

Bone Health and Fracture Prevention Rehab Playbook

Team:

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Goal: Prevent fractures

- Why PT?**
- Physical activity alone plays a modest role in improving bone density for people with osteoporosis. However, it is important for supporting and maintaining the effects of drug therapy.
 - Regular exercise (3 hrs/wk of a combination of balance training and functional strengthening)ⁱ can reduce fall risk by as much as 40% for older adults, and is therefore critical for fracture prevention. No drug can do that!
- How?**
- Supporting bone strength
 - Decreasing risk of falls
 - Promoting regular physical activity.
- Who?** Individuals with new or ongoing diagnosis of osteoporosis or osteopenia who:
- May be at risk of falling
 - Have medical or musculoskeletal co-morbidities that make it difficult to exercise
 - Want help designing a “good” physical activity program
 - Are in PT for reasons other than their osteoporosis diagnosis

Step 1: Classify patient -*what are current barriers to exercise?*

Falls risk assessment (see cheat sheet)- <i>Pt. could fracture during a fall, fear of falling could be prevent regular exercise.</i>	<ul style="list-style-type: none"> • Functional assessment (i.e. steadiness with gait, safety with transitions and transfers) • Standardized functional tools (i.e TUG, DGI, Tinnetti) • Self-report measures (ABC, history of falls)
Medical or orthopedic co-morbidities assessment- <i>Pain or co morbidities may interfere with pt. getting sufficient regular exercise</i>	<ul style="list-style-type: none"> • Functional assessment (i.e. pain with ADLs) • Body systems impairments (cardiac, muscle strength, joint ROM) • Self-report measures (i.e. ODI, LEFS)
Need for education assessment- <i>lack of knowledge may be preventing regular exercise</i>	<ul style="list-style-type: none"> • Experience with exercise and current activities- do they know what/how? • Motivation for exercise- do they understand benefits, have they found something they like? • Preference for types of exercise- are their preferred activities providing sufficient bone loading? • Access to equipment, gym, etc.- is inclement weather a barrier? Lack of access to machine weights? Lack of transportation? Financial barriers?

Fall risk assessment cheat-sheetⁱⁱ: Positive findings for ANY of these may lead you to conclude your patient is at risk of falling, and would benefit from skilled PT to mitigate this risk.

Tool	Observation that might lead you to this tool:	Norms (age)	Fall-risk cut-off score:
Standardized tools			
TUG	Frailty, unsteadiness or difficulty standing from chair	8-11 sec (65-90)	12 sec or more= risk of fall ⁱⁱⁱ
FGA	Unsteady, hx of fall	28-30/30	22/30 or less = risk of fall
5-times Sit to Stand	Frailty, difficulty standing from chair	11-14 sec (60-90)	12 sec or greater = risk of fall ^{iv}
10 meter walk test	Slow gait speed	1.3-0.9 m/s (60-90)	Less than 0.7 m/s = risk of fall
Berg Balance test	Hx. of falls, difficulty with transfers, lower level	58/58	Less than 50/58 = risk of fall ^v
Tinnetti test	Hx of fall, unsteadiness	28/28	18 or less= high risk of fall 19-23 = moderate risk of fall 24 or more= low risk of fall
Self-Report and Medical co-morbidities			
ABC		80-100%	Less than 67%
Number of falls		0	2 or more ^{vi}
Medications			Polypharmacy, psychoactive drugs ^{vii}
Impaired vision			May double risk of fall
Impaired sensation			Increases fall risk
Co-morbid progressive neurological problem			Increase risk of developing fall risk
Functional measures			
Chair rise	Inability to rise from standard chair without use of hands ^{viii}		
Stair negotiation	Clinical judgement (steadiness, functional strength, confidence, use of railing)		
Single leg balance	< 5 sec = risk of injurious fall ^{ix} < 15 sec in 50's = risk of recurrent falls later in life <10 sec risk of adverse health outcomes.		

Step 2: Use classification to determine *treatment plan, frequency and duration of care*

If falls risk and/or significant medical or orthopedic barriers:	Consider course of <u>regular PT</u> to address these issues. (1-2X wk, for 6-12 wk depending on severity).
If negligible falls risk or co-morbidities:	Consider <u>education model</u> : 1-3 sessions, 1/wk, with potential to follow up intermittently (i.e 1-2/month). Build in time between sessions to allow them to try HEP and work towards independence.

Ingredients for Exercise Program: Use these guidelines to build sessions in-clinic, and/or to structure plan for independent program

The ideal exercise program involves:	<ul style="list-style-type: none"> At least 3 hours of activity a week. <i>At least two</i>, but as many as all of the categories in Activity Categories cheat sheet below at the dosage specified.
To maximize effectiveness on bone strength:	<ul style="list-style-type: none"> Select weight-bearing or high-load resistance training over seated/reclined low-load, high repetition training
To improve long-term adherence:	<ul style="list-style-type: none"> Tailor activities to patient's abilities, access and preference.
High Achieving Patients:	<ul style="list-style-type: none"> Build a sufficient program to help <i>improve bone density</i> Goal is to include <i>all</i> items from Activity Categories cheat sheet
Low Achieving Patients: <i>those who do not tolerate a long term program with all activities in the chart</i>	<ul style="list-style-type: none"> Build a sufficient program to <i>decrease risk of fracture</i> Goal is to get at least <i>two</i> items from Activity Categories cheat sheet Functional strengthening + Balance training alone can reduce fractures Maximize time in weight-bearing- something is better than nothing Gradual increase in activity towards optimal dosage

Activity category cheat sheet: Best-practice recommendations^x to optimize the effectiveness of activity on bone strength:

Type of activity/ Role	Definition	Examples	Data/why this is recommended	Frequency, duration, intensity
Low impact, long duration Bone loading	Weight bearing and moving your body, without high impact on joints	Walking, Tai Chi, Elliptical, Standing chores such as cooking or cleaning	In isolation, may slow bone loss	50-60 min, 3 times per week
Static weight bearing Bone loading	Standing still while increasing the amount of body weight your legs are supporting	Standing on one leg, with or without using your hands to help you balance, standing still while holding weights	In isolation, may increase bone density (in femur)	1 min per leg, 3 times a day, every day
Resistance training Bone loading	Moving your body, weights, or some other resistance against gravity.	Weight machines, exercising with resistance bands or hand weights.	In isolation, may increase bone density	1-3 sets 70-85% of a 1-rep max, 2-3 times per week.
Balance training Fall prevention	Keeping your balance in an unstable situation	Standing or walking heel to toe, Standing on one leg, Standing on a compliant surface, Tai-chi	Decreases fx risk from falling	2-7 times per week, tasks that cause unsteadiness without failure.

***Current evidence does NOT support the following interventions used in isolation for supporting bone density:**

- Seated, low load, high repetition strength training
- Jumping, jogging or other plyometric/high force activities
- Vibration platforms
- Reduced body-weight or reclined exercise (swimming, mat Pilates exercises)

However, combining one of these activities with another activity from the table may effectively support bone density (e.g seated theraband resistance training + static weight-bearing program, or jogging + resistance training program).

Resistance Training: Tips on building a high-load program

<p>Best types of resistance:</p>	<ul style="list-style-type: none"> • No specific recommendations regarding free weights vs machines vs. bands. • “Best” type is what works best for your patient • Consider bodyweight, machines, free weights, bands etc. • Target all large muscle groups of upper and lower body
<p>When possible, work towards 70-85% of a 1-rep maximum</p>	<ul style="list-style-type: none"> • To estimate this, find a resistance where at least 8 but no more than 15 reps can be completed.
<p>When not possible</p>	<ul style="list-style-type: none"> • Perform lighter resistance training in standing and/or • Combine two other categories from chart
<p>Safety Considerations</p>	<ul style="list-style-type: none"> • Prevent falls while exercising • Start lighter and build up to 80% of 1 RM • Start with single joint movements in one plane, slowly increase complexity • Avoid loaded spinal flexion or torsion (modify Pilates or Yoga exercises)- risk of spinal compression fx • Avoid forceful or ballistic movements at the ankles or wrists

Step 3: Discharge planning and long-term independence with HEP

Consider evolving needs for exercise:

Will they soon need a more challenging program? Need a different program due to different seasons? At risk of loss of function?

- Education on exercise progressions (i.e. when and how to progress weight on gym machines to keep working at 60-80% 1 RM).
- Multiple programs for different seasons (gym program in the winter, outdoor program for summer)
- Options for monthly or yearly follow-ups for those at risk of falls, with high burden of other medical comorbidities, or with progressive neurologic disorders.
- Consider use of “My PT Plan” worksheet, included below

Points for Patient Education

- Improving bone density takes a long time! Consistent participation in physical activities is key to maintaining bone health. Studies show effects after 18-24 months.
- Loading the bones is the biological stimulus that supports bone density. Including weight-bearing activity and resistance training is important for this.
- Physical activity only decreases your fall risk as long as you continue to be physically active.
- Every little bit helps, doing something is always better than doing nothing, even if you are not physically/emotionally/mentally capable of meeting all the guidelines.
- Find things you like, find friends to exercise with, try group classes. All these things help you stick to a program.

ⁱ Sherrington et. al. 2020; from WHO 2020 guidelines on Physical Activity and Sedentary Behavior.

^{ii,vi-viii} Avin et. al. 2015. Management of falls in community-dwelling older adults: clinical guidance statement from the Academy of Geriatric Physical Therapy of the American Physical Therapy Association.

^{iii-v} Lusardi et. al. 2017. Determining risk of falls in community-dwelling elderly: A systematic review and meta-analysis using posttest probability.

^{ix} Vellas et. al. 1997. One-leg balance is an important predictor of injurious falls in older persons.

^x Hartley et. al. 2022. Physical management of patients with suspected or confirmed osteoporosis: a clinical practice guideline from the Academy of Geriatric Physical Therapy.

My PT plan for bone strength and fall prevention:

Category	How much?	How to do it?
Low-force dynamic weight-bearing	50-60 min, at least 3X per week	
Static Weight bearing	3X1 min, each leg, every day	
Resistance training	2-3 times per week, at least 48 hr rest between sessions	
Balance Training	2-3 times per week	

Other Notes: