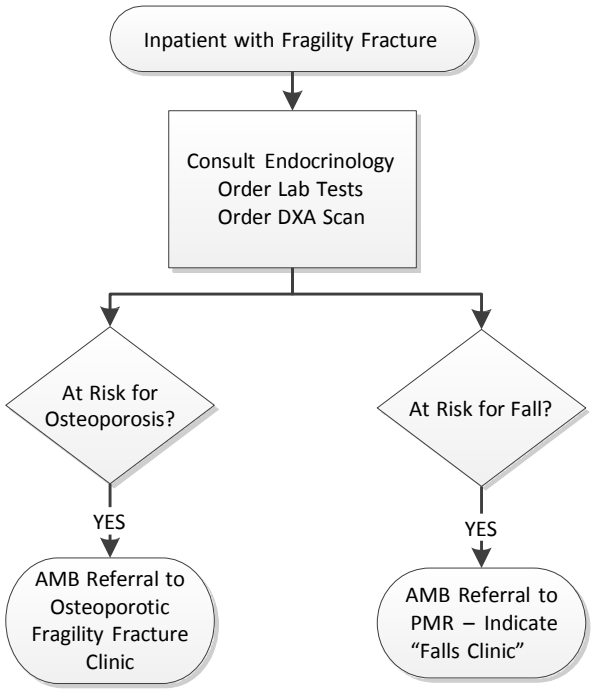
THE OHIO STATE UNIVERSITY
WEXNER MEDICAL CENTER

Inpatient Management of Fragility Fracture

Background

- A fracture increases the risk of another fracture by 2- to 5-fold, highlighting the need to identify and intervene to prevent secondary fractures.
- Efficacy of FDA-approved pharmacologic therapies to reduce fractures in osteoporosis is 20-70%. Use of these drugs within a fracture prevention program shows clinical effectiveness with 38% reduction in hip fracture.
- Appropriate treatment is associated with significant cost savings ($30.8 million over 4 years in a closed health system).
- These medications may also reduce mortality. A meta-analysis of osteoporosis drug trials demonstrated 10-11% mortality reduction versus placebo.
- However, nationally the initiation rate of osteoporosis medication after fracture is quite poor, about 20%. Rates of treatment initiation following fracture have been declining over a 10 year period before 2011.

Initial Assessment



- Place consult, "IP Ref Endocrinology" for evaluation of secondary causes of osteoporosis especially if Z-score -2.0 or lower or there are known conditions/medications predisposing to fracture (see Appendix A).
- Obtain a minimal set of relevant blood tests:
  - Calcium
  - 25-OH vitamin D
  - Renal function
  - Liver function
  - CBC
- Determine the mechanism of fracture and whether it was sustained by low-trauma conditions, e.g. standing height or less, unlikely to cause fracture in a healthy person. Fractures involving digits, skull, and face may be excluded.
- Enter the patient into a ***secondary fracture prevention pathway***, by placing the order for "AMB REFERRAL TO OSTEOPOROTIC FRAGILITY FRACTURE CLINIC"
- Enter DXA scan order, "BONE DENSITY AXIAL (HIP, PELVIS, SPINE)" for all patients with fragility fracture
  - For patients with traumatic fracture, ***obtain DXA scan in***:
    - Age 50+ years
    - <50 years with condition or taking a medication associated with low bone mass or bone loss (see Appendix A)

Contraindications

- Comfort Measures Only
- Entry to hospice
- Expired
- Poor prognosis
- Enrollment in a clinical trial pertaining to osteoporosis

Recommendations for all Postmenopausal Women and Men > 50 Years of Age upon Discharge

1. Counsel on the risk of future osteoporosis-related fractures in light of current fragility fracture.
2. **Calcium intake**. Assess dietary intake first. Supplementation may be required if dietary intake is inadequate

	Age	Dose
Men	50-70	1000 mg/day
	>70	1200 mg/day
Women	>50	1200 mg/day

3. **Vitamin D intake:**

	Medication/Dose	Comments
All patients Age > 50	800–1000 IU/day	Higher doses may be required to maintain recommended 25OH vitamin D level ≥30 ng/ml.
25-OH Vitamin D Level < 30 ng/ml	Start ergocalciferol 50,000 units weekly x 12 weeks, then maintenance dose of 1000 units daily	May adjust as needed to maintain target level.
25-OH vitamin D level <20 ng/ml	Start ergocalciferol 50,000 units weekly x 12 weeks, then maintenance dose of 2000 units daily	May adjust as needed to maintain target level.

4. Recommend regular weight-bearing, muscle strengthening exercise, and balance training in collaboration with Physical Therapy.
5. Assess risk factors for falls (see Appendix B) and offer appropriate interventions: e.g. consider home safety evaluation with Occupational Therapy, avoidance of central nervous system depressant medications, careful monitoring of antihypertensive medication, vision correction when needed.
6. Recommend cessation of tobacco smoking and avoidance of excessive alcohol intake.
    a. Consider referral to smoking cessation clinic "AMB REFERRAL TO SMOKING CESSATION" (or call 614-293-0932 to schedule)
7. Consider referral to OSU Fall Prevention Clinic, ideally when fractures have healed so all screening can be done.
    a. "AMP REFERRAL TO PMR" – indicate Falls Clinic

WHO Definition of Osteoporosis	
Normal Bone Mass	T-Score > -1.0
Low Bone Mass (osteopenia)	T-Score -1.0 and -2.5
Osteoporosis	T-Score < - 2.5

T-score: Number of standard deviations above or below mean BMD for young adult women

Z-score: Number of standard deviations above or below mean BMD for persons of the same age, race, gender

Pharmacologic Treatment

Consider treatment initiation in all patients with fragility fracture, T-score ≤-2.5.

Consider FDA-approved medical therapies in postmenopausal women and men aged 50 years and older, based on the following:

- A hip or vertebral (clinical or morphometric) fracture
- T-score ≤ -2.5 at the femoral neck, total hip, or spine after appropriate evaluation to exclude secondary causes
- Low bone mass/osteopenia (T-score between -1.0 and -2.5 at the femoral neck or spine) and a 10-year probability of a hip fracture ≥3% or a 10-year probability of a major osteoporosis-related fracture ≥20% based on the US-adapted WHO algorithm, FRAX.
- Clinician judgment and/or patient preferences may indicate treatment for people with 10-year fracture probabilities above or below these levels.

Medication Table

	Medication	Dose	Comments
First Line Therapies *Approved agents demonstrating reduction in hip, non-vertebral, and spine fractures*	alendronate (Fosamax®)	70 mg/week PO	Bisphosphonates have very low bioavailability (<1%); therefore to optimize absorption the drug **must** be taken on an empty stomach, with no other medications, after an overnight fast. Wait 30 min before eating, drinking, or taking any other medication. Bisphosphonates may cause esophageal irritation; therefore to limit this adverse effect, these drugs **must** be swallowed with 8 oz. of plain water (i.e. no coffee or other types of liquid). Patients must remain upright (sitting or standing) for the 30 min following administration. Recommend routine dental examinations while on therapy. **Contraindications:** Hypocalcemia, creatinine clearance <35 ml/min (alendronate), <30 ml/min (risedronate), esophageal abnormalities, inability to sit/stand for 30 minutes
	risedronate (Actonel®)	35 mg/week or 150mg/month PO	
Second Line Therapies *Consider if contraindications to first line therapies or failure of first-line medication. These will likely require prior authorization and outpatient initiation.*	zoledronic acid (Reclast®)	5 mg IV once yearly	Option for patients with GI abnormalities (malabsorption, uncontrolled GERD) or non-adherence Recommend routine dental examinations while on therapy. **Contraindications:** Hypocalcemia, creatinine clearance <35 ml/min
	denosumab (Prolia®)	60 mg SQ injection every 6 months	Requires in-clinic administration Contraindications: Hypocalcemia
	teriparatide (Forteo®)	20 µg daily SQ injection	Bone anabolic agent vs antiresorptive in all other options Not recommended in patients with increased risk of osteosarcoma (Paget disease of bone, open epiphyses, or an unexplained elevation of alkaline phosphatase) Not approved for use longer than 2 years' total duration, requires initiation of antiresorptive therapy after discontinuation
Third Line Therapies *The following therapies have not demonstrated significant reduction in hip/non-vertebral fractures.*	ibandronate (Boniva®)	150 mg PO once monthly	Similar administration/contraindications to alendronate and risedronate
	raloxifene (Evista™)	60 mg PO daily	Selective estrogen receptor modulator (SERM) Contraindications: Active or history of venous thromboembolism, pregnancy

Appendix A

Conditions, Diseases, Medications that Contribute to Osteoporosis and Fracture[1]

Lifestyle factors	Genetic Diseases	Endocrine Disorders
Alcohol abuse Excessive thinness Excess vitamin A Frequent falling Immobilization/inadequate activity High salt intake Low calcium intake Smoking (active or passive) Vitamin D insufficiency	Cystic fibrosis Ehlers-Danlos Gaucher's disease Glycogen storage diseases Hemochromatosis Homocystinuria Hypophosphatasia Marfan syndrome Menkes steely hair syndrome Osteogenesis imperfecta Porphyria Parental history of hip fracture	Androgen insensitivity Anorexia nervosa Athletic amenorrhea Hyperprolactinemia Panhypopituitarism Premature menopause (<40 years) Turner's and Klinefelter's syndromes Central obesity Cushing's syndrome Diabetes mellitus (types 1 and 2) Hyperparathyroidism Thyrotoxicosis

Gastrointestinal Disorders	Hematologic Disorders	Autoimmune Diseases	Neurologic and Musculoskeletal risk factors
Celiac disease Gastric bypass Gastrointestinal surgery Inflammatory bowel disease Malabsorption Pancreatic disease Primary biliary cirrhosis	Hemophilia Leukemia and lymphomas Monoclonal gammopathies Multiple myeloma Sickle cell disease Systemic mastocytosis Thalassemia	Ankylosing spondylitis Rheumatoid arthritis Systemic lupus	Epilepsy Multiple sclerosis Muscular dystrophy Parkinson's disease Spinal cord injury Stroke

Miscellaneous Conditions and Diseases	Medications	
AIDS/HIV Amyloidosis Chronic metabolic acidosis Chronic obstructive lung disease Congestive heart failure Depression End-stage renal disease Hypercalciuria Idiopathic scoliosis Post-transplant bone disease Sarcoidosis Weight loss	Aluminum (in antacids) Heparin (chronic) Anticonvulsants (phenytoin, phenobarbital, carbamazepine) Aromatase inhibitors Barbiturates Cancer chemotherapeutic agents Depo-medroxyprogesterone (as premenopausal contraception) Glucocorticoids (≥5 mg/day prednisone or equivalent for ≥3 mos) Gonadotropin-releasing hormone (GnRH) agonists	Lithium Cyclosporine and tacrolimus Methotrexate Parental nutrition Proton pump inhibitors Selective serotonin reuptake inhibitors Tamoxifen (premenopausal use) Thiazolidinediones Thyroid hormones (in excess)

Appendix B
Risk Factors for Falls

Environmental Risk Factors	Medical Risk factors	Medications	Neurologic/Musculoskeletal Risk Factors
Loose throw rugs Low level lighting Obstacles in the walking path Slippery conditions Not using or improperly using Assistive Device	Age Anxiety and agitation Arrhythmias Dehydration Depression Vitamin D insufficiency (25-OH vitamin D ≤30 ng/ml) Malnutrition Orthostatic hypotension Poor vision Previous falls or fear of falling Reduced problem solving or mental acuity and diminished cognitive skills Urinary Urgency and/or incontinence	Medications causing sedation (benzodiazepines, narcotics, anticonvulsants, psychotropics, hypnotics) Antihypertensives Diuretics Medications with high anticholinergic burden, including tricyclic antidepressants, diphenhydramine, anti-motility agents, over active bladder therapies (i.e. oxybutynin)	Kyphosis Poor balance Impaired transfer and mobility Diseases listed in Appendix A Neuropathy Weak muscles/sarcopenia Deconditioning Dizziness/vertigo

Order Sets

OSU IP END: Fragility Fracture – Medical Assessment **[3563]**

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Authors

- Steven Ing, MD, MSCE
- Laura Phieffer, MD
- Abigail Rabatin, PharmD, BCACP
- Tanya Gure, MD
- Dustin Chase, MD
- Joseph Rosenthal, MD

Quality Measures

- Percent of patient with an order for "IP Ref Endocrinology"
- Percent of patients with recommended lab tests ordered
- Percent of patients with an order for "Amb referral to osteoporotic fragility fracture clinic"
- Percent of patients with an order for DXA scan

Guideline Approved

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Disclaimer: *Clinical practice guidelines and algorithms at The Ohio State University Wexner Medical Center (OSUWMC) are standards that are intended to provide general guidance to clinicians. Patient choice and clinician judgment must remain central to the selection of diagnostic tests and therapy. OSUWMC's guidelines and algorithms are reviewed periodically for consistency with new evidence; however, new developments may not be represented.*