Geriatrics Case Study

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Virginia Commonwealth University
Objectives

- Present the PT management of a geriatric patient S/P reverse total shoulder arthroplasty
- Examine the evidence on the Berg Balance Scale and shoulder immobilization as predictors of fall risk
- Examine the evidence on aquatic and land therapy as interventions for improved balance and shoulder ROM
86 y.o. female, 4 days S/P L Reverse Total Shoulder Arthroplasty (rTSA)

Acute care setting 6/29 - 7/3
- Low oxygen sats → 2L $O_2$ via nasal cannula

Discharged to health care unit of Continuing Care Retirement Community (CCRC)
- Orders for $O_2$
Patient Information: History

- **Past Medical History:**
  - **Cardiovascular:** HTN, CAD, Cardiomyopathy, Atrial Fibrillation, & Hyperlipidemia
  - **Musculoskeletal:** Spinal Stenosis, Generalized OA, & Osteoporosis
  - **Other:** GERD, Hypokalemia, & Glaucoma

- **Social History:**
  - Lived alone in *independent living apartment* in CCRC
  - Widow, six children
  - Enjoys social events in the community
  - Inactive/sedentary lifestyle
Understanding the Procedure

**Total Shoulder Arthroplasty (TSA)**
- Mimics normal shoulder anatomy
  - Plastic “cup” glenoid
  - Metal ball humeral component
- Relies on RTC muscles

**Reverse Total Shoulder Arthroplasty (rTSA)**
- Indications: arthritis, irreparable RTC tear (cuff tear arthropathy), TSA revision, proximal humeral fx
- Components are switched → altered shoulder mechanics
  - Metal glenoid ball
  - Plastic humeral “cup”
- Relies on deltoid muscle

# Patient Information: Medications

<table>
<thead>
<tr>
<th>Medications</th>
<th>Relevant Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cardiac (8)</strong></td>
<td>Dizziness, Orthostatic Hypotension, Nausea, Weakness/drowsiness, Lack of coordination</td>
</tr>
<tr>
<td>Amiodarone, Aspirin, Furosemide, Metoprolol, Potassium Chloride, Simvastatin, Verapamil</td>
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<tr>
<td><strong>Bone Health (2)</strong></td>
<td>Dizziness, Arrhythmias, Nausea, Weakness/drowsiness</td>
</tr>
<tr>
<td>Alendronate Sodium, Calcium-Vitamin D Supplement</td>
<td></td>
</tr>
<tr>
<td><strong>Others (3)</strong></td>
<td>Dizziness, Hypotension, Drowsiness, Blurred/double vision</td>
</tr>
<tr>
<td>Esomeprazole Magnesium (GERD), Timolol Maleate (Glaucoma), Oxycodone HCL (Analgesic)</td>
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</tbody>
</table>
Patient Information: Evaluation

- **Vitals:**
  - BP: 157/67
  - HR: 59 bpm w/ sinus rhythm
  - SpO2: 91% at rest w/out O2

- **ROM:**
  - RUE: AROM WFL
  - BLE: AROM WFL

- **Precautions:**
  - LUE NWB, Fall Risk, Pacemaker, **LUE to remain in immobilizer x 6 weeks**

- **Strength:**

<table>
<thead>
<tr>
<th></th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder flexors</td>
<td>NT</td>
<td>3+/5</td>
</tr>
<tr>
<td>Shoulder abductors</td>
<td>NT</td>
<td>3+/5</td>
</tr>
<tr>
<td>Elbow flexion</td>
<td>NT</td>
<td>4/5</td>
</tr>
<tr>
<td>Elbow extension</td>
<td>NT</td>
<td>3+/5</td>
</tr>
<tr>
<td>Wrist flexion</td>
<td>3+/5</td>
<td>3+/5</td>
</tr>
<tr>
<td>Wrist extension</td>
<td>3+/5</td>
<td>3+/5</td>
</tr>
<tr>
<td>Hip flexors</td>
<td>3+/5</td>
<td>3+/5</td>
</tr>
<tr>
<td>Hip extensors</td>
<td>3+/5</td>
<td>3+/5</td>
</tr>
<tr>
<td>Hip IR/ER</td>
<td>3/5</td>
<td>3/5</td>
</tr>
<tr>
<td>Knee flexors</td>
<td>4/5</td>
<td>4/5</td>
</tr>
<tr>
<td>Knee extensors</td>
<td>3+/5</td>
<td>3/5</td>
</tr>
<tr>
<td>Dorsiflexors</td>
<td>3+/5</td>
<td>3/5</td>
</tr>
<tr>
<td>Plantarflexors—Standing HR</td>
<td>Unable</td>
<td>Unable</td>
</tr>
</tbody>
</table>
Evaluation cont’d

● Outcome Measures
  ○ Berg Balance Score (BBS): 25/56
  ○ 5X Sit to Stand: 42 sec w/ min A
  ○ Physical Performance & Mobility Exam= 1/12 (12/12= no impairment)

● Ambulation/Gait
  ○ Ambulation: 35 ft with min A using HHA
  ○ Gait: wide BOS, ↓ stride length, ↓ B toe clearance, ↑ double limb support time

● Bed Mobility
  ○ Sit→Supine: Mod A
  ○ Supine→Sit: Min A
  ○ Roll R: Min A

● Transfers
  ○ Sit→Stand: Min A
  ○ Stand Pivot: Mod A

● Pain/Edema
  ○ Pain: 6/10 L shoulder (after bed mobility); LBP 5/10 (after ambulation)
  ○ Edema: 2+ pitting edema B knees→toes
Premorbid Mobility Status

- Independent ambulation in her apt w/ RW
- Ambulated to the dining room (~200 ft from apt) w/ RW
- Distances >200 ft w/ power wheelchair
“I want to return to my apartment and be able to walk around with my walker again.”
ICF: Shoulder-Specific

Reverse TSA (rTSA)

- ↓ LUE ROM
- ↓ LUE Strength
- Pain L shoulder

- ↓ Independence with transfers
- Inability to ambulate with RW

- ↓ Social events
- ↓ Family visits

(+ ) Family support
(+ ) CCRC

(- ) Sedentary
ICF: General Deconditioning

OP, OA, Spinal Stenosis

- ↓ BLE Strength
- ↓ Balance
- ↓ Endurance

- ↓ Independence with transfers
  - Impaired gait

- ↓ Social events
  - ↓ Family visits

(+ ) Family support
(+ ) CCRC

(-) Sedentary
Physical Therapy Diagnosis

Patient presents with decreased shoulder ROM and strength s/p rTSA with concurrent balance and mobility deficits associated with general deconditioning.
Clinical Question: Prognosis

In an elderly female, is a low Berg Balance Scale score a prognostic indicator for future falls?
Use of the Berg Balance Scale for Predicting Multiple Falls in Community-Dwelling Elderly People: A Prospective Study

Susan W Muir, Katherine Berg, Bert Chesworth, Mark Speechley
Purpose: To examine the predictive validity of Berg Balance Scale (BBS) for any falls, multiple falls, and injurious falls

Type: Prospective Cohort Study

Subjects:
- 210 community-dwelling older adults (mean age 79.47 years, SD= 5.83; 65% male) who received comprehensive geriatric assessment including BBS
- 187 completed follow-up at 1 year

Methods: Mailed “fall calendars” monthly that asked subject to report on falls and send back in the mail at the end of each month. If reported a fall in the survey the subject was phoned to gather more information on the fall.
Muir et al., 2008

**Pertinent Findings:**
- Low sensitivity of identifying risk of falling in the future (25% for one fall; 45% for multiple falls).
- BBS has good discriminative ability in predicting multiple falls.
- Use of likelihood ratio data shows risk of fall increases as BBS scores decrease

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**Table 3.**
Positive Likelihood Ratios Across 5 Intervals of Berg Balance Scale (BBS) Scores for the Outcome Any Fall (n=187)\(^a\)

<table>
<thead>
<tr>
<th>BBS Scores (No. of Participants)</th>
<th>Fallers (n=80)</th>
<th>Nonfallers (n=107)</th>
<th>Positive Likelihood Ratio (95% Confidence Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Proportion</td>
<td>No.</td>
</tr>
<tr>
<td>&lt;40 (19)</td>
<td>12</td>
<td>12/80=0.15</td>
<td>7</td>
</tr>
<tr>
<td>40–44 (13)</td>
<td>7</td>
<td>7/80=0.09</td>
<td>6</td>
</tr>
<tr>
<td>45–49 (18)</td>
<td>9</td>
<td>9/80=0.11</td>
<td>9</td>
</tr>
<tr>
<td>50–54 (49)</td>
<td>21</td>
<td>21/80=0.26</td>
<td>28</td>
</tr>
<tr>
<td>≥55 (88)</td>
<td>31</td>
<td>31/80=0.39</td>
<td>57</td>
</tr>
</tbody>
</table>

\(^a\) “Fallers” were people who sustained a fall over the study period, and “nonfallers” were people who did not fall over the study period.
Limitations:

- Falls are multifactorial → cannot use balance impairment alone to predict falls
- Subjects previously educated regarding fall risk and fall prevention
- Risk of underreporting
- High proportion of men → May not be generalizable to other geriatrics

Implications for our patient:

- BBS: 25/56 → increased likelihood of falling
- Our patient does have decreased strength and mobility impairments as found in her evaluation which may impact our plan of care approach
The Effect of Shoulder Immobilization on Balance in Community-Dwelling Older Adults

Ann Coleman, DPT, PT, MSSW; Judy Clifft, DPT, PT, MS
**Purpose:** To examine the effect of shoulder immobilization on balance as measured by the Berg Balance Scale (BBS) in community-dwelling older adults.

**Inclusion criteria:**
- ≥ 65 yo; English-speaking; able to follow directions; living independently in the community.

**Exclusion criteria:**
- History of stroke, TIA, Parkinson’s, LE jt replacement or UE immobilized within the past month.

**Subjects:**
- 53 (14 males, 39 females)
- Average age 75.4 years
Coleman et al., 2010

Methods:

- BBS was administered twice to each subject with 2 min rest between trials
- With and without shoulder immobilizer
  - Elbow in 90° flexion
  - Dominant arm anchored to trunk
  - 33 wore immobilizer during the 1st trial and 20 during the 2nd
Pertinent Findings:

- Mean BBS without immobilizer: 53
- Mean BBS with immobilizer: 52
  - Mean change score of -1.02

Table 2. BBS Score Distribution

<table>
<thead>
<tr>
<th>Age group</th>
<th>All</th>
<th>Men</th>
<th>Men</th>
<th>Women</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without immobilizer</td>
<td>65-89</td>
<td>65-74 (n = 5)</td>
<td>75+ (n = 9)</td>
<td>65-74 (n = 19)</td>
<td>75+ (n = 20)</td>
</tr>
<tr>
<td>Range</td>
<td>38.56</td>
<td>54.56</td>
<td>41.56</td>
<td>51.56</td>
<td>38.56</td>
</tr>
<tr>
<td>Median</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>56</td>
<td>52.5</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>53 (4.0)</td>
<td>55.2 (0.8)</td>
<td>52.5 (5.0)</td>
<td>55.1 (1.5)</td>
<td>51.2 (4.6)</td>
</tr>
</tbody>
</table>
Limitations:

- Learning effect between trials
  - Unequal number of pts receiving immobilization during the first trial
- Rater bias
- Small fairly homogenous sample size
- No established MDC when using the BBS for orthopedic conditions

Implications for our patient:

- Immobilizing the UE may have a negative effect on balance as measured by the BBS placing our pt at an even greater fall risk
  - Restricts trunk movement
  - Interferes with balance strategies
- Fall prevention program + shoulder rehab
Clinical Question: Intervention

Is the addition of aquatic therapy to a traditional land-based program advantageous in improving early ROM and balance in an elderly female s/p shoulder surgery?
Early Aquatic Physical Therapy Improves Function and Does Not Increase Risk of Wound-Related Adverse Events for Adults After Orthopedic Surgery: A Systematic Review and Meta-Analysis

Elizabeth M. Villalta, BPhys, Casey L. Peiris, BPhys

From the Allied Health Clinical Research Office, Eastern Health; and School of Physiotherapy, La Trobe University, Victoria, Australia.
Purpose: To investigate whether early postoperative aquatic physical therapy is a low-risk and effective form of physical therapy to improve functional outcomes after orthopedic surgery.

Type: Systematic review of controlled trials

- Inclusion criteria: English text, peer-reviewed journal, adult participants, ≤3 mos post-surgery, compared aquatic vs. land-based PT
- Exclusion criteria: No data on adverse events or didn’t fit above criteria

Subjects: 8 controlled trials, 287 participants

- Adults, mean age 65 years (range 18-88)
- 55% women
- Post-orthopedic surgery (rotator cuff repair, ACL reconstruction, THR, & TKR)
Villalta and Peiris, 2013

Methods:

- 1° outcome: adverse events in relation to wound healing
- 2° outcomes: measures of impairment (edema, pain, strength, ROM), activities (ADLs), and participation (QOL)
- Individual trial methods varied, but all dosages well-matched
  - Rotator cuff repair trial:
    - Aquatic therapy began 10 days post-op
    - 2x/ week, 12 weeks
    - Aquatic therapy group also received land therapy
    - Group aquatic; individual land-based PT
Pertinent Findings:

- Aquatic PT did not increase risk of wound-related adverse events compared with land-based therapy.

- When compared with land-based PT, aquatic PT resulted in a significant improvement in measures of ADLs.

- Rotator cuff repair trial: aquatic PT group made significantly > improvement in shoulder flexion ROM at 3 & 6 weeks post-op compared to land-based group.

- No significant differences in pain, edema, QOL.
Limitations:

- English-language bias
- Combination of land and aquatic PT (which intervention caused treatment effects?)
- Only 1 UE study (and it did not match our patient’s surgery)
- Small number of participants

Implications for our patient:

- Aquatic PT (with appropriate wound dressing) does not ↑ risk of adverse wound events
  - Patient may benefit from aquatic PT + land-based PT to improve ADLs and shoulder ROM s/p L rTSA
The Effect of Land and Aquatic Exercise on Balance Scores in Older Adults

Peter Douris, PT, EdD, Veronica Southard, PT, MS, GCS, Celia Varga, PT, MS, William Schauss, PT, MS, Charles Gennaro, PT, MS, Arthur Reiss, PT, MS
Douris et al., 2003

**Purpose:** To determine whether aquatic exercise is more effective than land-based exercise for improving balance

**Subjects:** 11 subjects (average age 79.1)

- **Inclusion Criteria:** healthy, age > 65, independent in ADLs and ambulation, MMSE score > 20, BBS score < 47
- **Exclusion Criteria:** significant illness in last 6 months, receipt of therapy at time of study, participation in formal exercise program
**Methods:** Subjects assigned to a group: Aquatic OR Land

- Same dosage: *2x/ week for 6 weeks*
- Same exercise protocol:
  - Walking activities: 3x each for distance of 11 feet
    - *walk forward, march forward, sidestep, tandem walk*
  - Exercises: 1 x 15 reps each
    - *march in place, hip flex/ext, hip abd/add, toe/heel raises, shallow knee bends, sit to stands*
Pertinent Findings:

- Significant improvement in BBS scores in both groups, regardless of the medium.
- Balance ability can be improved in older adults through use of land-based OR aquatic-based lower extremity exercise.
Limitations:

- Small sample size
- Non-randomized study
- Aquatic group younger vs. land group (average age 75 vs. 83)
- BBS only outcome measure used

Implications for our patient:

- Aquatic therapy is equally as effective as land-based therapy at improving balance.
  - Patient may benefit from aquatic PT + land-based PT program to improve balance
  - Aquatic PT may be better option earlier on due to patient’s low BBS score and risk of future fall
Questions?
Instead of the John I call my bathroom the Jim!
That way it sounds better when I say I go to the Jim first thing every morning!!!
Physical Therapy Goals: Short Term

**Shoulder:**
1. In one week, patient will be able to independently recite surgery precautions to promote safety following rTSA.
2. In one week, patient will report a decrease in shoulder pain by at least 2 (MDC= 2 pts) on the VAS scale to improve tolerance to treatment.
3. In two weeks, patient will have 90 degrees of passive shoulder flexion ROM to prepare for AROM required for ADLs.

**Gait/Balance/Mobility:**
1. In one week, patient will be able to ambulate 100 feet with min A x 1 using HHA in order to promote safe community and household ambulation.
2. In two weeks, patient will be able to perform all transfers with CGA to improve independence with ADLs such as getting up out of bed.
1. In three months, patient will demonstrate full shoulder ROM in order to independently perform activities of daily living.

2. In three months, patient will be able to ambulate 200 feet with the least restrictive assistive device in order to promote return to safe household ambulation.
Initial Evaluation

- Educate pt on precautions (12w)
  - No reaching behind lower back or hip
    - Position of dislocation
  - No extending arm past neutral at side
  - No shoulder AROM (6 weeks)
  - No lifting/supporting BW with operative extremity
  - Keep incision clean

- Educate pt on donning/doffing immobilizer

- Educate family members on PROM techniques
Plan of Care

Dosage:
- 4x/ week for 12 weeks
- Combination of aquatic and land-based therapy

Things to consider:
- Shoulder immobilizer for 6 weeks
- NWB on LUE
- Monitor vitals often due to cardiac issues
  - RPE, SPO$_2$, BP (land)
Review: Properties of Water

- **Buoyancy**
  - Upward force that keeps body afloat, decreases the effects of gravity → ↓ joint load
  - Can provide assistance (to upward motion) or resistance (downward)

- **Hydrostatic pressure**
  - Fluid pressure water exerts on all submerged body parts
  - May impact edema

- **Drag force**
  - Force provided by fluid, acting opposite to the direction of movement
  - Provides resistance to movement → can be used to progress exercise difficulty

- **Other factors**
  - Decreased muscle activation in water → earlier AROM than on land
  - Viscosity → protection: slower speed of falling → LOB in pool would not result in impact with the ground
Our Intervention: Week 1

Aquatic Therapy

Shoulder:
- Shoulder rolls
- AROM elbow/wrist
- Buoyancy assisted shoulder flexion

General Deconditioning:
- Seated heel/toe raises (HR/TR)
- Sit-to-stand
- Mini-squats
- Gait training

Land Therapy

Shoulder:
- Pendulums
- PROM shoulder flexion in scapular plane 0-90°
- Pulleys
- Scapular retractions
- Cryotherapy PRN

PROTOCOL FOR rTSA:
- PROM (supine):
  - Fwd flexion 0-90°
  - ER 0-20/30° (available range)
- AROM/AAROM: C-spine, elbow, wrist & hand
Our Intervention: Weeks 2-3

Aquatic Therapy

Shoulder:
  ● Buoyancy assisted FF & ER

General Deconditioning:
  ● Single leg balance
  ● Marching
  ● Side-stepping

Land Therapy

Shoulder:
  ● Sub-max deltoid isometrics in the scapular plane
  ● Cryotherapy PRN

General Deconditioning:
  ● Walk w/ LRAD
  ● Transfer training

PROTOCOL: Continue previous exercises and:
  ● Begin pain-free deltoid isometrics in the scapular plane
Our Intervention: Weeks 3-6

Aquatic Therapy

Shoulder: PROM IR (≤50°)

General Deconditioning:
- Standing HR/TR
- ↑ speed of walking & side-stepping
- Semi-tandem walking
- Mini fwd/side lunges
- Hip Kickers

PROTOCOL: Continue previous exercises and:
- PROM: Fwd flex 0-120°, ER to tolerance
  - *@ 6w PROM IR (≤50°)
- RROM elbow, wrist, hand

Land Therapy

Shoulder:
- PROM shoulder flexion to 120°; ER to tolerance
- Begin PROM IR (≤50°)
- RROM: elbow, wrist and hand (bicep curls, wrist PRO/SUP w/ wt., putty)
- Cryotherapy PRN

General Deconditioning:
- Glute sets
- Mini-squats
- Standing hip abd/ext
- Walk w/ LRAD
- Transfer training
Our Intervention: Weeks 6-8

Aquatic Therapy

Shoulder:
- Standing breaststroke
- D1/D2 PNF pattern

General Deconditioning:
- Tandem walking

Land Therapy

Shoulder:
- IR PROM to tolerance
- Begin AAROM/AROM
- Sub-max GH IR & ER isometrics
- Scapular & D1 PNF pattern
- Progress strength: elbow, wrist, hand
- Grade I/II mobs to GH and ST jts
- Cryotherapy PRN

General Deconditioning:
- Double LE balance (compliant surface)
- Side-stepping
- Walk w/ LRAD

PROTOCOL: Continue previous exercises and:
- AAROM/AROM
- IR/ER isometrics
- @8w: Scapular PNF pattern
- GH jt mobs grade I/II
- Pt may begin using UE for feeding/light ADL’s
Our Intervention: Weeks 9-12

Aquatic Therapy

Shoulder:
- Arm circles
- Wall push-ups
- Claps
- Alternating flex/ext
- Resisted FF and ER with paddles

Land Therapy

Shoulder:
- Arm bike
- RROM flexion and elevation with 1-3# hand held weights
- Gentle RROM IR/ER
- RROM scapular stabilizers
- Cryotherapy PRN

General Deconditioning:
- Walk w/ LRAD

PROTOCOL:
- Continue all previous exercises→functional activity progression
- RROM flexion in scapular plane
- RROM IR/ER
Our Intervention: Weeks 12-16

- Continue with previous program
- Educate patient about local resources
  - community pools, gyms, etc
- Cryotherapy PRN

**Criteria for discharge:**
- Patient able to maintain pain-free shoulder AROM demonstrating proper shoulder mechanics
  - 80-120° of shoulder flexion
  - 30° of functional shoulder ER
Questions?
References


