Rehab Considerations for Total Shoulder & Reverse Total Shoulder Arthroplasty

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Inpatient Rehab: David Day, PT and Santosh Nichani, OT

Outpatient Rehab: Kristina Hayes, PT

Postural Implications - Relevant Throughout Recovery: Bailey Perry, PT

Phase I	Phase II	Phase III	Phase IV	Phase V
(0-3 weeks) Immediate Post op	(4-6 weeks) Intermediate Post Op	(6-8 weeks) Intermediate Post Op cont.	(9-11weeks) Transitional Post Op	(12-16weeks) Advanced Strengthening

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Objectives

- To understand Inpatient Physical Therapy Protocols to treat Total Shoulder Arthroplasty and Reverse Total Shoulder Arthroplasty patients within the day of surgery.

- To understand compensatory bed mobility, transfer & gait techniques for Total Shoulder Arthroplasty and Reverse Total Shoulder Arthroplasty patients

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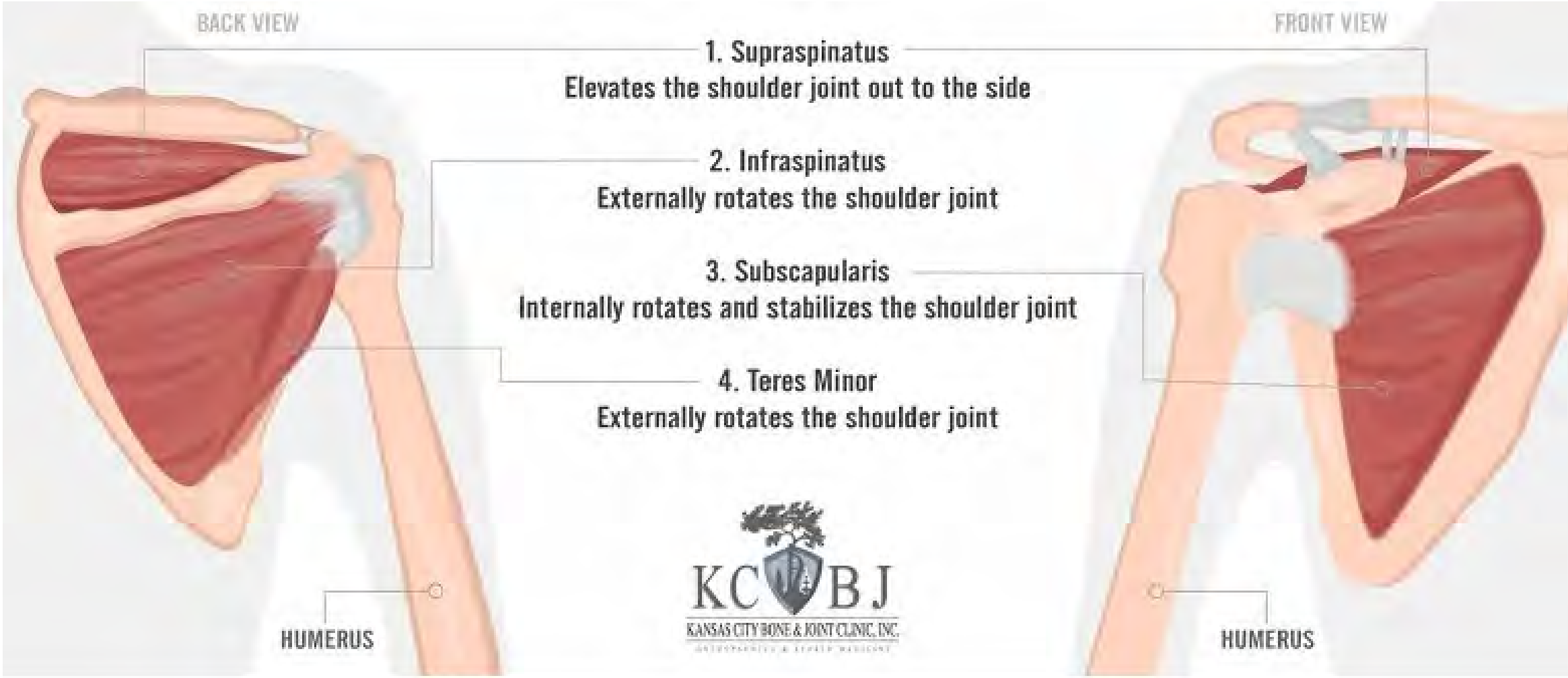
Glenohumeral Joint

Rotator Cuff Muscle Actions



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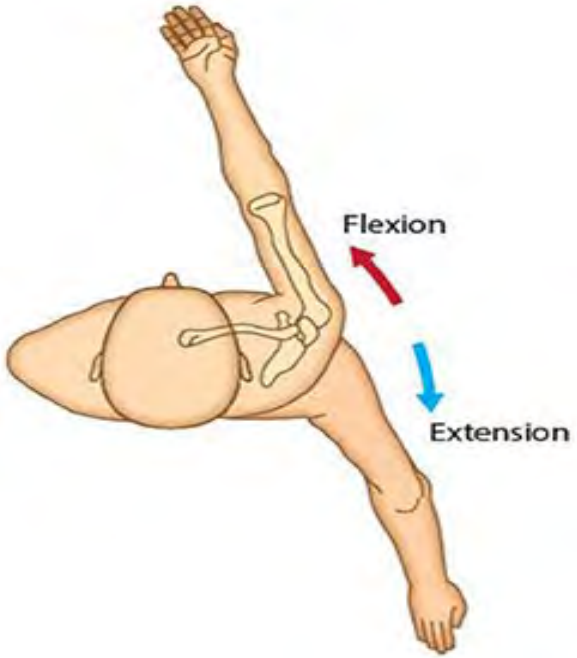
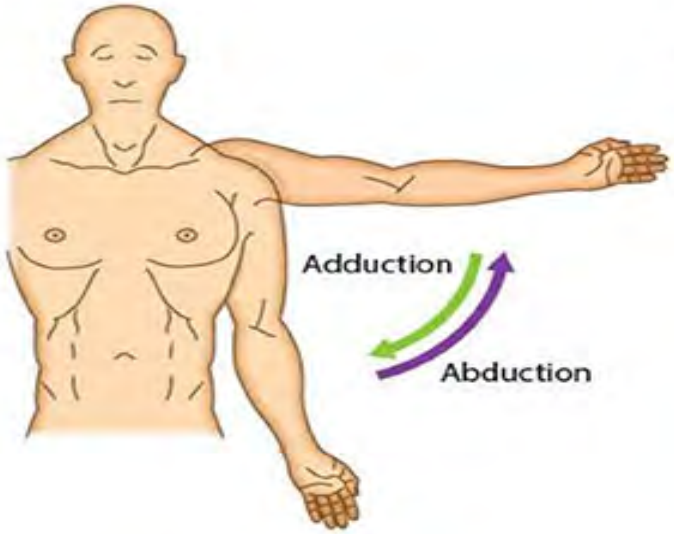
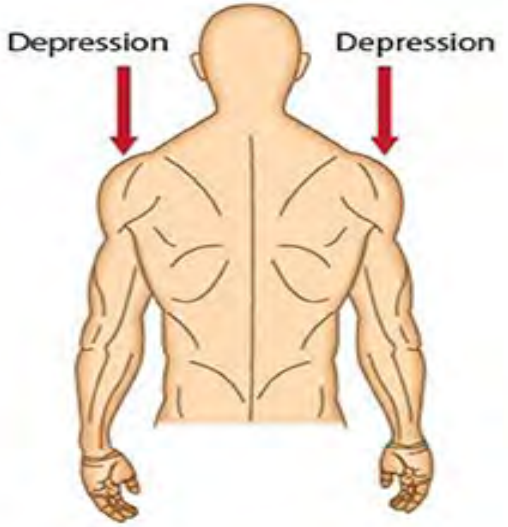
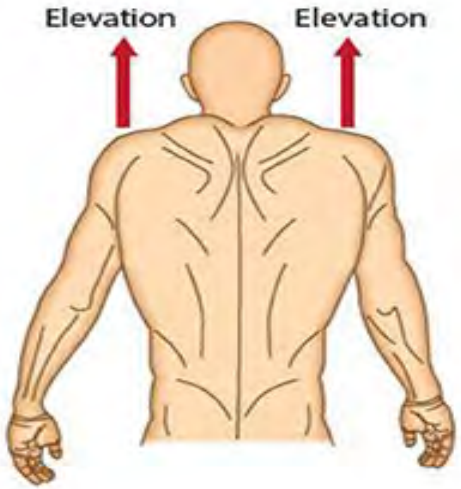
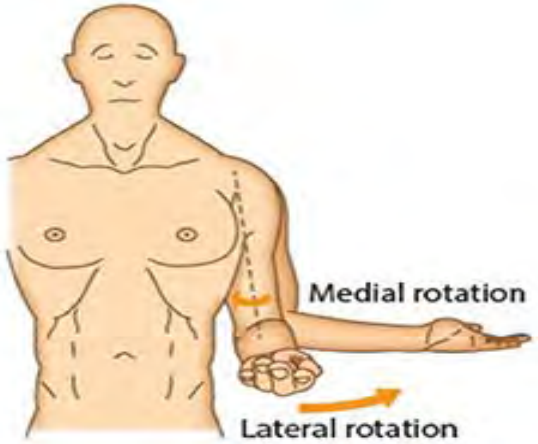
Glenohumeral Functional Considerations

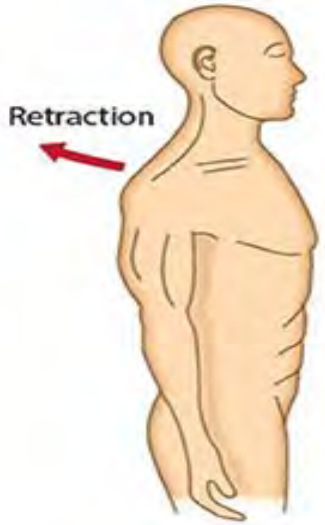


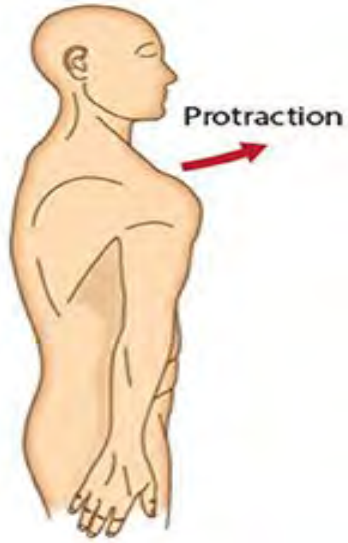












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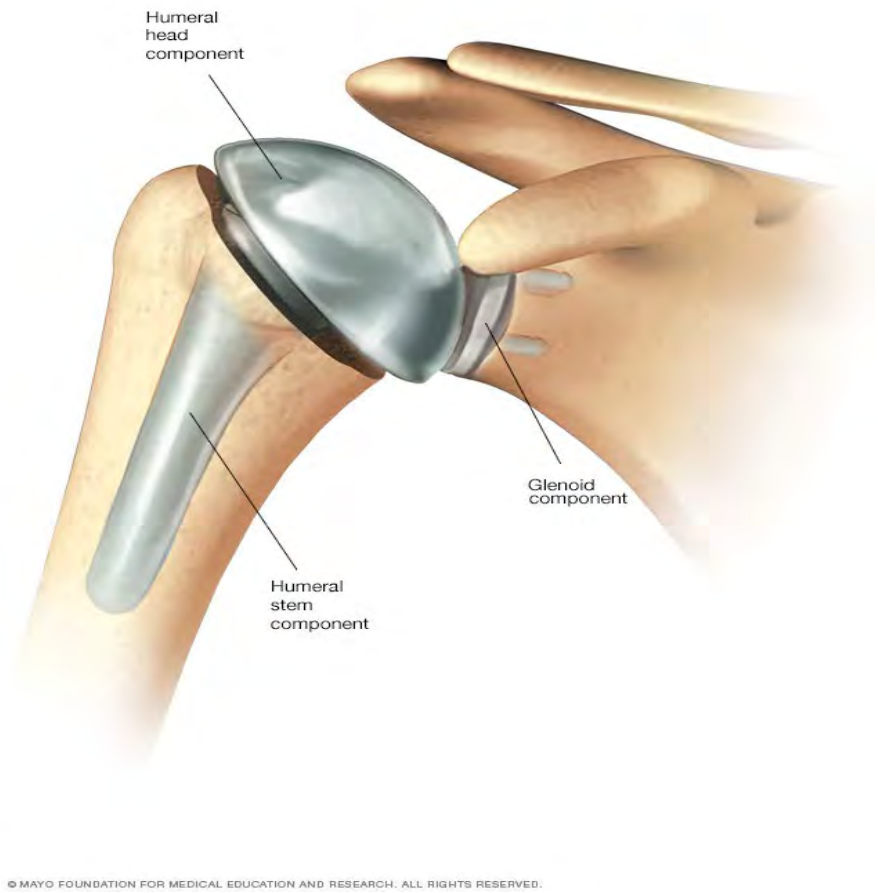
What is a Total Shoulder Arthroplasty (TSA)?



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Replacement of the Humeral Head and resurfacing/plating of the glenoid fossa

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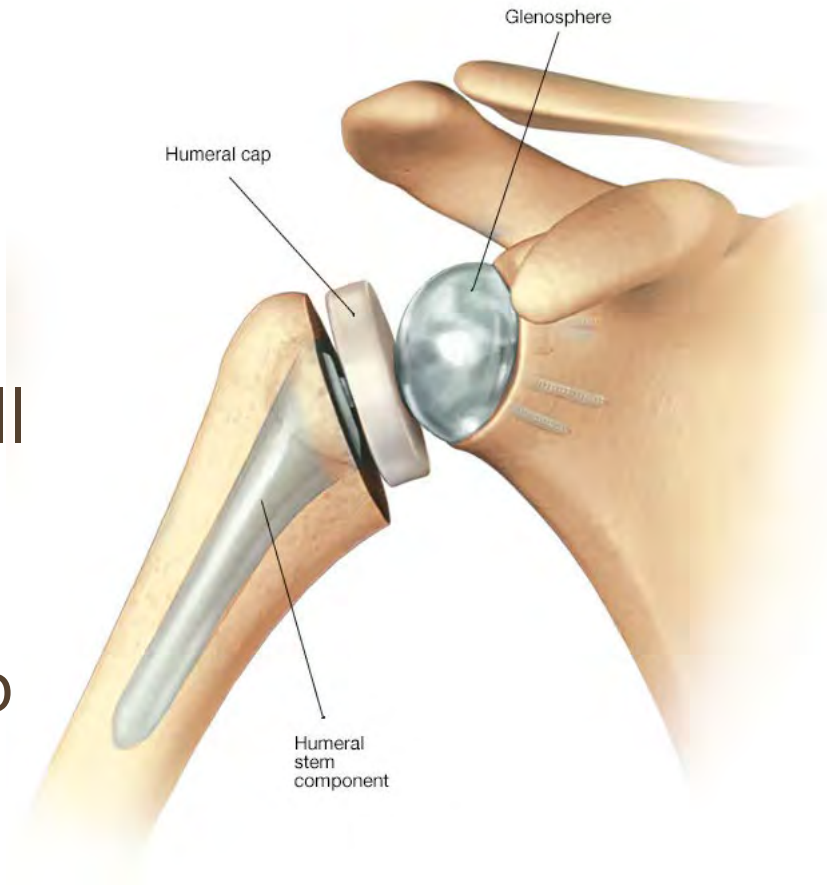
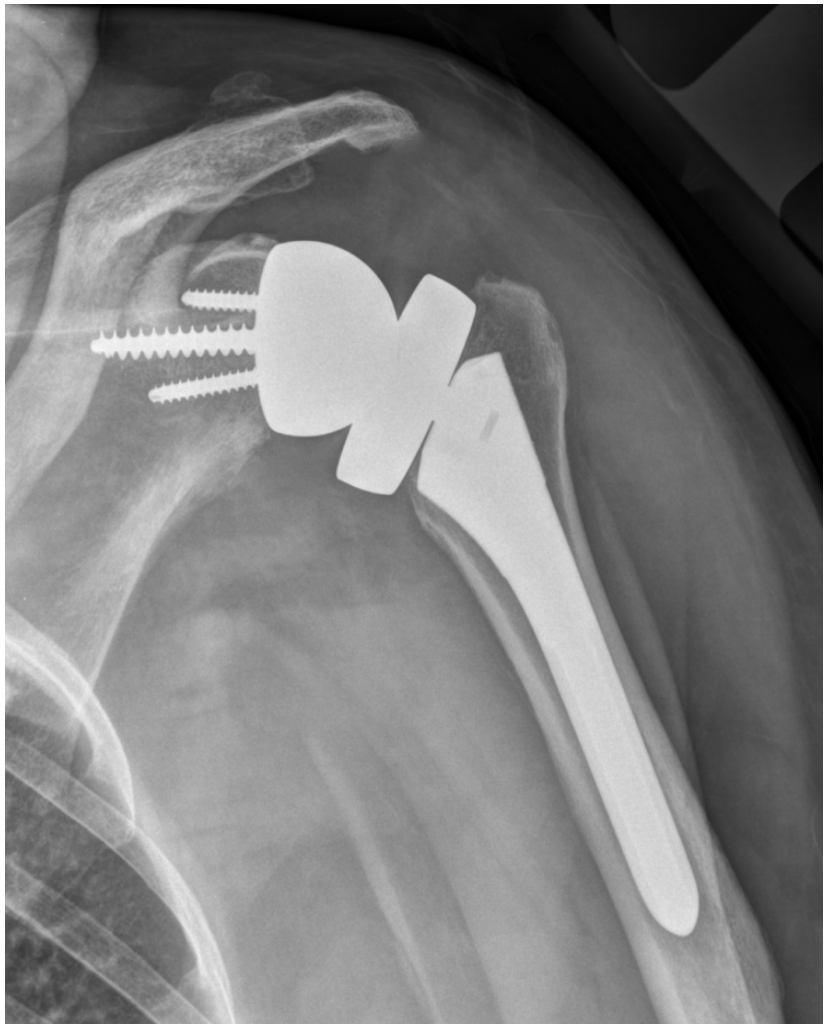
What is a Reverse Total Shoulder Arthroplasty (Rev TSA) ?

The replacement components are "reversed". The ball is attached to the glenoid and the socket is attached to the proximal end of the humerus.





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Indications for a TSA & Rev TSA

- ✓Shoulder Pain
- ✓Loss of Functional Use of the Upper Extremity
- ✓Subluxation of the Glenohumeral Joint
- ✓Humeral Fractures
- ✓Rotator Cuff Tear Arthropathy
- ✓Failed previous TSA / shoulder surgeries

- ❖MD Discretion

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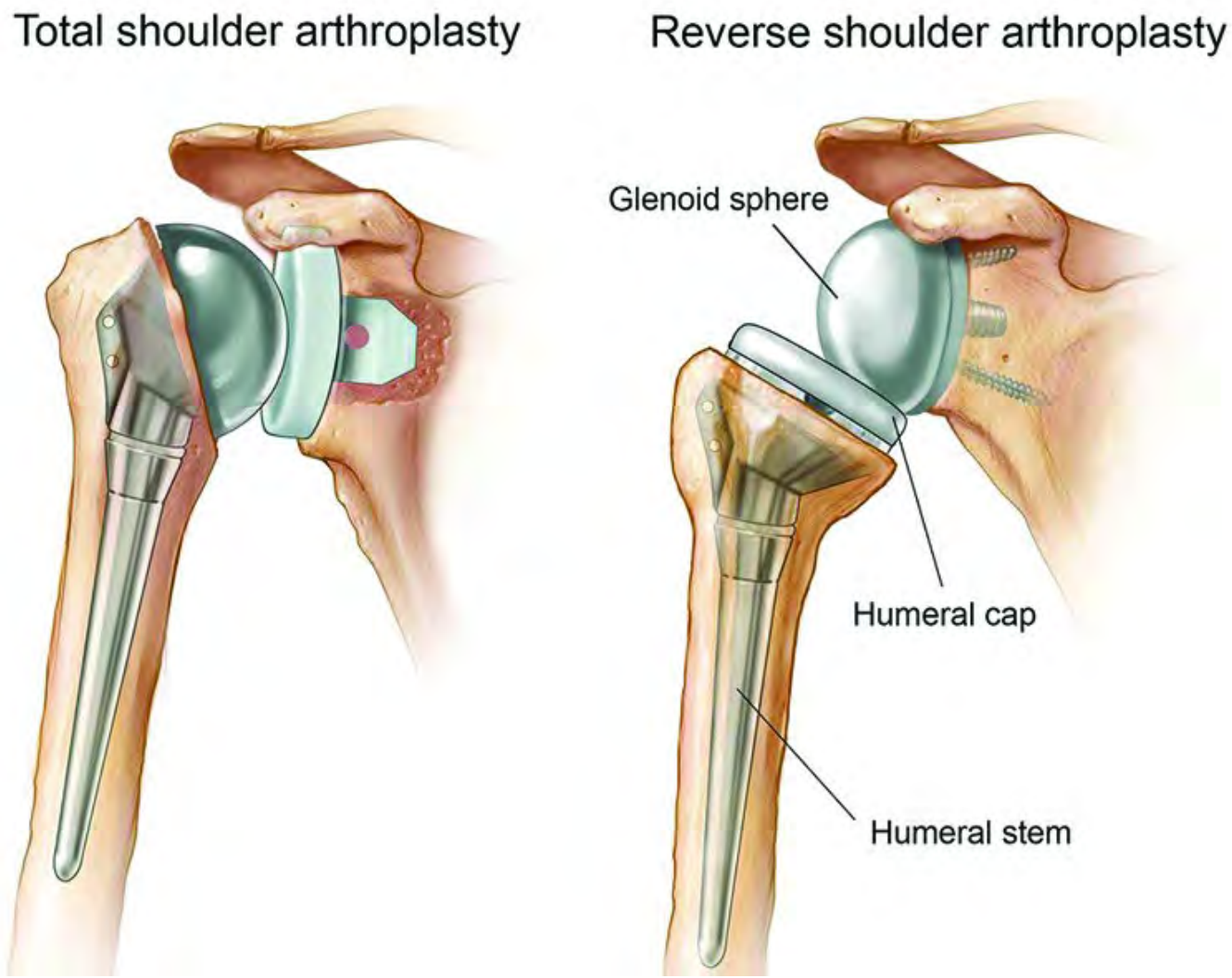
How is it Decided to Perform a TSA vs Rev TSA?



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TSA vs Rev TSA?

- Integrity of the Rotator Cuff Musculature
- Integrity of the glenoid bone
- Failed prior TSA

- MD Discretion

- Rev TSA is a more complicated surgery and require more conservative management within the Inpatient Setting.

Physical & Occupational Therapy Post Op Orders

- **WB Precautions**
- **Movement Precautions**
  - Shoulder ROM (Specific motions)
  - Elbow / Wrist / Hand ROM
- **Exercise Progression**
- **Sling**
    - Duration of use
    - Immobilization guidelines
      - Strict use at all times
      - May don/doff for Therapeutic Exercise & Activities for Daily Living (ADLs)
    - Abductor wedge
- *All of the above needs to be clarified with MD if not provided.*
- Rehab needs post discharge from Inpatient

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Inpatient Physical & Occupational Therapy Follow Up

- Evaluation on Day of Surgery
- PACU or Unit
- Education and training
  - ROM orders
  - Sling orders / use
  - Mobility & Safety Techniques
- Discharge Barriers
  - Curbs / Stairs
  - Car transfers
  - ADL considerations

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Sling with Abduction Pillow

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Bed Mobility & Transfer Techniques

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Bed Mobility Techniques: Log Roll to Nonsurgical side

1

2

3

4

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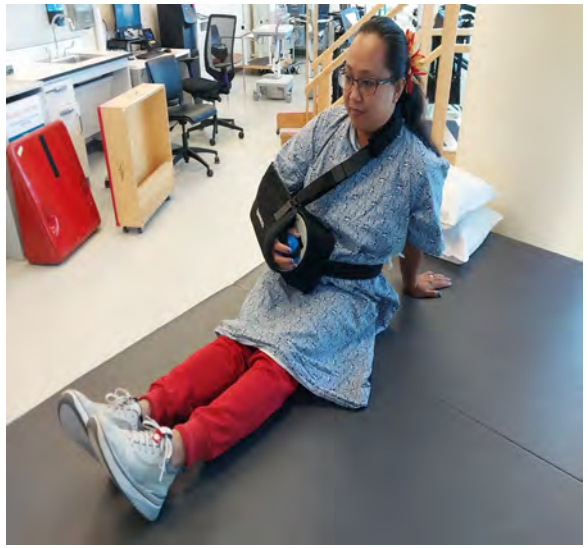
Bed Mobility Techniques: Long Sit Pivot to Surgical Side

1



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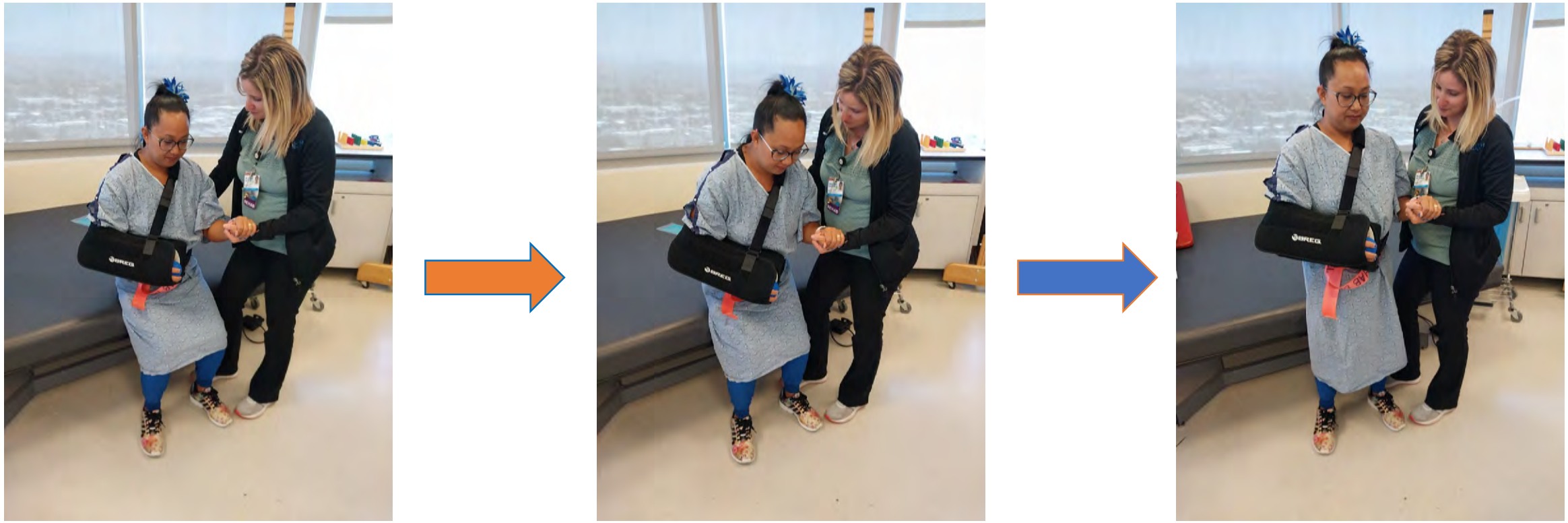
Transfers: Sit to Stand



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Mobility Progression Once Out of Bed

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Pre-Gait and Balance Assessment

Lateral Weight Shifting

March in place

Sidesteps

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Gait Mechanics: Normal vs Abnormal

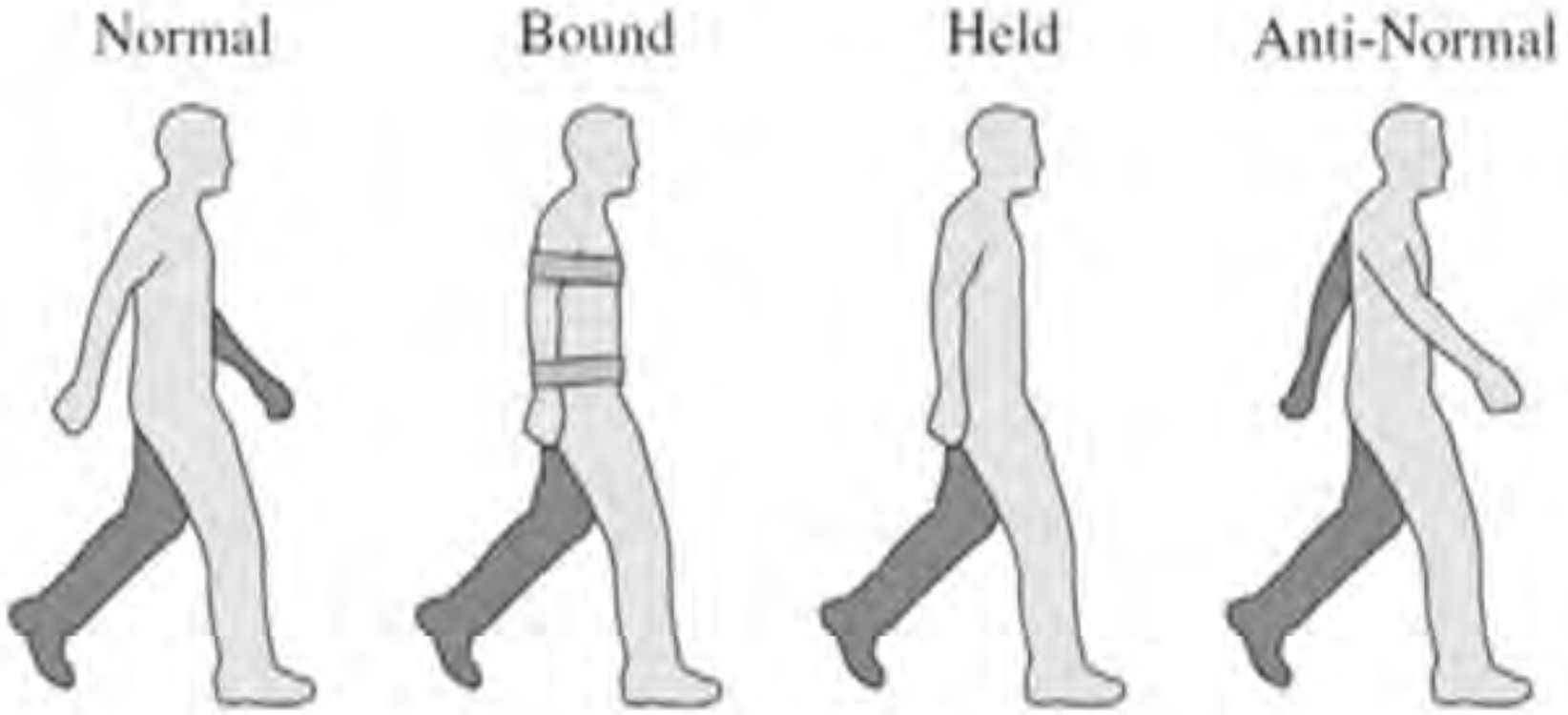

Figure 1. Various walking gaits presented by Collins including Normal: arms swing in opposite phase with legs, Bound: arms physically bound to the body, Held: arms held purposely to the body; Anti-normal: arms deliberately swing with a phase opposite to the normal. [19]

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Gait Progression and Training

Hemiwalker

Quadcane

Single Point Cane

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Stair Training

Posterior Guard Ascending

Anterior Guard Descending

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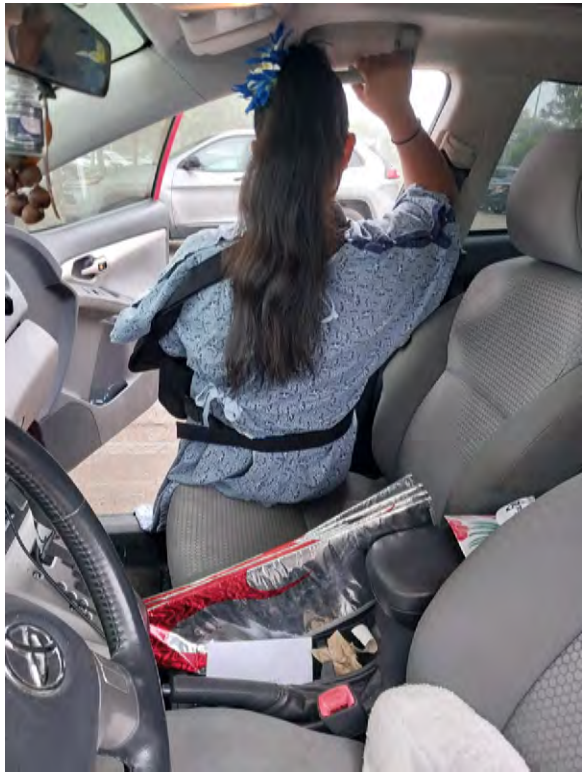
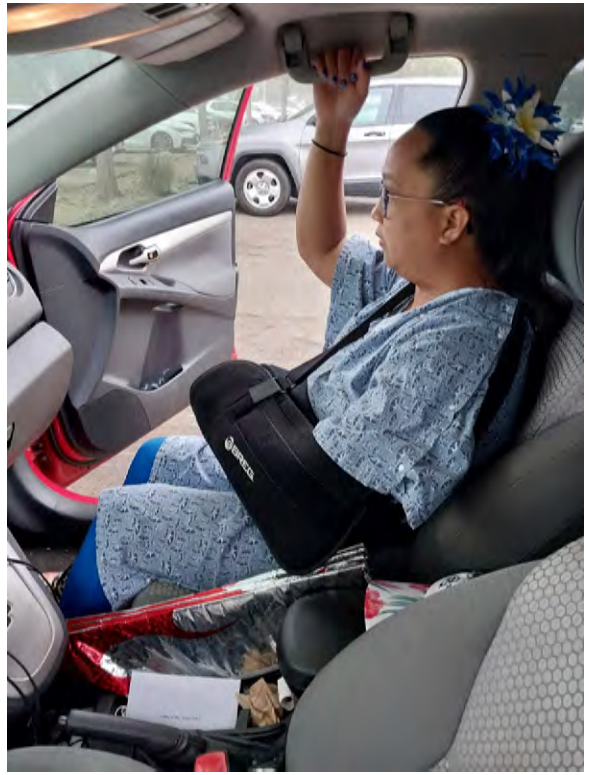
Car Transfers





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Shoulder Replacement
Physical Therapy Exercises

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PATIENT CHECKLIST

Procedures:

☐ Left ☐ Right ☐ Total Shoulder Replacement ☐ Reverse Total Shoulder Replacement
☐ TSR + Rotator Cuff Repair ☐ Bicep Tenodesis

Range of Motion (ROM) and Phase Guidelines:

- Phases can overlap and are a guide only.
- All exercises should be pain free.
- Your Physical Therapist will progress you to the next phase as you meet goals.
- Use the sling for 4 weeks at all times except for exercise and bathing, or as directed by MD/PT.

For 10 weeks:

- Avoid resisted internal rotation.
- Avoid reaching behind your back.
- Avoid lifting more than 2–3 pounds.
- Avoid external rotation beyond neutral position.

Weeks 1–6: Passive Shoulder Range of Motion (Active Assist) Only

Weeks 6–9: Active Shoulder Range of Motion

- Okay to begin work in extension by week 9.

Week 10+: No Shoulder Range of Motion Restrictions

PHYSICAL THERAPY PROTOCOL

ACUTE PHASE OF RECOVERY		Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week
Inpatient Days 1 and 2, Home Health week 1 (post-op day 0–7)	**Day 1–2**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
• Wear sling at all times as directed by MD/PT _____	•	•	•	•	•								
• Use rolled towel behind arm when lying on back	•	•	•	•	•	•	•						
• Avoid reaching behind back	•	•	•	•	•	•	•	•	•	•	•		
• Avoid resisted internal rotation	•	•	•	•	•	•	•	•	•	•	•		
• Avoid external rotation beyond neutral _____	•	•	•	•	•	•	•	•	•	•	•		
• Avoid lifting more than a coffee cup (2–3#) w/surgical arm	•	•	•	•	•	•	•	•	•	•	•		
Active wrist flexion, extension and wrist circles	•	•	•	•	•	•	•						
Active ball squeeze	•	•	•	•	•	•	•						
Neck range of motion; rotation, chin tucks, up and down	•	•	•	•	•	•	•						
Shoulder blade pinch	•	•	•	•	•	•	•						
Pendulums	•	•	•	•	•	•	•						
Supine active assist forward elevation	•	•	•	•	•	•	•						
Supine active assist external rotation _____	•	•	•	•	•	•	•						
Supine active elbow flexion	•	•	•	•	•	•	•						
Ice 10–20 minutes, 3–5 times per day, 7 days per week	•	•	•	•	•	•	•						

Patient Education Handout

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Elbow, Wrist & Hand Exercises

Squeeze Ball

Wrist ext

Elbow Flexion

Elbow extension

Elbow supination

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Role of Occupational Therapy Post Shoulder Replacement

Santosh Nichani OTR

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Objectives

- Review shoulder precautions post shoulder replacement.
- Teach proper donning and doffing of the sling safely.
- Re-educate dressing upper body, lower body one handed.
- Review strategies to groom and eat one handed.
- Train safety with toilet transfers, toileting and bathing techniques.
- Provided resources on adaptive equipment and DME for ADLs
- Emphasize energy conservation during ADLs and IADLs while protecting shoulder complex.

Shoulder Precautions Post Shoulder Replacement

Precautions are crucial in preventing dislocation and maintaining surgical integrity.

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Shoulder Precautions Post Shoulder Replacement

Typically, precautions include :

- No excessive shoulder internal/external rotation,
- No horizontal adduction or abduction, and
- No excessive shoulder extension.

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Shoulder Precautions Post Shoulder Replacement

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Shoulder Precautions Post Shoulder Replacement

Practice Activities Within Box Area

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Post Op- Use of Sling

It is essential to wear the sling as instructed by the surgeon or therapist.

Proper fit and position of the sling are crucial for optimal outcomes.

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Donning the Sling

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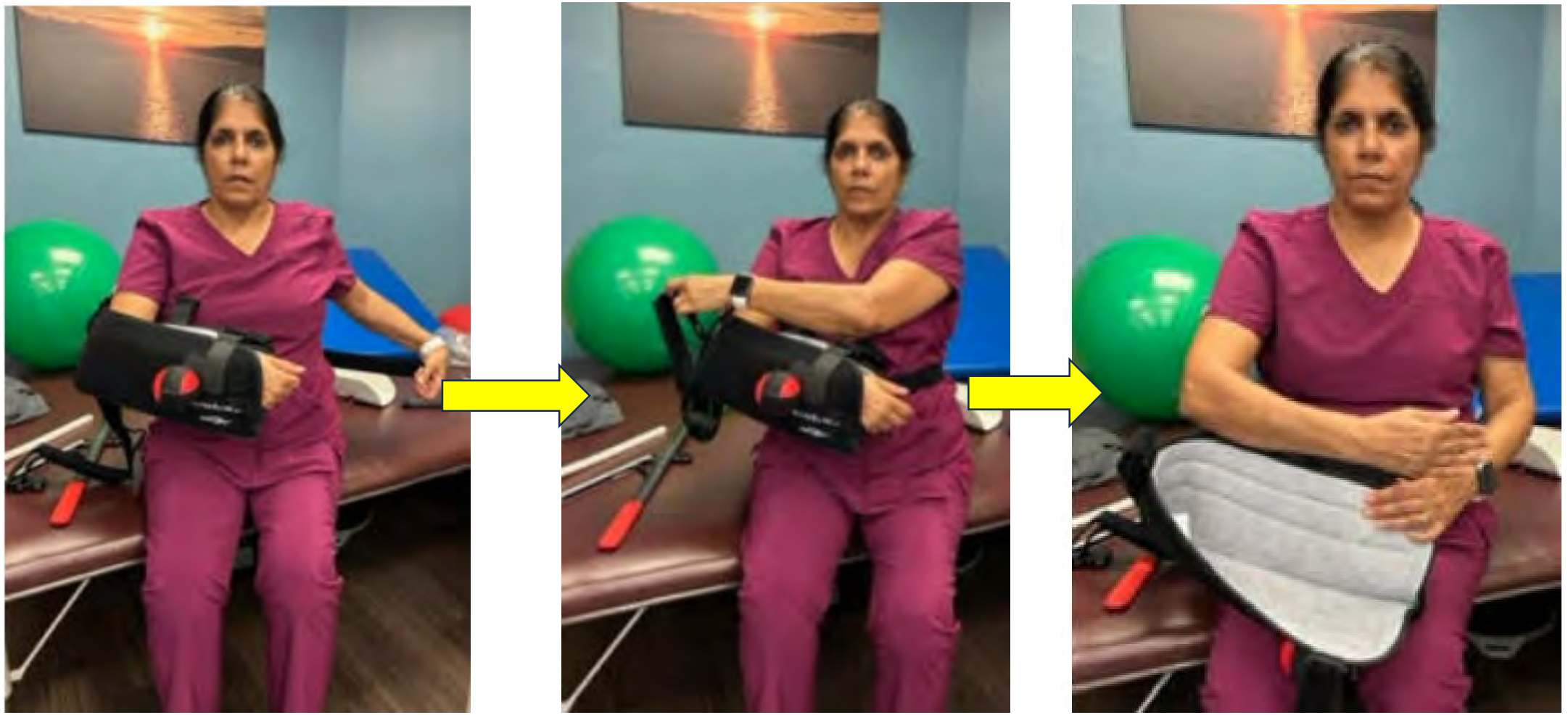
Doffing the Sling



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01

Use strategies to dress with one hand

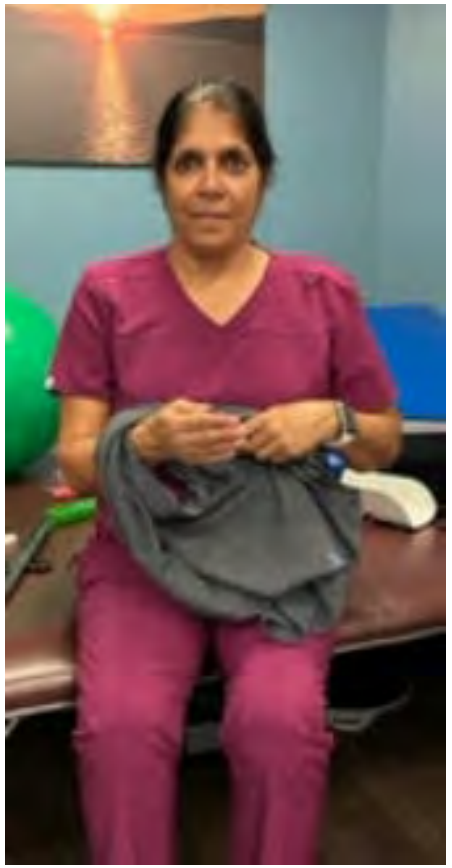
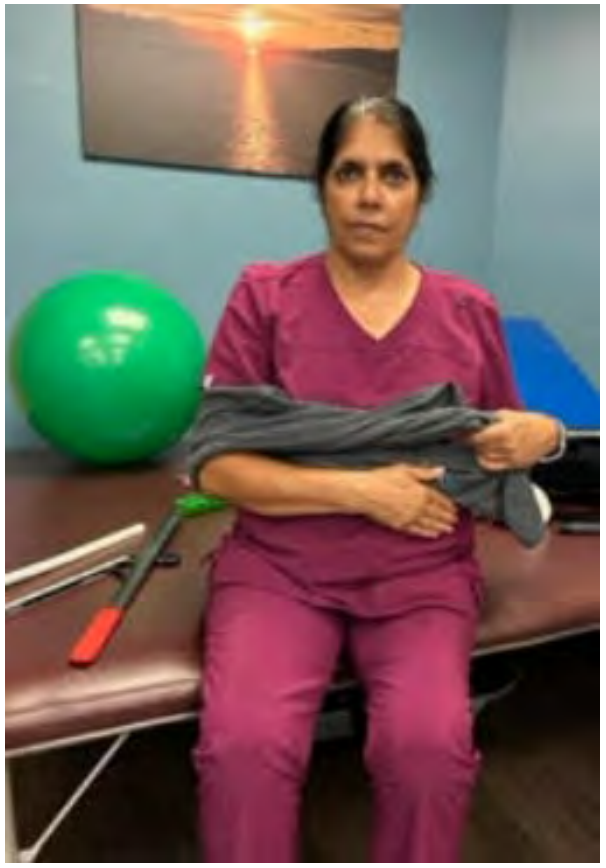
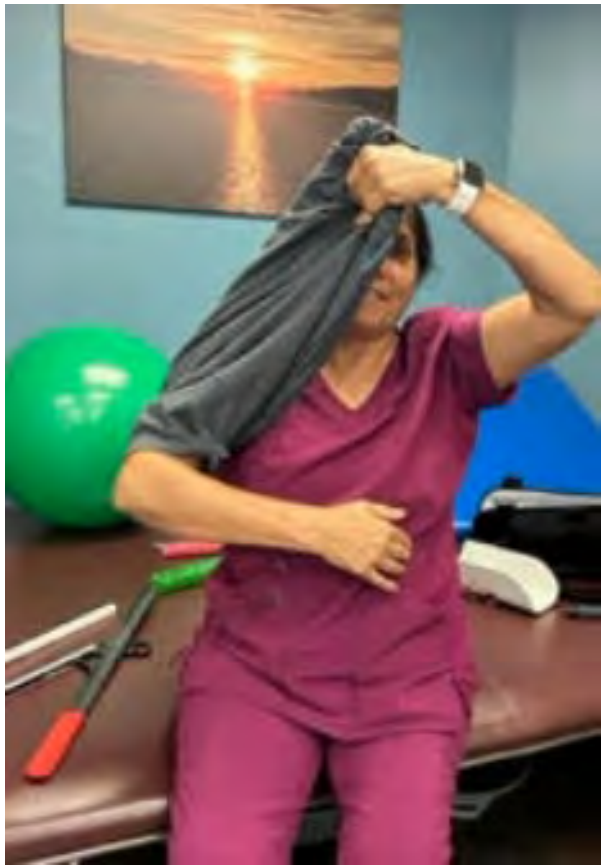
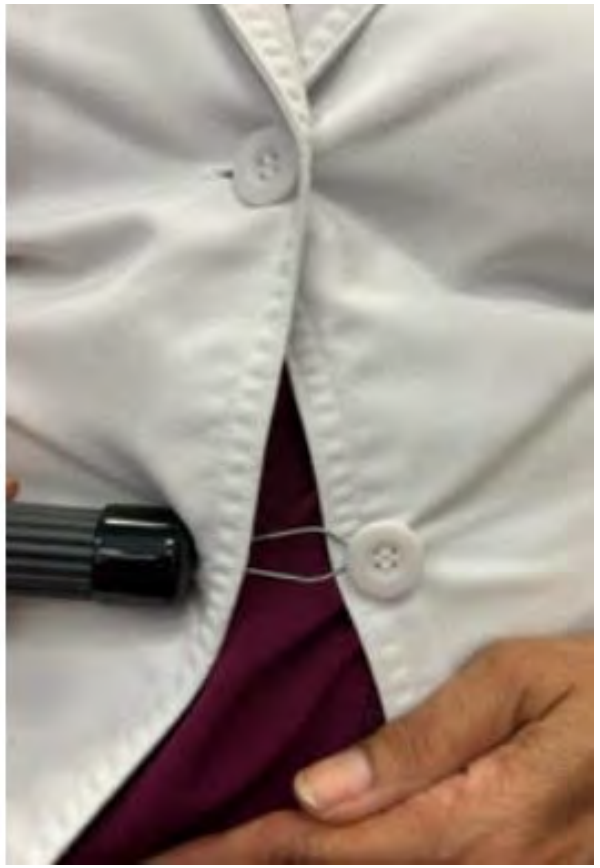
02

Use loose fitting and/or adaptive clothing

03

Use equipment such as buttonhooks, zipper pulls, and long-handled reachers can facilitate independent dressing

Dressing Upper Body

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Dressing Lower Body

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Adaptive Equipment

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Toileting and Bathing

- Teach safe transfer techniques (toilet and shower).
- Review safety, environmental modifications.
- Information on Raised toilet seat, Shower chair, tub bench, grab bars.
- Recommend adaptive equipment- Reacher, Long handled sponges, handheld shower.

Grooming, Toileting & Shower




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HYGIENE AND CONTINENCE NEEDS


Bottom Buddy (large grasp)


Bottom Buddy (slide button)


Bottom Buddy (button)


Toilet Tongs


PureWick


Bed Pan


Bidet


Bidet Attachment


Peri Bottle


(Female) Urinal

CLOTHING MANAGEMENT


Depends versus Diapers


Reacher


Step Stool


Suspenders

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Self-Feeding

- Provide strategies for one-handed eating techniques, such as stabilizing the plate/bowl with a non-surgical hand, using adapted utensils, and cutting food into smaller pieces
- Suggest modification of meal preparation and cooking
- Propose the use of arm support slings or pillows while eating

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Adaptations for Eating

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Grooming and Oral Care

Demonstrate techniques for self-care activities, such as brushing hair, teeth, and shaving, that minimize shoulder movement

Use of adaptive aids such as long-handled brushes, electric toothbrushes, and electric razors

Grooming and Oral Care-Applying Toothpaste One Handed

1. Place toothbrush down with bristles facing up.
2. Uncap toothpaste either by twisting or popping it off.
3. Squeeze toothpaste onto the toothbrush.
4. Cap the toothpaste.
5. Brush teeth with the same hand using the toothbrush.

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Household Activities & Energy Conservation

01

Discuss modifications can facilitate household chores

02

Suggest the use of ergonomic tools and gadgets to reduce excessive gripping or twisting, such as jar openers and knob turners

03

Encourage pacing tasks and taking regular breaks to avoid overexertion and muscle fatigue

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Kitchen and Home Management





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Role of Occupational Therapy

- To facilitates independence with basic activities of daily living (BADLs) and instrumental activities of daily living (IADLs)
- Promote safe and efficient use of shoulder post surgery
- Support patients in achieving their functional goals

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Role Of Outpatient Physical Therapy Post Shoulder Arthroplasty

Kristen Hayes, MSPT

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Objectives

1. Examine the phases of recovery after shoulder arthroplasty including precautions and exercise progression.
2. Understand the functional implications during recovery

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The Protocol Outlined in this Presentation is a General Guideline.

Specific variations in protocols is at the discretion of the surgeon

Ze lu et al, conducted a systematic review of current literature on clinical outcomes of PT programs after rTSA. The review concluded that a **PT program progressing through the phases of therapy was recommended as common management for patients s/p rTSA**. However further study is still needed on exact timeframes. This further supports the **idea that the protocols are guidelines and can have some variation.**

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Phase I: Immediate Post-Op (0-3 weeks)

SLING USE

Total Shoulder

Sling on at all times

Reverse Total Shoulder

Sling on at all times

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Phase I: Immediate Post-Op (0-3 weeks)

PRECAUTIONS

Total Shoulder

NO shoulder AROM

- **NO reaching behind back**
- **NO excessive shoulder External rotation (ER) or Abduction**
- **NO lifting**
- **NO weight bearing on surgical arm**
- **Avoid hyperextension of shoulder (place small pillow / towel roll under elbow)**

Reverse Total Shoulder

- **NO reaching behind back**
- **NO shoulder PROM into Internal rotation (IR)**
- **NO Lifting**
- **NO weight bearing on surgical arm**
- **Avoid hyperextension of shoulder (place small pillow / towel roll under elbow)**

Phase I: Immediate Post-Op (0-3 weeks)

FUNCTIONAL RELEVANCE

Total Shoulder

NO reaching/lifting ADLs with surgical UE

Reverse Total Shoulder

NO reaching/lifting ADLs with surgical UE

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Phase II: Intermediate Post-Op (4-6 weeks after surgery)

SLING USE

Total Shoulder

- Gradually wean out of sling during the day
- Continue to sling wear at night

Reverse Total Shoulder

- Gradually wean out of sling during the day
- Continue to sling wear at night

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Phase II: Intermediate Post-Op (4-6 weeks after surgery)

PRECAUTIONS

Total Shoulder

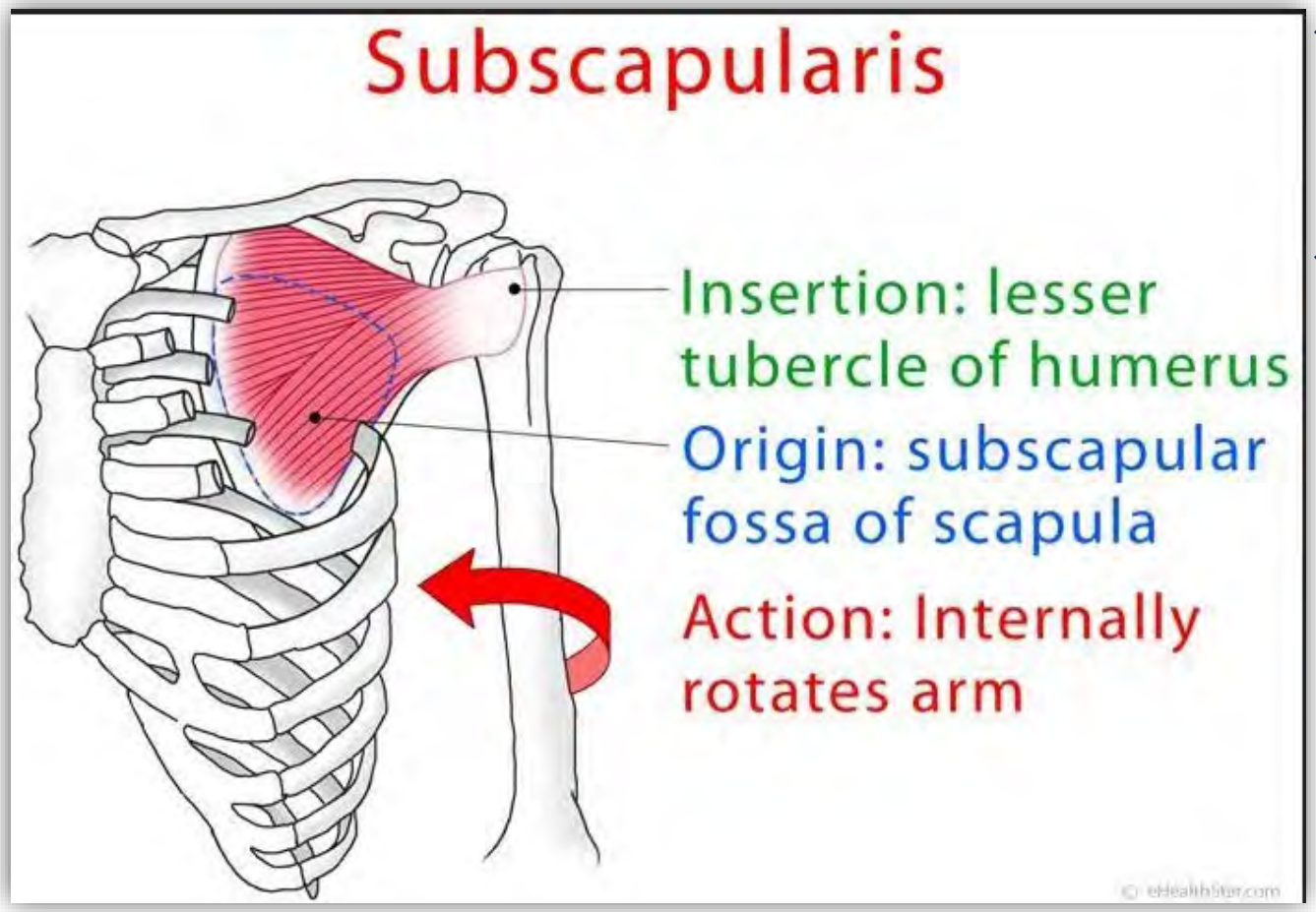
NO excessive shoulder ER or Abduction

- NO lifting more than a coffee cup
- NO weight bearing on surgical arm
- Avoid hyperextension of shoulder (place small pillow / towel roll under elbow)

Reverse Total Shoulder

NO reaching behind back, especially into IR unless otherwise cleared by MD

- NO Lifting more than a coffee cup
- NO weight bearing on surgical arm
- Avoid hyperextension of shoulder (place small pillow / towel roll under elbow)



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Phase II: Intermediate Post-Op (4-6 weeks after surgery)

FUNCTIONAL RELEVANCE

Total Shoulder

Able to reach to shoulder level and carrying light objects (coffee cup), able to reach behind back for activities such as toileting

Reverse Total Shoulder

Able to reach to shoulder level and carrying light objects (coffee cup)

Phase II: Intermediate Post-Op (4-6 weeks after surgery)

INTERVENTIONS

Total Shoulder

ROM/MOBILITY

- **PROM: Full except ER</= 30 degrees scapular plane and </= 90 degrees Abduction. Avoid Abduction with ER together**
- **AAROM:** All planes within restrictions
- **AROM:** Progression from supine flexion / elevation to standing
- **Strengthening:** ER isometrics, prone rows, serratus anterior punches, biceps / triceps strengthening, Rhythmic stabilization – ER in scapular plane, Flexion 90-125 degrees

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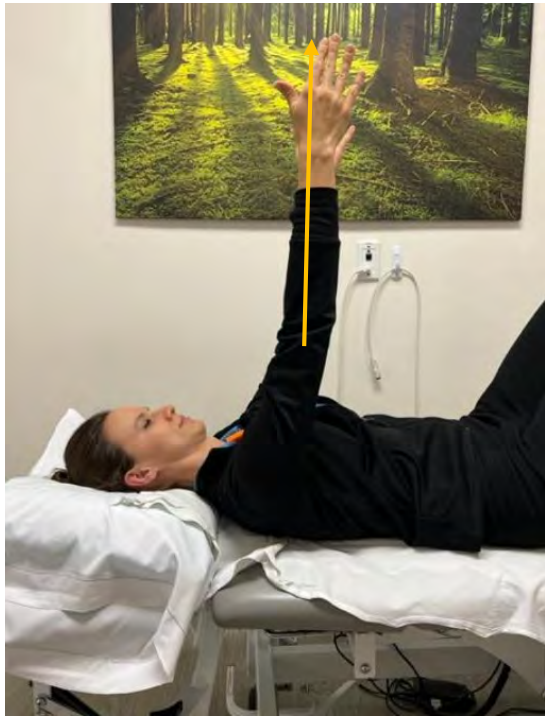

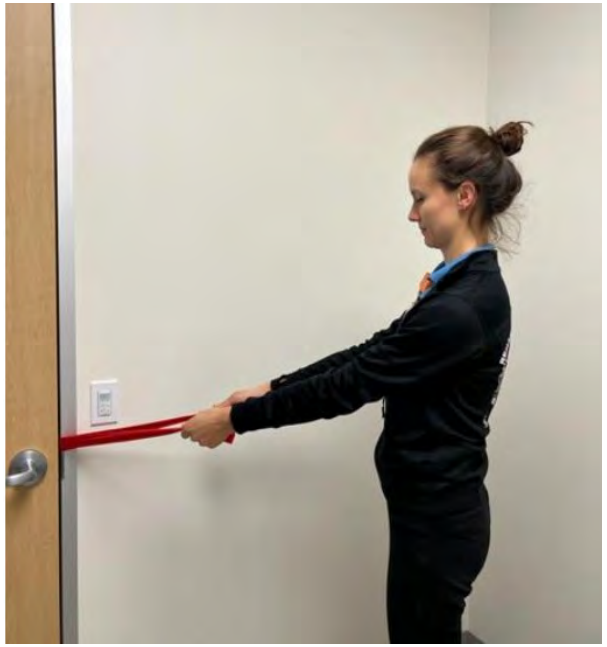

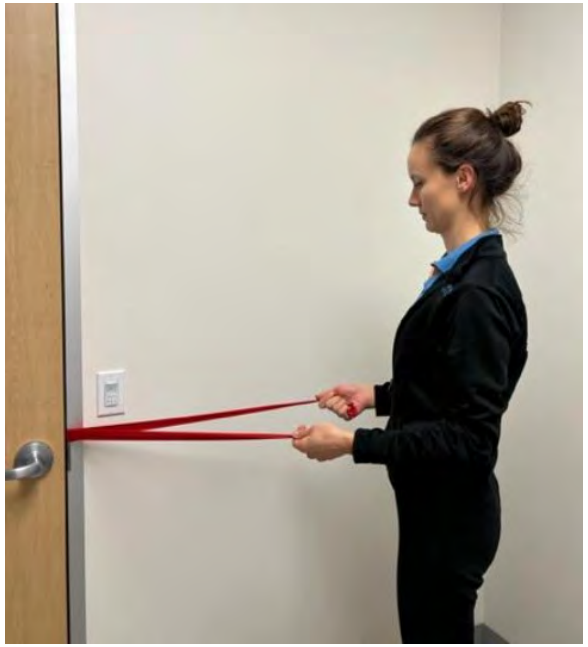

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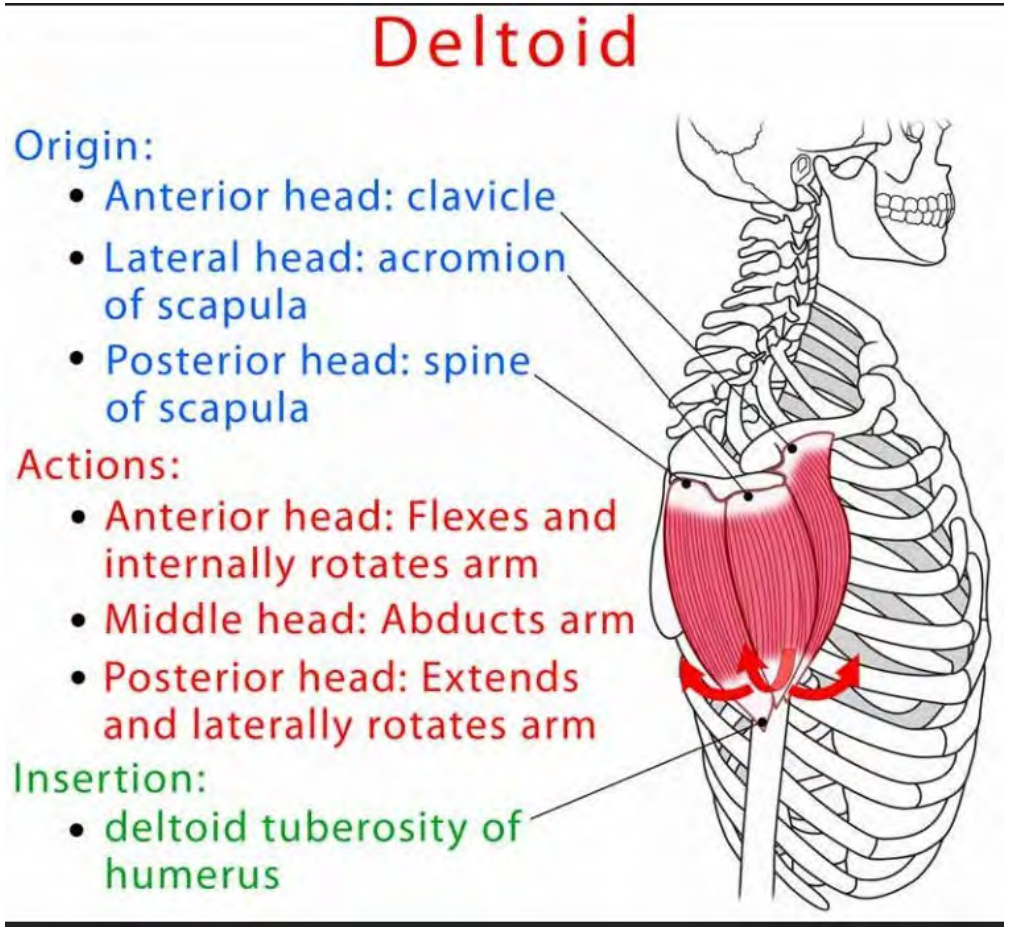
Phase II: Intermediate Post-Op (4-6 weeks after surgery)

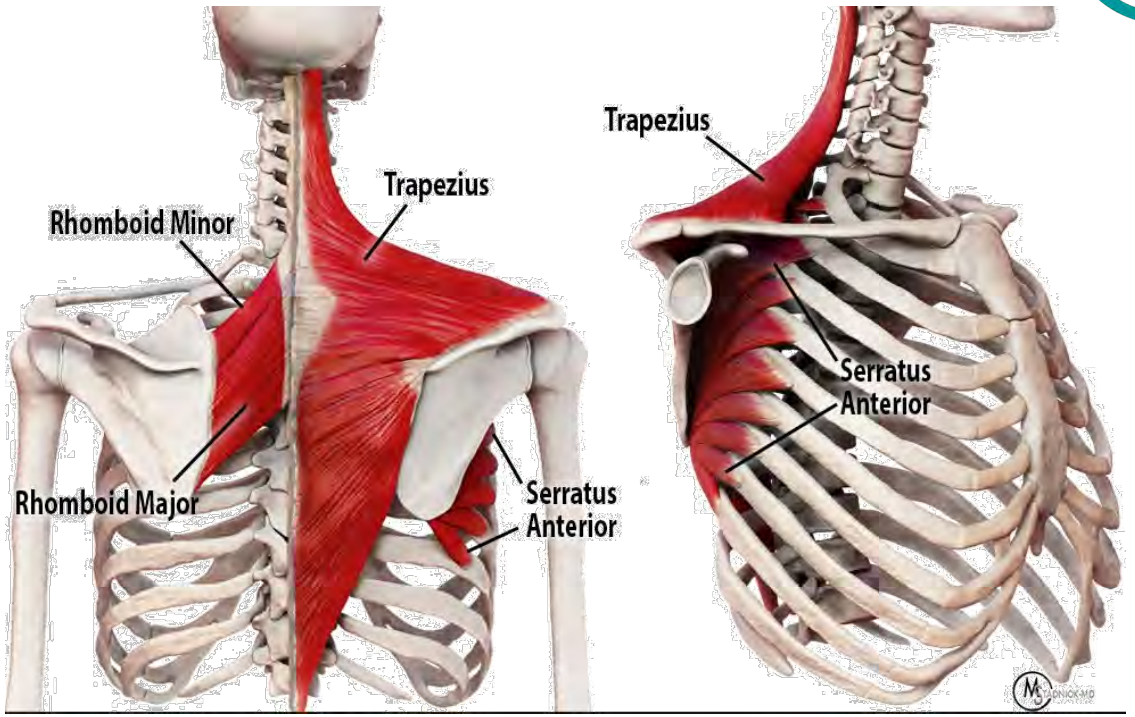
INTERVENTIONS

Reverse Total Shoulder

ROM/MOBILITY

- **PROM: Full except IR to 0 degrees in scapular plane and </= 90 degrees Abduction**
- **AAROM: All planes within restrictions**
- **AROM: Progression from supine flexion / elevation to standing**
- **Strengthening:**
  - **Periscapular: scapular retraction, prone scapular retraction, standing scapular setting, low row**
  - **Deltoid: isometrics in scapular plane**





Posterior Scapular Stabilizers

rTSA strengthening focuses on **deltoid and scapular stabilizers.** The **deltoid** is now the prime mover for shoulder elevation as the patient does not have a fully functioning rotator cuff

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Phase III: Intermediate Post-Op Continued (7-8 weeks after surgery)

SLING USE

Total Shoulder

Sling Discontinued

Reverse Total Shoulder

Sling Discontinued

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Phase III: Intermediate Post-Op Continued (7-8 weeks after surgery)

PRECAUTIONS

Total Shoulder

Lifting limited to < 10 pounds

Reverse Total Shoulder

NO reaching behind back beyond pant pocket unless otherwise cleared by MD

- **NO lifting of objects heavier than a coffee cup**
- **NO supporting of body weight with hands**
- **Continue to avoid shoulder hyperextension**

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Phase III: Intermediate Post-Op Continued (7-8 weeks after surgery)

FUNCTIONAL RELEVANCE

Total Shoulder

Light lifting / ADLs as tolerated.

Reverse Total Shoulder

No lifting heavier than a coffee cup

- No pushing up out of bed with surgical arm
- No excessive reaching behind back (reaching for bra), but can now reach behind back for toileting, putting on a belt, etc.

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Functional Internal Rotation permitted for rTSA during Phase III

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Phase III: Intermediate Post-Op Continued (7-8 weeks after surgery)

INTERVENTIONS

Total Shoulder

ROM / Mobility:

- **PROM:** Full ROM in all planes
- **AAROM / AROM:** Progress for all planes
- **Strengthening:** IR/ER isometrics progressed to Rotator Cuff (RC) resistance training, Rhythmic Stabilization, PNF patterns

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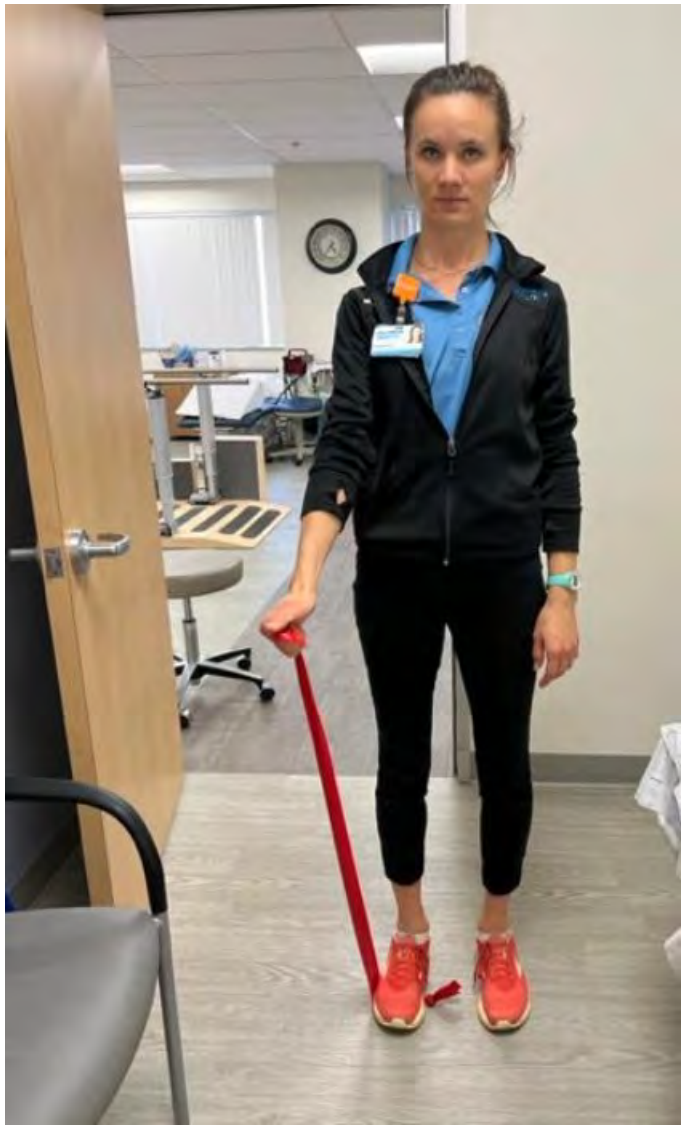

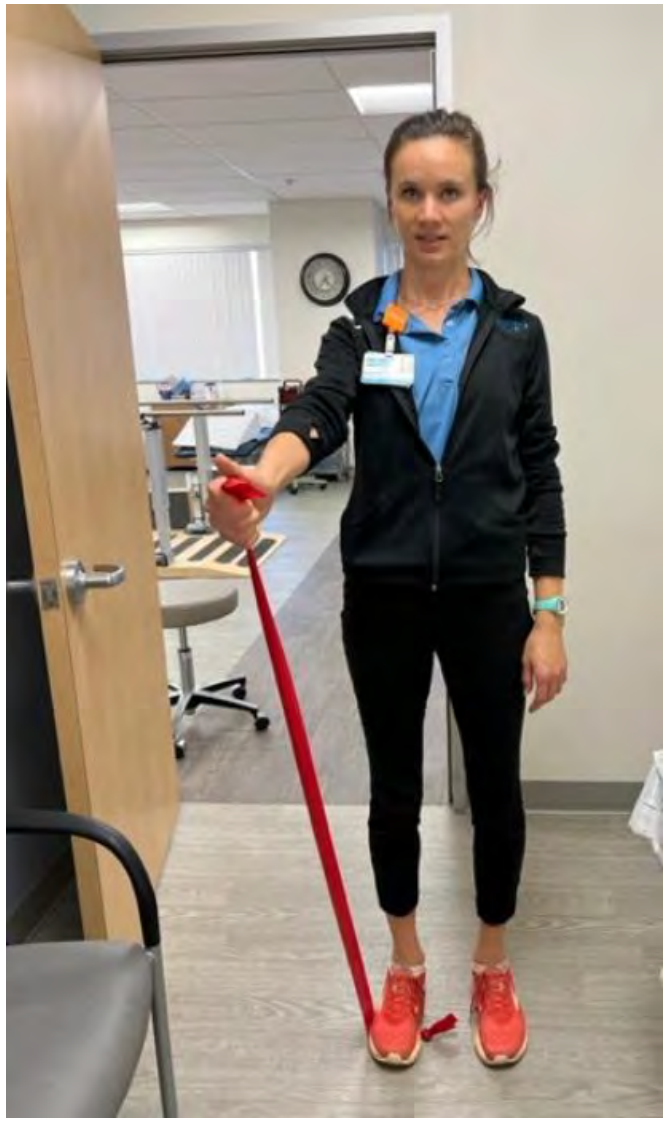

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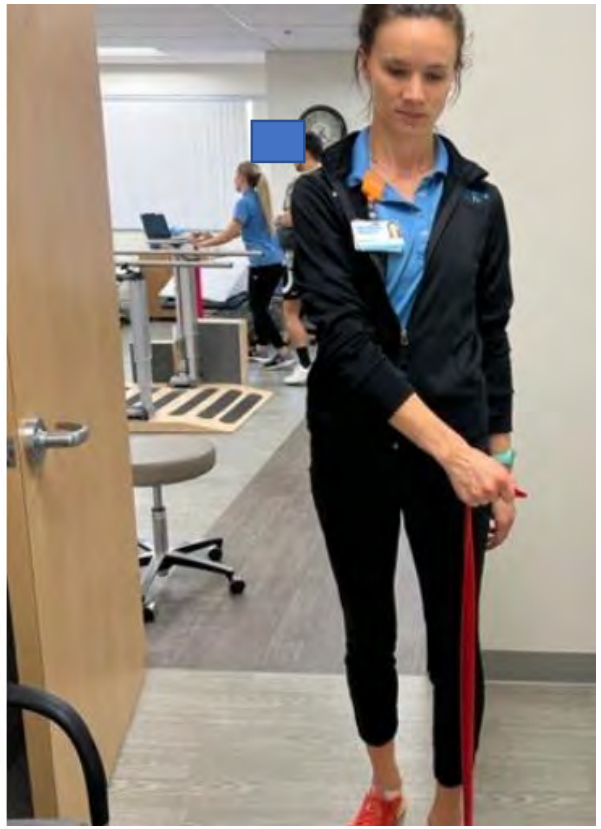
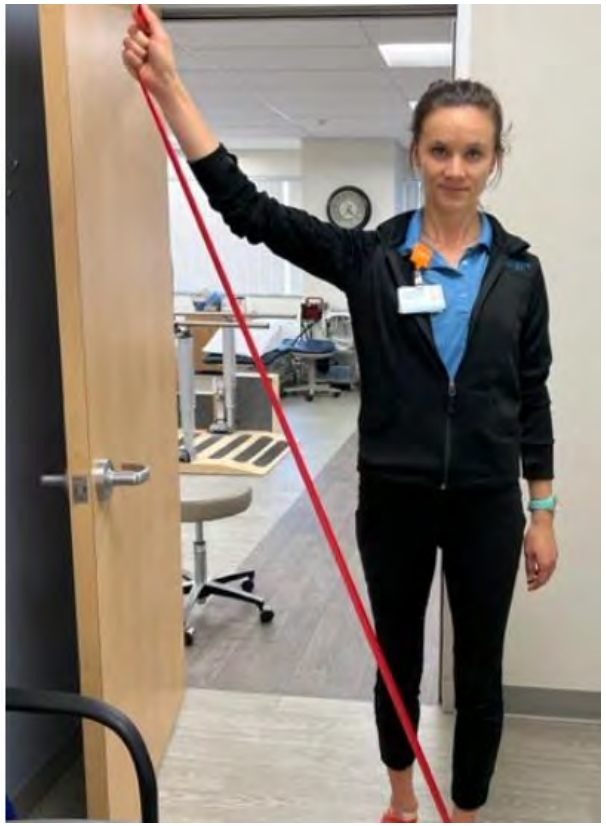
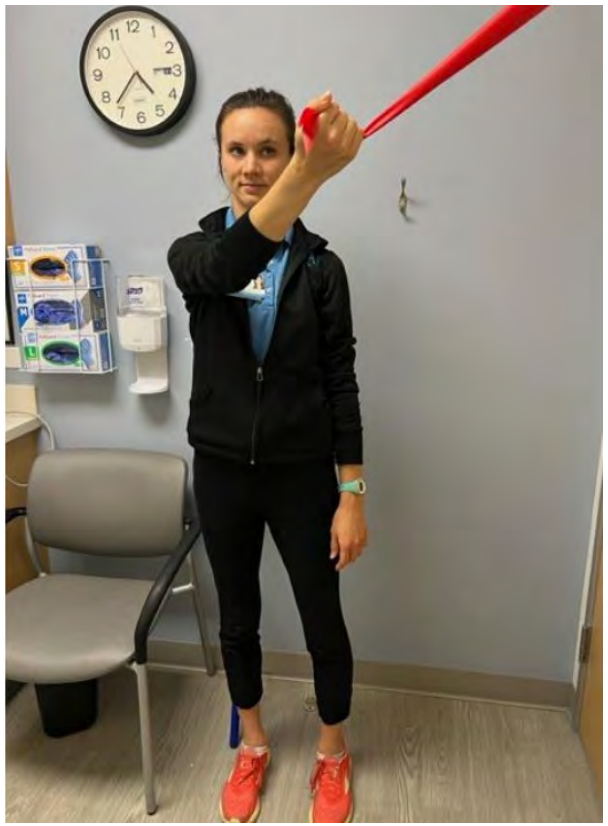


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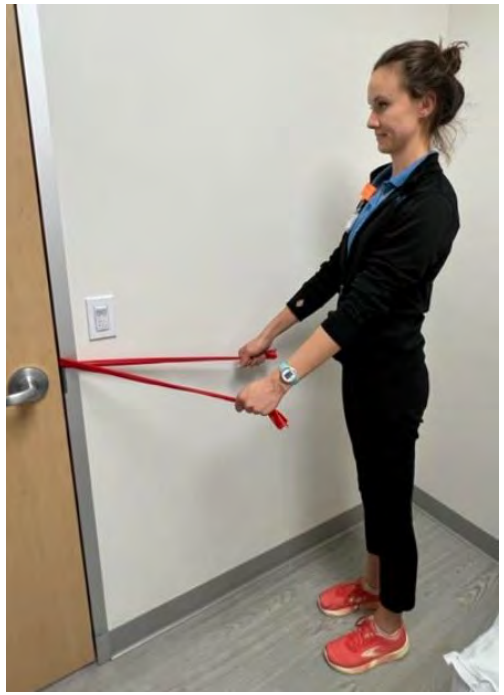
Phase III: Intermediate Post-Op Continued (7-8 weeks after surgery)

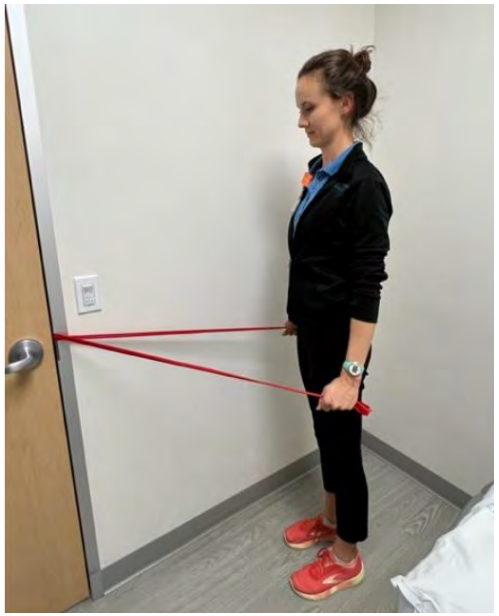
INTERVENTIONS

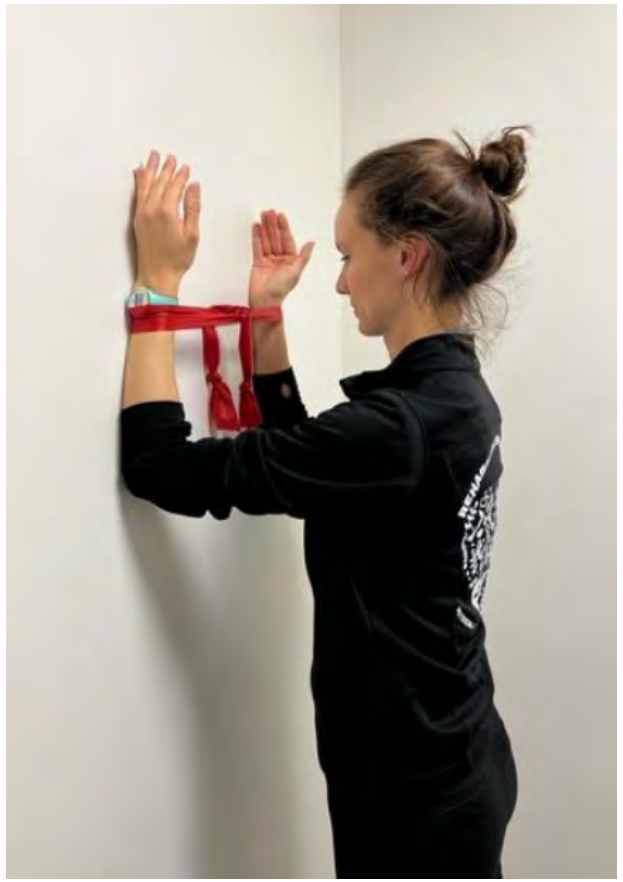
Reverse Total Shoulder

ROM/MOBILITY

- **PROM:** Full in all planes except gradual PROM IR in scapular plane </=50 degrees.
- **AAROM/AROM:** Progress in all planes with restriction above.
- **Strengthening:** IR/ER isometrics progressed to RC resistance training, Rhythmic stabilization. Progress deltoid strengthening.







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Phase IV: Transitional Post-Op (9-11 weeks after surgery)

PRECAUTIONS

Total Shoulder

- **NO lifting >10 pounds**

Reverse Total Shoulder

- **NO lifting > 10 pounds**

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Phase IV: Transitional Post-Op (9-11 weeks after surgery)

FUNCTIONAL RELEVANCE

Total Shoulder

Light lifting /ADLs as tolerated

Reverse Total Shoulder

Light lifting / ADLs as tolerated

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Phase IV: Transitional Post-Op(9-11 weeks after surgery)

INTERVENTIONS

Total Shoulder

ROM / Mobility:

- Full ROM in all planes
- Strengthening: Continue with resistance progression of RC strengthening, may initiate prone W, I's, push-up plus on knees, PNF patterns with progressive resistance

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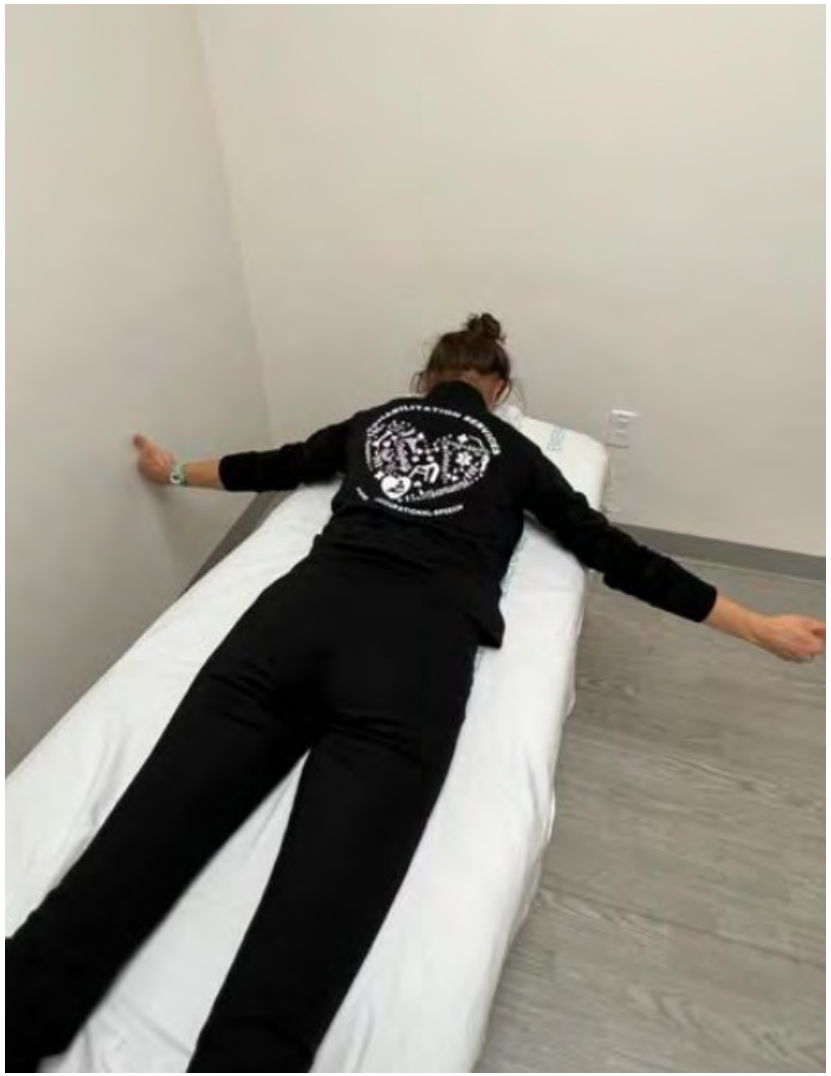

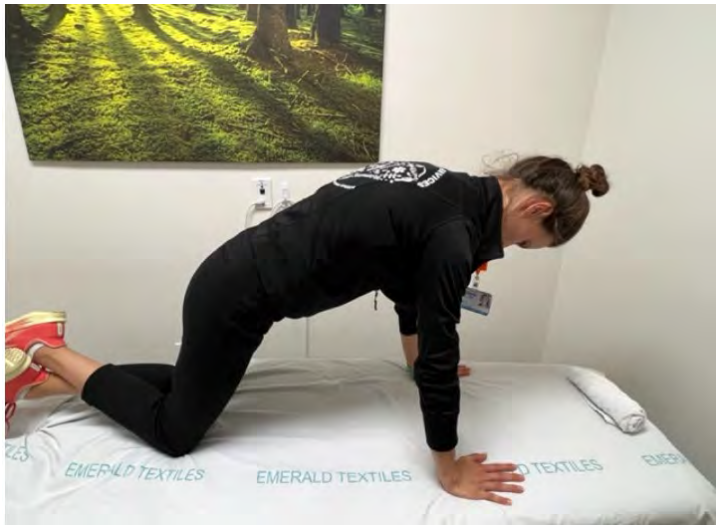

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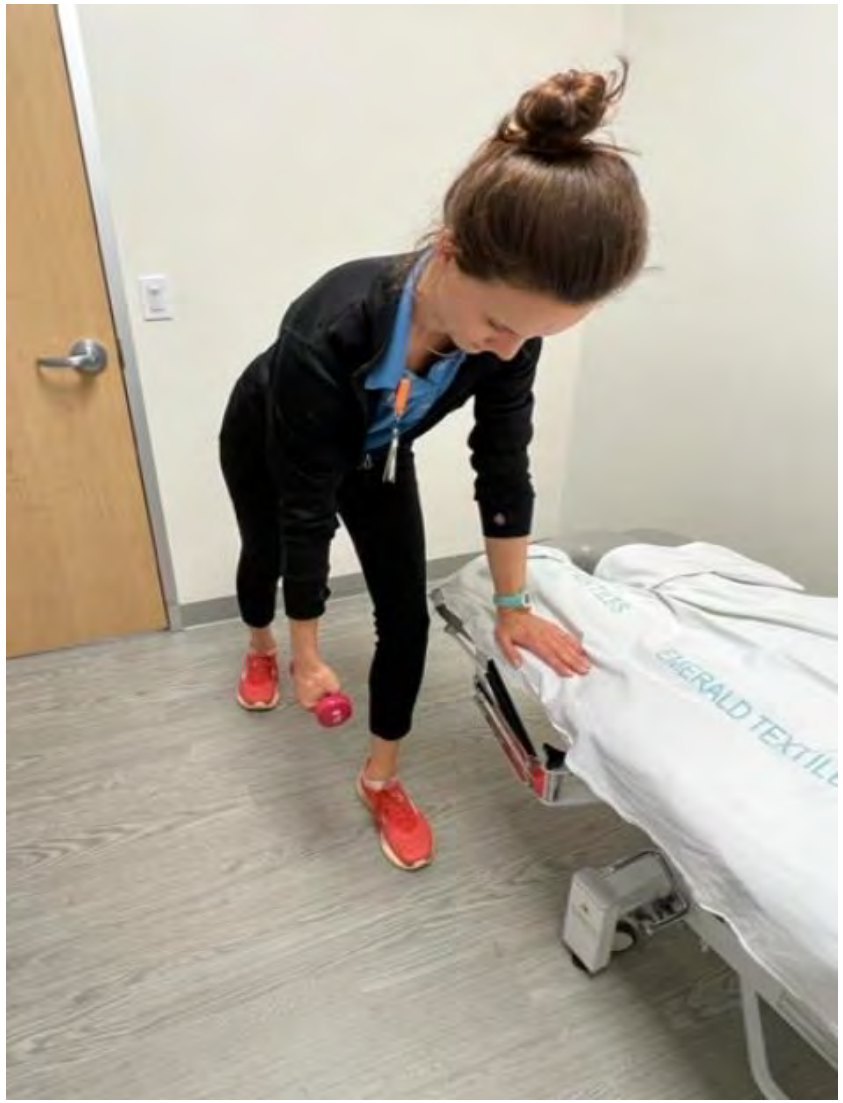
Phase IV: Transitional Post-Op (9-11 weeks after surgery)

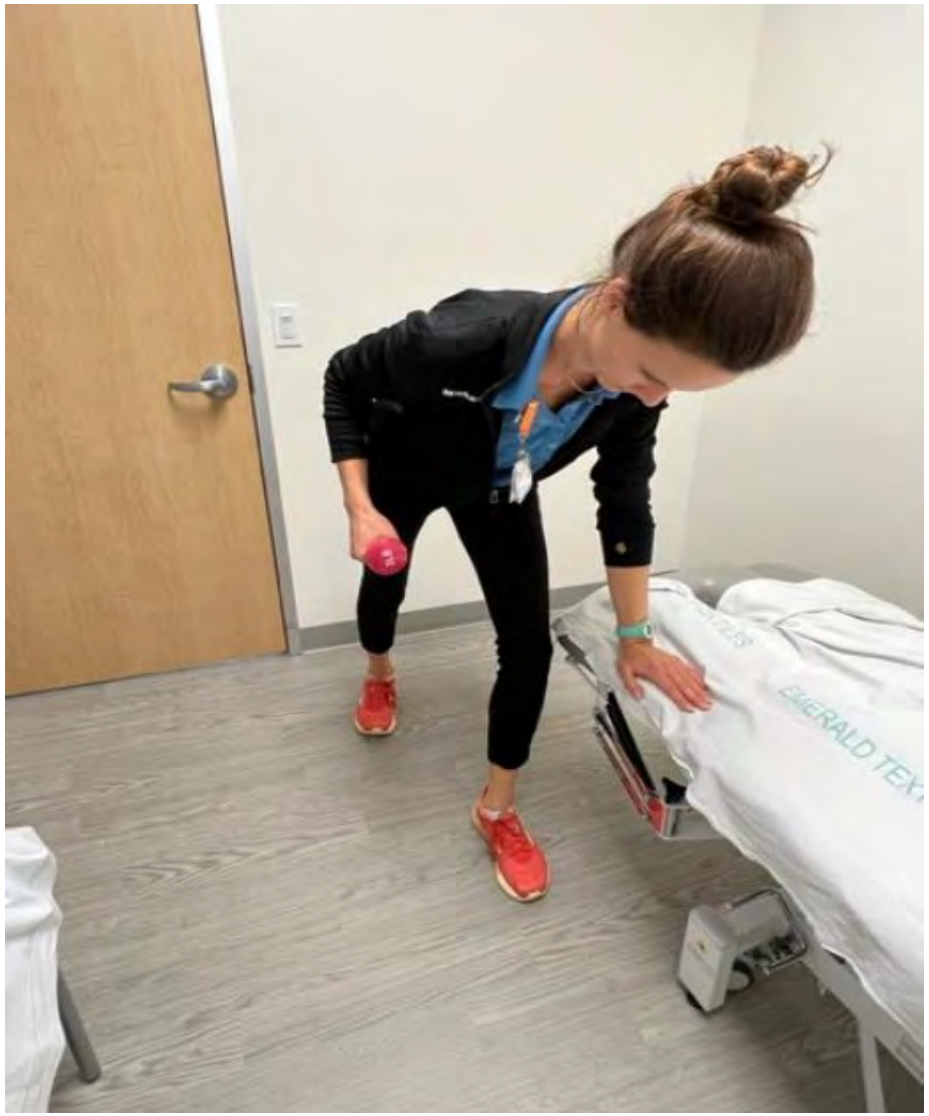
INTERVENTIONS

Reverse Total Shoulder

ROM/MOBILITY

- **PROM**: Full in all planes
- **Strengthening**: Continue with IR/ER progression of RC resistance training, Rhythmic stabilization, PNF patterns. Initiate resisted shoulder extension, rows, lawnmowers, PNF patterns.





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Phase V: Advanced Strengthening (12-16 weeks after surgery)

PRECAUTIONS

Total Shoulder

Long-term lifting restrictions 25 pounds (unless otherwise cleared by MD)

Reverse Total Shoulder

Long-term lifting restrictions 25 pounds (unless otherwise cleared by MD)

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Phase V: Advanced Strengthening (12-16 weeks after surgery)

INTERVENTIONS

Total Shoulder and Reverse Total Shoulder

ROM / Mobility:

- Full ROM in all planes.
- Progress strength as tolerated

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Phase V: Advanced Strengthening (12-16 weeks after surgery)

LONG TERM FUNCTIONAL RELEVANCE

Total Shoulder and Reverse Total shoulder

- All ADLs WNL within 25 pounds lifting restrictions
- No Pull ups or push-ups unless otherwise cleared by the surgeon
- May return to leisure activities such as golf, tennis, kayaking and yardwork/gardening

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According to a study by Mannava et al, almost 94% of patients successfully returned to various recreational sporting activities at participation levels comparable with preoperative levels after shoulder arthroplasty.

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2. Sandeep Mannava, MD, PhD, Marilee P. Horan, MPH, Salvatore J. Frangiamore, MD MS, Zaamin B. Hussain, BA, Erik m Fritz, MD, Jonathan A. Godin, MD, MBA, Jonas Pogorzelski, MD, MHBA, and Peter J. millett, MD, MSc. Return to Recreational Sporting Activities Following Total Shoulder Arthroplasty. Orthopedic Journal of Sports Medicine. 2018

Posture, Movement Mechanics, and Regional Interdependence

Bailey Perry, PT, DPT

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Objectives:

- Understand how posture impacts shoulder function
- Understand how movement mechanics (specifically interaction between the scapula and the humerus) impacts shoulder function
- Understand regional interdependence, the concept that seemingly unrelated impairments in a remote anatomical region may contribute to, or be associated with, the patient's primary concern

Everybody Freeze!

- Do not change your posture!
- Without moving your head, look at the person in front of you, to your right, to your left
- Where are their head and shoulders?

Posture

https://www.hep2go.com/

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Posture

- Sling can encourage this forward shoulder and forward head posture

https://www.hep2go.com/

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Posture

- Definition: the position in which someone holds their body when standing or sitting
- Influenced by:
  - Bony anatomy
  - Joint mobility
  - Muscle flexibility
  - Muscle strength and endurance
  - Neuromuscular control
    - The ability to produce controlled movement through coordinated muscle activity

Upper Crossed Posture

https://healthfitchiro.com/

Bony anatomy: excessive thoracic kyphosis, excessive cervical spine lordosis

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Upper Crossed Posture in patients with history of TSA or rTSA

- OP PT needs to address more than shoulder range of motion, flexibility, and strength
- Need to also address any identified impairments in cervical spine, scapular, and thoracic spine joint mobility, muscle flexibility, muscular strength and endurance, and neuromuscular control to optimize shoulder function

Stretching to Optimize Shoulder Girdle Posture

Suboccipital stretch

https://www.hep2go.com/

Upper trapezius stretch

https://www.hep2go.com/

Levator scapula stretch

https://www.hep2go.com/

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Stretching to Optimize Shoulder Girdle Posture

Pectoralis minor stretch

https://www.hep2go.com/

Pectoralis major stretch

https://www.hep2go.com/

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Thoracic Spine Mobilization to Optimize Shoulder Girdle Posture

Cat cow stretch

https://www.hep2go.com/

Open book stretch

https://www.hep2go.com/

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Strengthening to Optimize Shoulder Girdle Posture

Chin nod

https://www.hep2go.com/

Scapular retraction

https://www.hep2go.com/

Row

https://www.hep2go.com/

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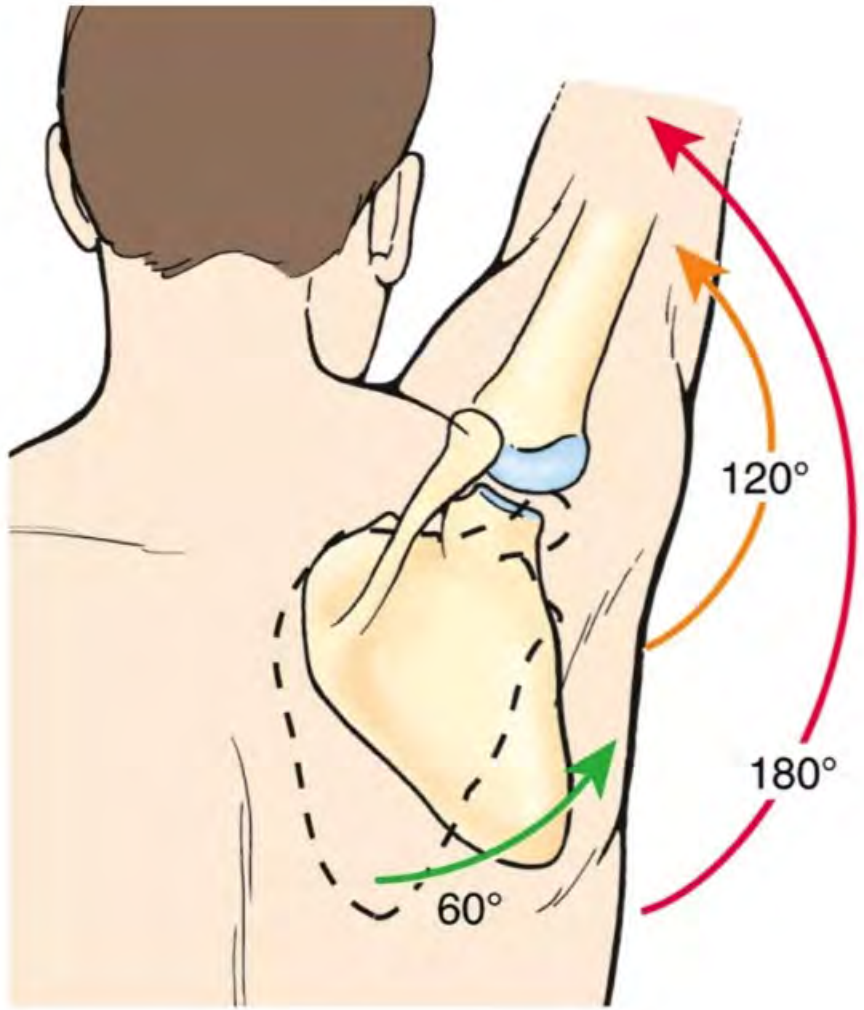
Movement Mechanics

- Biomechanics: the science of the movement, including how muscles, bones, tendons, and ligaments work together to move.
- Influenced by:
  - Bony anatomy
  - Joint mobility
  - Muscle flexibility
  - Muscle strength and endurance
  - Neuromuscular control

Scapulohumeral Rhythm:

- Definition: The interaction between the scapula and humerus to achieve shoulder elevation
- Shoulder elevation is accomplished by two joints
  - Glenohumeral joint flexion
  - Scapulothoracic joint upward rotation
- What percentage of shoulder elevation do you think is accomplished by the glenohumeral joint?

Optimal Scapulohumeral Rhythm



- Optimal scapulohumeral rhythm is 1:2
- 60 degrees of scapular upward rotation
- 120 degrees of glenohumeral flexion
- 2/3 (66.7%) of the movement comes from the glenohumeral joint

https://www.physio-pedia.com/Scapulohumeral_Rhythm#/media/File:Scapulohumeral_rhythm-1-.png

Scapulohumeral Dyskinesia: Altered Scapulohumeral Rhythm

- In patients with TSA and rTSA, a greater proportion of shoulder elevation is from the scapula
- Especially with rTSA, because deltoid does not as effectively create shoulder elevation compared to the rotator cuff
- Clinically, in order to achieve shoulder elevation, we see excessive scapular elevation, overuse of upper trapezius and levator scapula
  - Leading to neck pain

Scapulohumeral Dyskinesia: Altered Scapulohumeral Rhythm

- To decrease excessive scapular elevation and overuse of upper trapezius and levator scapula
  - Strengthen scapular upward rotators
    - Serratus anterior
  - Strengthen scapular stabilizers
    - Middle and lower trapezius
  - AND LEARN HOW TO USE THEM APPROPRIATELY

Neuromuscular Re-Education

- Neuromuscular control: the ability to produce controlled movement through coordinated muscle activity
- Neuromuscular re-education: techniques to restore normal, controlled movement patterns
  - Visual feedback
  - Verbal cuing
  - Tactile cuing

Regional Interdependence

- Regional interdependence: the concept that seemingly unrelated impairments in a remote anatomical region may contribute to, or be associated with, the patient's primary concern

Regional Interdependence Example:

- 1 year s/p R reverse total shoulder arthroplasty
- 2 years s/p L total hip arthroplasty
- Chronic lumbar spinal stenosis
  - Low back pain and R LE radiating pain with standing upright
- Recently retired from full time job requiring sitting 8 hours a day, with 1 hour commute each way
- Current hobbies: watching television, knitting, puzzles

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Lower Crossed Posture

https://www.pakenhamosteopathy.com

Bony anatomy: excessive lumbar lordosis, hip flexion contracture

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Stand up and try this!

- Pelvis: anterior pelvic tilt
- Hips: flexed 20 degrees
- Lumbar spine: flexed, because neutral or extended position is painful for this patient
- What does this do to your neck and shoulders?
- How high can you reach?

References

- Felipe F. Gonzalez, Raphael Fonseca, Gustavo Leporace, Rafael Pitta, Marcos N. Giordano, Jorge Chahla, Leonardo Metsavaht, Three-dimensional kinematic evaluation of scapulohumeral rhythm after reverse shoulder arthroplasty: a systematic review and meta-analysis, JSES Reviews, Reports, and Techniques, Volume 2, Issue 1, 2022, Pages 8-16, ISSN 2666-6391, https://doi.org/10.1016/j.xrrt.2021.10.009.
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