a rope and bed sheet, thus turning the patient on the side.
4. If patient weighs more than 234 lbs. mechanical assistive devices should be used to assist. Use your best clinical judgment for the number of health care workers required to assist.

GENERAL NOTES:

- For any patient who has, or is at risk for a pressure ulcer, care should be taken to avoid shearing force (such as using a friction reducing device for repositioning in bed). Shearing force is when there are two forces moving in opposite directions adjacent to each other (like scissors).
- The height of the bed should be appropriate for staff safety.
- During any patient handling task, if the health care worker is required to lift more than 35 lbs (16kg) of a patient's weight, then the patient should be considered fully dependent and an assistive device should be used. (Waters, T. [2007]. When is it safe to manually lift a patient? *American Journal of Nursing*, 107(8), 53-59).

Orthopedic Algorithm #2: Vertical Transfer of a Post-Op Total Hip Replacement Patient (Bed to Chair, Chair to Toilet, Chair to Chair, or Car to Chair)



FOOTNOTES:

1. See A, B, C, D below for technique to position patient at side of bed:

- A. Moving from supine head of bed elevated to sitting at edge of bed requires: patient's ability to shift their seated weight in a sitting position. Typically accomplished by unweighting one buttock and moving it toward the edge of the bed; repeating this in an alternating fashion until patient is sitting at edge of bed.
- B. With an impaired upper or lower extremity, health care worker might need to support the limb while patients attempts A
- C. If patient is unable to accomplish A with B & the amount of assistance from health care worker will exceed 35 lbs, then a mechanical lift device should be used to achieve sitting position at the edge of the bed
- D. Friction reducing devices and seated discs might be useful when the amount of health care worker assistance is close to recommended limits; be aware of skin shearing risks. Shearing forces are caused when there are two forces moving in opposite directions adjacent to each other (like scissors).

2. Maintain orthopedic precautions as prescribed while performing this activity such as total hip, knee, shoulder, or spine precautions.

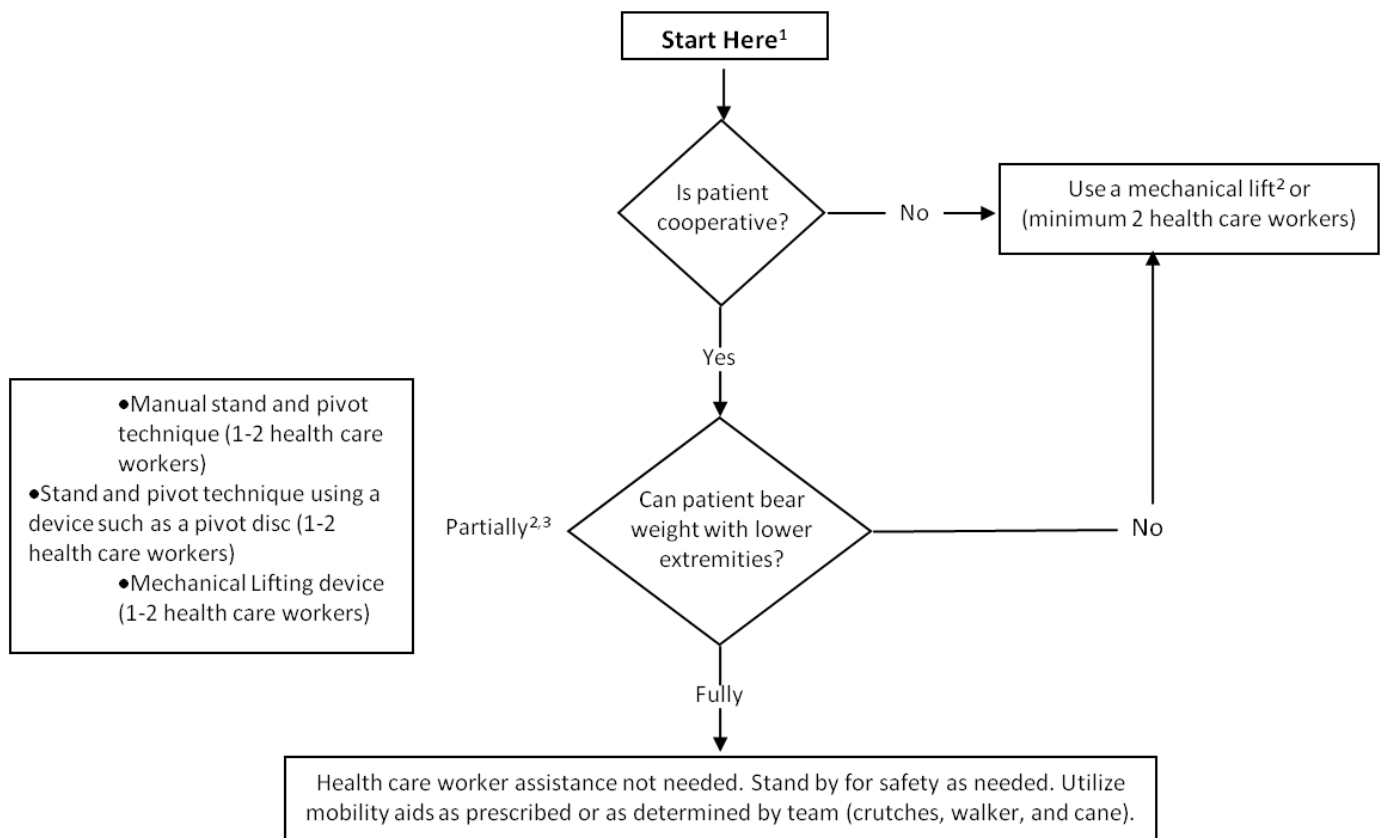
3. Select sling to meet and maintain the patient's pre-op or post-op positioning guidelines/precautions for the affected limb/body parts(s).

4. This will include situations where the patient may be allowed: limited weight bearing on one lower extremity and full weight bearing on the other extremity or partial weight bearing through both lower extremities

GENERAL NOTES:

- If patient has partial weight bearing capacity, transfer toward stronger side.
- For car transfers: If patient cannot tolerate a seated position when doing a car transfer use a stretcher transfer or alternative transportation may be required; all car transfers should comply with the provincial laws for both children & adults; don't forget to use all of the features of the car (i.e. adjustability of the seat) during transfer
- The height of the bed should be appropriate for staff safety.
- During any patient handling task, if the health care worker is required to lift more than 35 lbs (16kg) of a patient's weight, then the patient should be considered fully dependent and an assistive device should be used. (Waters, T. [2007]. When is it safe to manually lift a patient? *American Journal of Nursing*, 107(8), 53-59).

Orthopedic Algorithm #3: Vertical Transfer of a Patient with an Extremity Cast/Splint



FOOTNOTES:

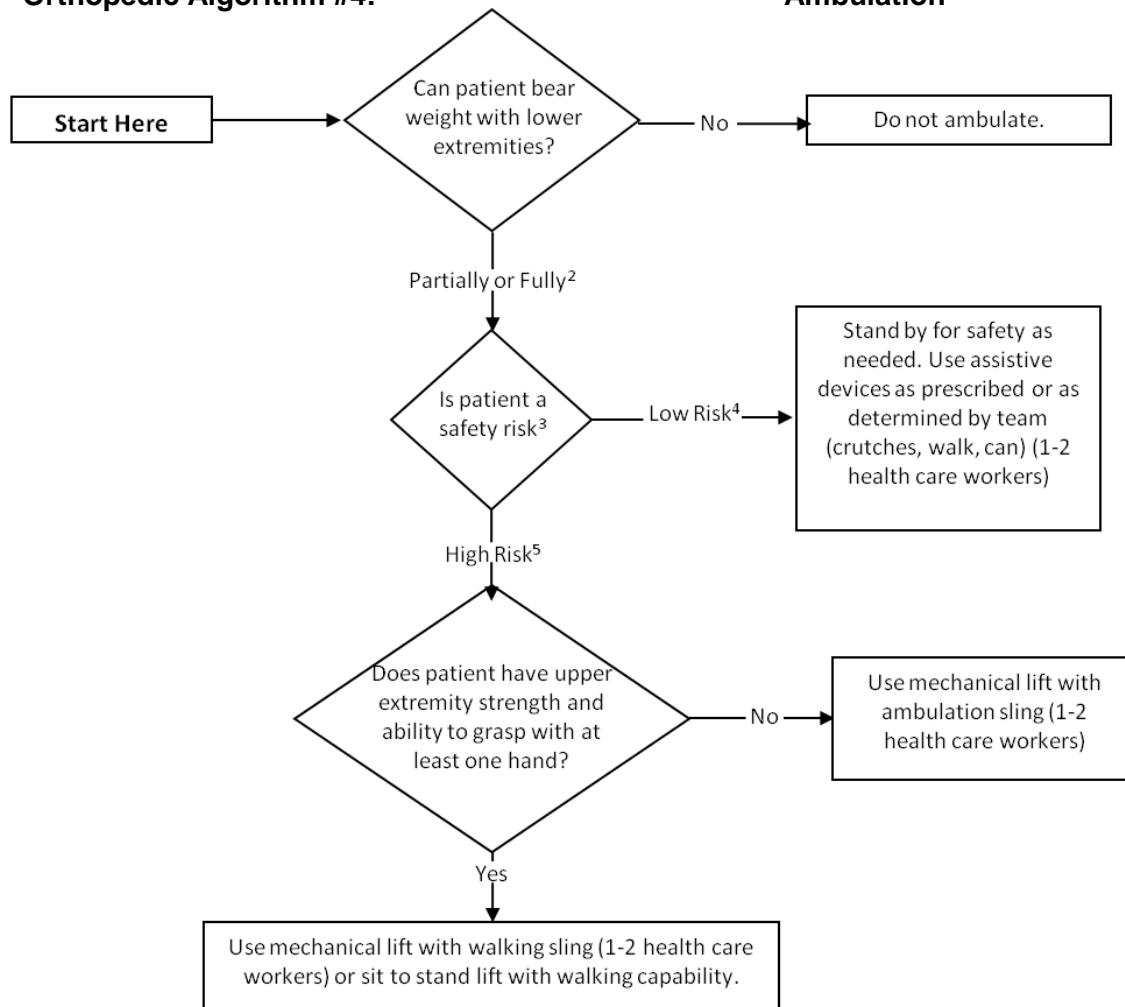
1. Moving from supine head of bed elevated to sitting at edge of bed requires: patient's ability to shift their seated weight in a sitting position
 - A. When assistance is not required, this is typically accomplished by unweighting on buttock and moving it toward the edge of the bed; repeating this in an alternating fashion until patient is sitting at edge of bed.
 - B. With an impaired upper or lower extremity, health care worker might need to support the limb while patient moves unassisted to side of bed (provided that amount of assistance does not exceed 35 lbs)
 - C. If patient is unable to accomplish A with B & the amount of assistance from health care worker will exceed 35 lbs, then a limb sling with a mechanical lift will provide limb support while patient moves unassisted to side of bed
 - D. If patient is unable to accomplish A, B, or C a mechanical lift device with a seated sling to lift the patient to side of bed can be used or friction-reducing device to assist staff in pulling patient to side of bed.
 - E. Friction reducing devices and seated discs might be useful when the amount of health care worker assistance is close to recommended limits; be aware of skin shearing risks. Shearing forces are caused when there are two forces moving in opposite directions adjacent to each other (like scissors).
2. Select sling to meet and maintain the patient's pre-op or post-op positioning guidelines/precautions for the affected limb/body parts(s).
3. Patient can bear weight on one leg only (e.g. weight bearing on unaffected limb or limited weight bearing on affected limb).

GENERAL NOTES:

- Need to test the fit of the sling with an immobilized extremity.
- Maintain affected extremity immobilization/alignment
- Use lift device with limb sling if applicable
- During any patient handling task, if the health care worker is required to lift more than 35 lbs (16kg) of a patient's weight, then the patient should be considered fully dependent and an assistive device should be used. (Waters, T. [2007]. When is it safe to manually lift a patient? *American Journal of Nursing*, 107(8), 53-59).

Orthopedic Algorithm #4:

Ambulation



FOOTNOTES:

1. Non-weight bearing: Patient is unable to bear weight through both lower extremities or weight-bearing through both lower extremities is contraindicated.
2. Partial weight bearing: this will include situations where the patient may be allowed: limited weight bearing on one lower extremity and full weight bearing on the other extremity or partial weight bearing through both lower extremities.
3. Safety risks may include: decreased cognition, decreased ability to cooperate/combativeness or medical stability.
4. Factors that contribute to low safety risk: lack of combativeness, ability to follow commands, medical stability, and experience with assistive device.
5. Factors that contribute to high safety risk: combativeness, lack of ability to follow commands, medical instability, lack of experience with the assistive device, neurological deficits.

GENERAL NOTES:

- In health care, weight-bearing is often used to describe the amount of weight bearing that the patient can or has done. In orthopedics, weight bearing status is prescribed by the physician based on the patient's ability to safely bear weight through the musculoskeletal system. Exceeding the prescribed weight bearing status may be detrimental to the patient.
- Patients should be assessed for safety risks as described above. If patients are determined to be at significant risk for falls, then health care workers assisting with ambulation are also at risk for assisting patients to prevent fall. In high risk situations precautions should be taken, and devices such as walking sling should be used. At some point in care, the team will need to weigh the risks of falls with the benefits of ambulation and take a therapeutic risk in order to functionally advance the patient.
- Need to test the fit of the sling with an immobilized extremity.
- Maintain affected extremity immobilization/alignment
- During any patient handling task, if the health care worker is required to lift more than 35 lbs (16kg) of a patient's weight, then the patient should be considered fully dependent and an assistive device should be used. (Waters, T. [2007]. When is it safe to manually lift a patient? *American Journal of Nursing*, 107(8), 53-59).

Appendix 4.3.2 – Ergonomic Tool: Lifting and Holding Legs or Arms in an Orthopedic Setting

This tool shows the calculation of the average weight for an adult patient's leg and arm as a function of whole body mass ranging from slim to morbidly obese body type. Weights are presented both in pounds (lbs.) and metric (kg). Maximum lift and hold loads were calculated based on 75th percentile shoulder flexion strength and endurance capability for U.S. adult females, where the maximum weight for a one-handed lift is 11.1 lbs. and a two-handed lift is 22.2 lbs.

The shaded areas of the table indicate whether it is acceptable for one health care worker to lift the listed body parts with one or two hands or hold the respective body parts for one, two, or three minutes with two hands. Respecting these limits will minimize risk of muscle fatigue and the potential for musculoskeletal disorders. If the limb weight exceeds the values listed in the table, assistive technology is recommended, such as a ceiling lift or floor-based lift with a limb-support sling. Orthopedic health care workers must use clinical judgment to assess the need for additional staff assistance or assistive devices to lift and/or hold one of these body parts for a particular period of time.

Note: The chart shows the acceptable weights for limbs without a cast in place. If the health care worker is lifting a limb with a cast, the additional weight of the cast should be added to determine whether the lift is acceptable. An alternate method is provided below for limbs with casts. These are guidelines for the average weight of the leg and arm, and are based upon the patient's weight. The maximum weight for a one-handed lift is 11.1 lbs. and a two-handed lift is 22.2 lbs.

Patient weight is divided into weight categories (see Table 1), ranging from very light to morbidly obese. Normalized weight for each leg and each arm are calculated as a percentage of body weight where each complete arm weighs 5.1% of total body mass and each leg weighs 15.7% of total body mass (Chaffin, Anderson, & Martin, 1999). All weights are presented in both pounds and kilograms, rounded to the nearest whole unit.

To accommodate 75% of the U.S. adult female working population, a maximum load for a one-handed lift is calculated to be 11.1 lbs. (5.0 kg.). This is determined by calculating the strength capabilities for the 25th percentile U.S. adult female maximum shoulder flexion movement (the mean equals 40 Newton meters, standard deviation equals 13 Nm) (Chaffin, Anderson, & Martin, 1999) and the 75th percentile U.S. adult female shoulder to grip length (the mean equals 610 mm, the standard deviation equals 30 mm) (Pheasant, 1992). Maximum loads for one person for a two-handed lift (i.e., 22.2 lbs. /10.1 kg.) are calculated as twice that of a one-handed lift. Muscle-strength capabilities diminish as a function of time; therefore, maximum loads for two-handed holding of body parts are presented for one-, two-, and three-minute durations. After one minute, muscle endurance decreases by 48%, after two minutes by 65%, and after three minutes of continuous holding, strength capability is only 29% of initial lifting strength (Rohmert, 1973, a, b). If the limits in ergonomic Table 1 are exceeded, additional staff members or assistive limb holders should be used.

Patient Weight lbs. (kg.)	Body Part	Body Part Weight lbs. (kg.)	Lift 1 hand	Lift 2 hands	Hold 2-hands 1 min.	Hold 2-hands 2 min.	Hold 2-hands 3 min.
<40 lbs.	Leg	<6.3 lbs.	(3 kg)				
(< 18 kg.)	Arm	<2.0 lbs.	(1 kg)				
40-90 lbs.	Leg	<14.1 lbs.	(6 kg)				
(18-41 kg.)	Arm	<4.6 lbs.	(2 kg)				
90-140 lbs.	Leg	<22.0 lbs.	(10 kg)				
(41-64 kg.)	Arm	<7.1 lbs.	(3 kg)				
140-190 lbs.	Leg	<29.8 lbs.	(14 kg)				
(64-86 kg.)	Arm	<9.7 lbs.	(4 kg)				
190-240 lbs.	Leg	<37.7 lbs.	(17 kg)				
(86-109 kg.)	Arm	<12.2 lbs.	(6 kg)				
240-290 lbs.	Leg	<45.5 lbs.	(21 kg)				
(109-132 kg.)	Arm	<14.8 lbs.	(7 kg)				
290-340 lbs.	Leg	<53.4 lbs.	(24 kg)				
(132-155 kg.)	Arm	<17.3 lbs.	(8 kg)				
340-390 lbs.	Leg	<61.2 lbs.	(28 kg)				
(155-177 kg.)	Arm	<19.9 lbs.	(9 kg)				
390-440 lbs.	Leg	<69.1 lbs.	(31 kg)				
(177-200 kg.)	Arm	<22.2 lbs.	(10 kg)				
> 440 lbs.	Leg	>69.1 lbs.	(31 kg)				
(>200 kg.)	Arm	>22.2 lbs.	(10 kg)				

* No shading: Lift and hold is appropriate, but use clinical judgment and do not hold longer than noted.

Heavy shading: Do not lift alone; use assistive device or more than one health care worker.

Appendix 4.3.3 – Alternate Method for Determining Safe Lifting and Holding of Limbs with Casts

Multiply the patient’s weight times the limb factor (0.157 for leg and 0.051 for arm) and add the weight of the cast. Compare the calculated weight to the value in the appropriate task box. If the total limb weight exceeds the weight in the appropriate box, then the health care worker should not manually lift the limb alone, but should use an assistive device or more than one health care worker should perform the lift. On the other hand, if the calculated weight is less than the value in the appropriate box, then it is acceptable to manually lift and hold the limb, and the health care worker should use clinical judgment and not hold longer than noted.

For example, if the patient weighs 200 lbs. and has an arm cast weighing 5 lbs., then the total arm weight would be 200 lbs. x 0.051 plus 5 lbs., or 15.2 lbs. In this case, the arm should not be lifted with one hand (i.e., 15.2 lbs. > 11.1 lbs.) but could be lifted with two hands (i.e., 15.2 lbs. < 22.2 lbs.), but should not held in that position for more than a few seconds (15.2 lbs. > 11.6 lbs.). Similarly, if the patient weighs 75 lbs. and has a 5-lb. leg cast, then the total limb weight would be 75 lbs. x 0.157 plus 5 lbs., or 16.8 lbs. In this case, it would not be acceptable to lift the limb with one hand (i.e., 16.8 lbs. > 11.1 lbs.), but it would be acceptable to lift it with two hands (i.e., 16.8 lbs. < 22.1 lbs.), but the lift should not be held more than a few seconds (16.8 lbs. > 11.6 lbs.).

Limb	Limb-Weight Factor	1 hand	2 hands	2 hands 1 min.	2 hands 2 min.	2 hands 3 min.
Leg	0.157	11.1 lbs. (5.1 kg.)	22.2 lbs. (10.2 kg.)	11.6 lbs. (5.3 kg.)	7.8 lbs. (3.5 kg.)	6.4 lbs. (2.9 kg.)
Arm	0.051					

Table 2.1 – Predicted Weight for Different Types of Casts

The following table provides predicted weights for a fiberglass cast.

Short-Arm Cast (adult)	Long-Arm Cast (adult)	Short-Leg Walking Cast (150 lbs. adult)	Long-Leg Cast (150 lbs. adult)	Infant Body Spica (20-30 lbs.)	Child Body Spica 3-5 yrs. old (30-50 lbs.)
0.5 lbs.	1 lbs.	2 lbs.	3.0 lbs.	2 lbs.	4lbs.
2 rolls 3"	1 roll 2" 3 rolls 3"	4 rolls 4"	3 rolls 3" 3 rolls 4"	2 rolls 2" 3 rolls 3"	5 rolls 3" 5 rolls 4"
+ webril*	+ webril*	+ webril*	+ webril*	+ webril*	+ webril*

Table 2.2 – Predicted Weights for a Fiberglass Cast

*Weight of webril is 0.25 lb. per packet