Beyond 3 Sets of 10

PAMELA BARTLO, PT, DPT, CCS
PATRICIA NOWAKOWSKI, PT, PHD, GCS, CEEAA
RONALD WHITE, PT, DPT, OCS
Learning Objectives

• Describe the physiology behind decisions of parameters of exercise.

• Understand the barriers to individualized care vs. protocols.

• Detail standardized tests that may be used to formulate individual exercise programs.

• Explain and apply options for individualization of exercise for patients with several co-morbidities and apply those concepts to common patient case scenarios in a variety of settings.
Schedule

• Introduction.

• Physiology behind exercise program parameters.

• Barriers to individualized care and the effect of protocols.

• Discussion of standardized tests for exercise prescription.

• Intervention ideas and case studies for Cardiovascular and Pulmonary, Homecare, and Outpatient Orthopedic patients.

• Open discussion and questions.
Introduction

• Collectively:
  • D’Youville College, Buffalo, NY - About 60 students per cohort in DPT program
  • Over 60 yrs experience as PTs and 35 as educators

• Individually:
  • Pam - has been a CCS since 2005, has numerous publications and presentations in the area of cardiovascular and pulmonary PT, as well as exercise for adults with intellectual disabilities. She has been a Clinical Associate Professor since 2004 and worked per diem in an out patient cardiopulmonary rehab setting since 2011.
  • Ron – has been an OCS since 2007. He has owned a private physical therapist orthopedic clinic since 1997 and he has been a full time Clinical Assistant Professor since 2012.
  • Pat – has been a GCS and CEEAA since 2015. She has worked per diem in Home Health for several years. She has been the DCE and a Full time Associate Professor since 2000.
3 Sets of 10
History, Physiology, and More

PAMELA BARTLO, PT, DPT, CCS
3 SETS of 10 – The History

• 1945 - Army physician, Dr. Thomas L. DeLorme experimented with a new rehabilitation technique.

• DeLorme used strength training after an illness as a child

• He reasoned that heavy training could help injured servicemen.

• DeLorme's protocol: multiple sets of resistance ex - pts lifted their 10-rep max.

• He worked on the protocol and by 1948 – it was 3 progressively heavier sets of 10 reps

• Called it "Progressive Resistance Exercise."
3 SETS of 10!!!! – The Physiology

• 3 sets of 10 uses a 10 rep max and repeats it 3 times. Attempts to build muscle tissue by microtears during fatigue

• Lower reps/Higher weight \(^{1-3}\)
  • Point is to fatigue muscle at high weight
  • Change the protein phosphorylation (muscle protein synthesis) response of the muscle fiber Create a hypertrophic effect which leads to increased muscle fiber number and size
Low Weight/ High Reps - Physiology

• Higher reps/lower weight
  - Point is to change muscle protein phosphorylation, but without full fatigue of muscle
  - Creates increased muscle fiber number and size to a degree, but less hypertrophy than high weight

• Is one superior to the other???????
Protocols

• Established to: guide care, provide standardized treatment, encourage quickest/most efficient recovery, eliminate use of poor techniques, etc.

• True protocol
  • **NO** room for individualization
  • Patient can’t meet protocol – they **FALL** off the protocol and get a different treatment

• **Realistic protocol** – establishes “guidelines” and allows for individualization as needed
Barriers to Individualized care Affect of Protocols

RONALD WHITE, PT, DPT, OCS
What are Barriers to Individualized Care

• Protocols
• Co-morbidities
• Reimbursement Rates
• Static care plans that exclude patient input
• Ineffective communication strategies
• Lacking team approach
• Time
Protocols

• Who has written the protocol?

• Do we only do exactly what is on the protocol?

• Does this limit our professional conversation with MD’s
Protocols Con’t

• Example: RTC Repair (protocol states ROM only no strengthening)
• Soft Tissue Mobilization?
• Scapular Mobilization?
• Scar Tissue Management?
• Lower Trapezius Activation?
• Core Strengthening?
Co-Morbidities

• Fear of Progressive exercises due to lack of knowledge about diagnosis.

• Reduced intensity to an ineffective level

• Patient-Centered vs. disease-oriented

• Educate patients on exercise and their conditions
How do Co-morbidities Affect Rehab?

- **HTN/MI/Cardiac**: Need to monitor vitals, attention to meds
- **Depression**: Prevalent following surgery: look for signs
- **DM**: Wound healing/ Balance/Proprioception issues/Sensation/ Glycemic control
- **Arthritis**: Joints other than the surgically replaced can affect progress.
- **COPD /Emphysema /Asthma**: Need to monitor vitals, may require more frequent rest
Reimbursement Rates

• Low rates force PT’s to see multiple patients at one time

• Decreased manual techniques due to lack of time

• Decreased individual/specific exercises
Static Care Plans That Exclude Patient Input

• Culture

• Individual and Meaningful Goals

• Patient Resources
Ineffective Communication Strategies

• Motivation

• Clarification

• Learning Style
Lacking **Team** Approach

- Patient
- Clinician
- Interdisciplinary Collaboration
Time

- High co-pays
- Work schedules
- Family responsibilities
- Transportation
Standardized Tests for Exercise Prescription

PATRICIA NOWAKOWSKI, PT, PHD, GCS, CEEAA
Aerobic Capacity

• 2 Minute Walk Test

• 6 Minute Walk Test

• Graded Stress Test

• 2 Minute Step Test
Balance Tests

- Functional Reach
- One Leg Stance Test (OLST)
- Four Square Step Test
- Sitting Balance Scale
Gait and Locomotion Tests

- Dynamic Gait Index
- Gait Speed
- Tandem Walk
- Timed Up and Go (TUG)
Muscle Performance Tests

• Single Step Test
• Sit to Stand Test (30 second)
• Sit to Stand Test (5 repetition)
• Getting Up from the Floor
Intervention Ideas and Case Studies – Cardiovascular and Pulmonary Patients

PAMELA BARTLO, PT, DPT, CCS
HTN, CAD, MI, PTCA, CABG, AICD Pacemaker

- History to guide ex:
  - Before heart issue
  - Since diagnosis, MI, or surgery
  - Likes/Dislikes and Goals

- Adjust duration and intensity of each piece of equipment
  - Don’t fall into trap of your facility’s standard

- Weights – based on ability and time from event

- Use standardized tests

- Use **VITAL SIGNS including 4\textsuperscript{th} Vital Sign – RPE\textsuperscript{5}**
Additional Individualized Exercises

• Tai Chi – very effective $^{6,7}$
• Swimming – needs to be ok’ed by MD first
  • Watch depth and temp of water
• Therapy Ball exercises
• Yoga $^{8,9}$
• Others that the person may want to do
CHF, LVAD, Transplant

• Should be 100% individualized\textsuperscript{10,11}
• Use VITALS to guide your prescription
• Lighter weight/more reps
• Longer duration/lower intensity as able for aerobic
  • Or do intervals at low to moderate intensity in beginning
COPD, IPF, CF, Lung Surgery or Transplant

• All individualized\textsuperscript{12}

• Definitely use intervals with rest

• Try therapy ball and Tai Chi for breathing and thoracic mobility techniques

• A lot of emerging research in yoga for pulmonary conditions due to the breathing component \textsuperscript{13-16}
Smart Technology to Help Us (Apps)

- **Human move 30 min or more**: tracks outdoor walking until you hit 30 min, doesn’t count indoors
- **Accupedo**: accurate pedometer to track walking
- **Fitocracy**: turns workouts into video game like experience
- **Fitbit**: pedometer, also monitors calories burned, food eaten, and hours you sleep
- **My Fitness Pal**: calorie counter, but you also put in exercise so may be good for someone who’s main exercise motivator is weight loss as main motivator for exercise
- **Map my run/walk/hike**: You get the app for the activity you are doing (walking, running, etc.) App uses GPS to track distance, speed, time, etc.
- **Gorilla workout** – app gives you an ex program to do at home
Case Study – Alessandro Flores

ACROSS THE CONTINUUM OF CARE
ACUTE CARE
Alessandro Flores

• Alessandro is a 58 y/o man. He was admitted to the hospital 2 days for TKA. He underwent uncomplicated TKA yesterday.

• PMH: HTN, MI in 2009, PTCA 2009, OA bilateral knee, DM.

• Social History: Lives with his wife in a 2 story house. He works full time as an accountant for a Dentist practice.

• Interests: playing golf and pickle ball
Why individualize the care of a TKA patient?

- Co-Morbidities, especially **Cardiac** and **Pulmonary** impact outcomes \(^{17,18}\)
- Historically more intensive PT for TKA and THA was started too late and too little after surgery (i.e. 2-4 weeks) \(^{19}\)
- Research shows impairments in quads from not rehabbing enough can cause other compensations and knee conditions \(^{20-22}\)
- Individualizing gait exercises focusing on symmetry training had greater knee extension in mid-stance and improved symmetry during gait versus just exercise alone. \(^{23}\)
- A High Intensity program led to better short and long term strength and functional outcomes compared to lower intensity programs. \(^{24}\)
TKA Rehab Recommendations

- Fast Tracking
- Early initiation
- High Intensity (HI) Rehab
How to individualize acute care?

- **VITAL SIGNS** – use them to guide how much to push pt
- Use EKG if you have it. **DON’T** be afraid of EKG
- Give frequent rests due to aerobic demands
- Watch breath holding due to exertion or pain
- Early mobility and progressive enough
- Don’t forget an endurance goal!
Case Study – Mary Bianchi

ACROSS THE CONTINUUM OF CARE

ACUTE CARE
Mary Bianchi

- Mary is a 75 y/o woman. She underwent an L4 decompression surgery yesterday.
- PMH: Multi-level lumbar spinal stenosis, HTN, venous insufficiency, and Fibromyalgia.
- Social History: Lives alone in a 3rd floor apartment with an elevator. She works part-time at a florist’s helping with arrangements and customer service.
- Interests: bowling and playing cards with friends.
Mary – PT Care

• Why individualize the care of this patient?
  • Increased age (> 65 y/o) led to increase in all complications and D/C to someplace other than home.  
  • Cardiac and pulmonary complications somewhat commonly arise after spinal surgery.  
    • Pulmonary embolism
    • MI
Mary – Acute Care

• How to individualize acute care?
  • **VITAL SIGNS** – use them to guide how much to push pt
    • More importantly to watch for abnormal responses
  • Use EKG if you have it. **DON’T** be afraid of EKG
  • Watch for signs of O2 difficulties due to exertion (smoking hx)
  • Watch for signs of DVT/PE
  • Watch breath holding due to exertion or pain
• Don’t forget an endurance goal!
Intervention Ideas and Case Studies – Homecare Patients

PATRICIA NOWAKOWSKI, PT, PHD, GCS, CEEAA
Diabetes

• Aerobic exercise and resistance exercise improve glycemic control in T2DM.\textsuperscript{27}

• Incorporating Tai Chi in program demonstrates: Improvements in QoL for people with elevate blood glucose.\textsuperscript{28}
Diabetes

• Continuous high intensity endurance exercises are equally effective as continuous low intensity endurance exercises to improve glycemic control.\(^{29}\)

• High intensity versus low intensity strength training results in greater improvements in strengthening but no difference in muscle mass or glycemic control with T2DM.\(^{30}\)
LESS SIT,
MORE FIT
Increasing Medical Safety of Exercise in T2DM

- Hyperglycemia
- Hypoglycemia
- Retinopathy
- Nephropathy
- Peripheral Neuropathy
- Autonomic Neuropathy
Fibromyalgia

• Aerobic exercise has been shown to decrease pain, fatigue and depression and improve health related quality of life (HRQOL).\textsuperscript{31,32}

• Strength training associated with large improvements in global health and physical function.\textsuperscript{31}

• Combination of strength, aerobic and or flexibility exercise demonstrates improvements in pain and physical function.\textsuperscript{31}
Fibromyalgia

• Low to moderate intensity but not low intensity aerobic exercise reduced pain.\textsuperscript{33}

• “Start low and go slow approach”

• Begin strengthening programs with lower resistance levels than age predicted norms.\textsuperscript{34}

• Increase intensity by 10% after 2 weeks of exercise without exacerbating symptoms.\textsuperscript{34}
Additional Interventions for Fibromyalgia

• Nordic walkers-improvements in 6 min walk test, FIQ physical scores and reduced HRs during submax cycle ergometer compared to controls.\textsuperscript{35}

• Yoga, Tai Chi and Breathing exercises -improvements in symptoms, SF-36 and FIQ components. \textsuperscript{31,36}

• Improvements in balance and SF-36 global score noted using Whole Body Vibration. \textsuperscript{31}

• Aquatic- pain reduction. \textsuperscript{31}
Factors Affecting Response to Exercise

• Symptoms (variety, severity, and duration)
• Physical fitness levels
• Psychological characteristics
• Preference for types of exercise
Case Study – Alessandro Flores
ACROSS THE CONTINUUM OF CARE
IN-HOME CARE
Why Individualize the HomeCare of TKA Rehabilitation?

Remember:
No 2 Patients are alike
Individualized Rehab in Home Care

- Prior Level of Function
- Personal goals /expectations
- Family / Social Support / Pets
- Home environment /Available space / Stairs
- Co-morbidities / Medications
- Vigilant for signs of Infection, DVT
- Incision Care / Edema Management
Individualized Rehab in Home Care

• Incision Care / Edema Management
• Full PROM Knee Extension / Quad control
• Strengthen proximal and distal musculature
• Don’t forget other limb
• Monitor VITALS: RPE, Talk Test
• Safe and efficient Transfer and Gait Training
• Interdisciplinary collaboration
Case Study – Mary Bianchi
ACROSS THE CONTINUUM OF CARE
IN-HOME CARE
Mary – Homecare

• How to individualize homecare?

• Vitals- pre and post ex; R vs. L, if vascular component present compare UE ipsilateral pulse to LE ipsilateral pulse

• Co-morbidities: DM, vascular insufficiency. Differentiate symptoms of neurogenic versus vascular claudication. Monitor

• Monitor signs of infection, DVT, PE
Mary-Homecare

- Medications & Exercise
- Glycemic Control
- Patient Knowledge of ABCs
- Education on bending, lifting and twisting restrictions
- Promote movement within limitations
- Incorporate fun and value in ex program
Post Surgical Management

• General aerobic fitness work
• LE Stretching
• Stability exercises
• Strengthening & endurance training for back, abdominal and leg muscles
• Ergonomic training
Post Surgical Management Cont’d

- Education on restrictions
- Cognitive Behavioral Training (CBT)
- Assess Fear Avoidance Behavior
Additional Interventions for Chronic LBP

• Yoga
  • Significant reductions in functional disability and pain intensity compared to control group at 24 weeks in patients with low back pain.\(^{37}\)
  • Improved back function at 3, 6, and 12 months and higher pain self-efficacy scores at 3 and 6 months but not at 12 months.\(^ {38}\)
  • Physical and psychological benefits with a variety of musculoskeletal disorders.\(^ {39}\)
Additional Interventions

• Tai Chi / GiGong
  • Improve balance\textsuperscript{40}
  • decrease risk of falls\textsuperscript{41}
  • Stress management / immune support\textsuperscript{40}
• Modified complementary approaches
Intervention Ideas and Case Studies – Orthopedic Patients

RONALD WHITE, PT, DPT, OCS
Case Study – Alessandro Flores
ACROSS THE CONTINUUM OF CARE
OUTPATIENT CARE
Rehabilitation of the TKR in an Orthopedic Setting

• What Does the Research Say?

• 80-90% of Patients objectives are successfully met. 42-45

• Failure to meet patient expectations is one of the major cause for dissatisfaction after surgery. 44,46

• Patients who are under 60 are at higher risk of post op pain compared to older adults. 47

• Woman are 45% more likely to report moderate to severe pain 2 years post op. 47

• Depression plays a major factor in outcomes. 48

• Social support is related to earlier success. 49
Evaluation

• Important not to think of this as “Just a Total Knee”
• Good sound history (pre-surgery level- both functional and measurable, co-morbidities, realistic goals, motivation)
• Copy of Surgical Report
• Vitals
• Asses wound/Scar mobility, Assess core, upper body strength, static and dynamic balance
“Cook Book Exercises”

• Heel slides

• SAQ, LAQ, SLR’s

• Heel Raises

• Gait and Stair Progression
Important “Overlooked” Activities

• Incision and Scar Mobility
• Pre condition i.e.. Varus/Valgus Deformity: How will this affect post operative care?
• Lower Extremity Swelling: Post surgical vs. Circulation
• Other LE joint issues
• Core Strength
Treatment

• Difficult to follow “Protocol”, All patient’s treated individually.

• Patient Goals and “Realistic” post activities should drive treatment.

• Scar Mobility

• Early Gait Training- ambulating with a good gait pattern is far more important than progressing a device too early.
Treatment Con’t

- Looking at deficits throughout the entire body, the patient has probably ambulated with a compensatory gait pattern for a long period of time and this certainly has effected other extremities/spine.

- Balance/Proprioception

- Higher Level functional activity level specific activities
Case Study – Mary Bianchi
ACROSS THE CONTINUUM OF CARE
OUTPATIENT CARE
Rehabilitation of the Lumbar Fusion Patient in the Outpatient Physical Therapy Setting

• What are the facts? Complications that affect Therapy?
• 60-70% state pain is improved
• 80% satisfied
• Complications: Infection, Blood loss, Nerve injury, Lack of solid fusion
• Rates of sx depends on zip code?
  • Bangor, Maine 9.2/100,000
  • Bradenton, Florida 127.5/100,000
Physical Therapy Evaluation

- Good sound history (pre-surgery level- both functional and measurable, co-morbidities, realistic goals, motivation)
- Copy of Surgical Report
- Vitals
- Asses wound/Scar mobility, Assess core, upper body strength, static and dynamic balance
- Assess gait and posture
- Look for signs of depression
Education

• Educate patient on surgical procedure
• Realistic expectations/ Goals
• Importance of exercise / Address fear of exercise
• Pain management
• Daily activity modification
• Importance of posture
Treatment

• This is very surgeon dependent when starting OP PT, (1-3 months)
• Early Phase (1-3 months)
• Modalities- Pain/swelling control
• Recumbent Bike
• Scar Tissue mobility, Neural glides
• Educate- avoid excessive flexion, extension, rotation
• UE/LE light resistance exercises
Treatment Continued

• Intermediate (3-4 Months)
• Continue with bike
• Progress UE/LE to tolerance
• Begin Joint mobilizations to adjacent levels
• Neutral Spine core stability exercises
• Static/Dynamic Balance/Proprioception activities (incorporate standing functional activities with good spine control)
References


References Cont’d


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