

W H I T E P A P E R

Falls and Fractures

A Leading Cause of Dependency in Older Adults

Hip Fracture · Vertebral Compression · Traumatic Brain Injury · Osteoporosis · Sarcopenia

A Complete Guide for Patients, Families, and Caregivers

Prevention · Acute Treatment · Rehabilitation · Caregiver Support

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1. EXECUTIVE SUMMARY

Falls are the leading cause of both fatal and nonfatal injury among Americans age 65 and older. According to CDC data, one in four older adults falls each year, and one in five falls causes a serious injury — most commonly a hip fracture or traumatic brain injury. For an older adult who was living independently, a single fall can end that independence within a matter of weeks.

Unlike stroke or Parkinson's disease, falls are not a diagnosis — they are an event, driven by a combination of medical, medication, sensory, environmental, and musculoskeletal factors. That combination is what makes falls both preventable and, when they occur, so consequential. Approximately 25% of older adults who sustain a hip fracture die within one year, and up to 50% never return to their prior level of function.

This white paper covers the medical landscape of falls and fractures in 2026: the epidemiology, the identifiable risk factors, the diagnostic workup after a fall, acute surgical and medical management of the fractures that most often follow, the current medication landscape for osteoporosis, promising 2026 clinical trials, rehabilitation strategies, and the practical work of supporting a family member through recovery. It is written for older adults, families, and caregivers who want to understand what actually drives dependency after a fall — and what can be done at every stage to prevent it or slow it.

Key Facts at a Glance

- **Incidence:** Approximately 14 million U.S. adults age 65+ report a fall each year — one every 1 to 2 seconds. Roughly 3 million are treated in emergency departments.
- **Hip fractures:** Over 300,000 hip fractures occur in Americans age 65+ annually. Women account for about 70%. The average age at hip fracture is now approximately 82.
- **Mortality:** One-year mortality after hip fracture is 20–30% overall and higher in men and in adults over 85.
- **Loss of independence:** Up to half of hip-fracture survivors do not recover their prior walking ability. Roughly 25% require long-term nursing care they did not need before the fall.
- **Traumatic brain injury:** Falls are now the leading cause of TBI-related death in the United States, especially for adults on anticoagulants.
- **The good news:** Structured fall-prevention programs reduce fall risk by 20–35%. Modern osteoporosis medications reduce fracture risk by 50–70%. Multidisciplinary hip-fracture co-management cuts mortality and length of stay meaningfully.

Falls are the single most common gateway to long-term care dependency in older adults. Yet — unlike stroke or dementia — the underlying risk factors are highly identifiable, and effective interventions exist at every stage: prevention, acute care, rehabilitation, and post-recovery. The families who fare best are those who understand what a fall really represents, act early on modifiable risks, and mobilize the right medical team the moment a fall occurs.

2. UNDERSTANDING FALLS AND FRACTURES

A fall is defined by the World Health Organization as an event in which a person unintentionally comes to rest on the ground, floor, or a lower level, not as a result of a major intrinsic event (such as a stroke) or overwhelming external force. In older adults, the vast majority of falls are the result of the intersection of multiple small deficits — none of which alone would cause a fall, but which together overwhelm the person's ability to maintain balance.

Why Falls Are Different in Older Adults

Younger adults fall regularly and rarely suffer serious harm. In older adults, three physiologic changes make the same fall dangerous:

- **Reduced bone density (osteoporosis):** Bones become porous and fracture at much lower forces. A fall from standing height is enough to break a hip, wrist, spine, or shoulder.
- **Reduced muscle mass and strength (sarcopenia):** Older adults lose 3–8% of muscle mass per decade after age 30, accelerating after 60. Weakened quadriceps, gluteal, and core muscles cannot arrest a fall in progress.
- **Slowed reaction time and reduced postural reflexes:** The vestibular, visual, and proprioceptive systems all decline with age, and the brain's integration of those signals slows. Recovery from a stumble that a 30-year-old could correct becomes a full fall at 80.

Types of Falls

Type	Description	Typical Underlying Cause
Accidental / environmental	Trip or slip on stairs, rug, cord, wet floor, uneven surface	Environmental hazard + reduced correction ability
Gait / balance related	Loss of balance during walking, standing, or turning	Sarcopenia, neuropathy, arthritis, deconditioning
Medication related	Fall following a dose of a sedating, hypotensive, or hypoglycemic drug	Polypharmacy, benzodiazepines, opioids, antihypertensives, insulin
Syncopal	Loss of consciousness before the fall	Orthostatic hypotension, arrhythmia, vasovagal, aortic stenosis
Neurologic	Fall from stroke, TIA, seizure, Parkinson's, neuropathy	Underlying neurologic condition
Vestibular	Vertigo, unsteadiness on head turn or position change	BPPV, vestibular neuritis, Ménière's, central vestibular

Type	Description	Typical Underlying Cause
Vision related	Fall due to poor vision, glare, missed step	Cataract, macular degeneration, glaucoma, bifocals on stairs

The Fracture Cascade

Not every fall causes a fracture, and not every fracture happens from a fall — but the two are tightly linked in older adults. The clinical pattern is often a fragility fracture: a broken bone from a fall from standing height or less, in a person with underlying osteoporosis. Fragility fractures cluster at predictable sites:

Fracture Site	Typical Age Range	Consequences
Distal radius (wrist)	50s–70s	Often the first fragility fracture; a warning sign of osteoporosis
Vertebral compression (spine)	60s–90s	Often silent; causes height loss, kyphosis, chronic back pain, restrictive lung disease
Proximal humerus (shoulder)	60s–80s	Disabling for months; may require surgery
Hip (femoral neck / intertrochanteric)	75+	The most consequential — surgery almost always required; 20–30% one-year mortality
Pelvis	75+	Pain and immobility even without displacement; often mistaken for muscle strain
Ribs	60+	Painful; risk of pneumonia in frail patients
Skull / intracranial	any age	TBI risk especially in anticoagulated patients

A wrist fracture at 65 is not just a wrist fracture. It is a signal that bone density has declined enough for a fall from standing height to break a bone — and it predicts a five-fold higher risk of hip fracture in the next decade. The moment to start treating osteoporosis is the day of the first fragility fracture, not years later.

Osteoporosis — The Silent Disease Beneath the Fracture

Osteoporosis is the underlying condition that turns a fall into a fracture. It is defined by low bone mineral density (BMD) measured on a DEXA scan, or by the occurrence of a fragility fracture in an older adult. Roughly 10 million Americans have osteoporosis and another 44 million have osteopenia (low bone mass). Only about 20% of women — and far fewer men — are diagnosed and treated.

- **Postmenopausal osteoporosis:** The most common form; estrogen loss accelerates bone resorption after menopause. Bone loss is fastest in the first 5–10 years after menopause.
- **Senile osteoporosis:** Age-related bone loss affecting both men and women after 70, driven by reduced osteoblast activity, vitamin D deficiency, and reduced calcium absorption.
- **Secondary osteoporosis:** Caused by chronic steroid use, hyperthyroidism, hyperparathyroidism, malabsorption (celiac disease), certain cancers, certain diabetes medications, and immobility.

Sarcopenia — The Muscle Side of the Equation

Bone strength is only half the story. Sarcopenia — age-related loss of muscle mass, strength, and function — is what determines whether a person can catch themselves during a stumble, rise from a chair without help, and walk safely across a room. Sarcopenia is now recognized as an independent risk factor for falls, fractures, hospitalization, and mortality.

- Muscle mass declines 3–8% per decade after age 30 and accelerates after 60
- Grip strength below 26 kg in men (16 kg in women) is diagnostic
- Slow gait speed (under 0.8 m/s) predicts falls, hospitalization, and mortality
- The single most effective intervention is progressive resistance training — muscle mass can be regained in the 70s, 80s, and 90s

3. RISK FACTORS — WHAT DRIVES FALLS

Fall risk in older adults is multifactorial. The classic clinical teaching is that falls are the product of intrinsic factors (things about the person) and extrinsic factors (things about the environment) — and that reducing risk requires addressing both. The more risk factors a person carries, the higher the fall risk, in a roughly additive way.

Major Intrinsic Risk Factors

Risk Factor	Why It Matters	Modifiable?
Prior fall in past year	Strongest single predictor — doubles or triples future fall risk	Yes (by treating causes)
Age 75+	Falls incidence rises steeply after 75	No, but risk is modifiable
Female sex	Higher osteoporosis risk; higher fracture rate at any given fall	No, but treatable
Gait or balance impairment	Failing timed-up-and-go > 12 seconds signals high risk	Yes — physical therapy
Lower extremity weakness	Cannot rise from chair without arms; slow chair-stand	Yes — resistance training
Cognitive impairment	Dementia doubles fall risk; poor judgment about environment	Partially
Depression	Associated with polypharmacy and reduced activity	Yes
Peripheral neuropathy	Reduced foot sensation; especially in diabetics	Partially
Orthostatic hypotension	BP drop on standing > 20/10 mmHg	Yes — medication review
Vision impairment	Cataract, macular degeneration, wearing bifocals on stairs	Often yes
Fear of falling	Restricts activity → deconditioning → more falls	Yes — CBT and PT
Foot problems	Bunions, calluses, poor footwear,	Yes

Risk Factor	Why It Matters	Modifiable?
	poor toenail care	
Urinary urgency / incontinence	Rushing to the bathroom at night is a leading fall cause	Often yes

Medication-Related Fall Risk

Medications are among the most modifiable fall risk factors — and the most under-addressed. The American Geriatrics Society Beers Criteria list dozens of medications that increase fall risk in older adults. A single sedating medication can double fall risk; four or more (polypharmacy) can triple or quadruple it.

Drug Class	Examples	Mechanism of Fall Risk
Benzodiazepines	Lorazepam, alprazolam, clonazepam, diazepam	Sedation, delayed reaction time, gait unsteadiness
Z-drugs (sleep meds)	Zolpidem, eszopiclone, zaleplon	Nighttime sedation with hangover effect
Opioids	Oxycodone, hydrocodone, tramadol, morphine	Sedation, orthostatic hypotension, delirium
Antipsychotics	Quetiapine, risperidone, olanzapine, haloperidol	Sedation, orthostatic hypotension, extrapyramidal side effects
Antihypertensives (over-treated)	ACE inhibitors, ARBs, beta blockers, diuretics	Orthostatic hypotension especially if BP goals too low
Tricyclic antidepressants	Amitriptyline, nortriptyline	Anticholinergic effects, orthostatic hypotension
Sedating antihistamines	Diphenhydramine (Benadryl), hydroxyzine	Sedation, confusion, orthostatic hypotension
Muscle relaxants	Cyclobenzaprine, methocarbamol, carisoprodol	Sedation and weakness
Anticonvulsants	Gabapentin, pregabalin, older AEDs	Sedation, ataxia
Insulin / sulfonylureas	Insulin, glipizide, glyburide	Hypoglycemia-mediated falls
Anticholinergics	Oxybutynin, tolterodine, older	Confusion, blurred vision,

Drug Class	Examples	Mechanism of Fall Risk
	antihistamines	orthostatic changes
<i>The single highest-yield fall-prevention intervention available is a pharmacist-led or geriatrician-led medication review, sometimes called deprescribing. Removing one sedating or blood-pressure-lowering medication that is no longer necessary can meaningfully lower fall risk within days — no equipment, no exercise class, no home modification required.</i>		

Environmental / Extrinsic Risk Factors

- Poor lighting — especially on stairs, in hallways at night, and in bathrooms
- Loose rugs, cords, and clutter — the single most common in-home tripping hazards
- No grab bars in bathroom (tub, shower, toilet); slippery tub surface
- Uneven flooring, transitions between rooms, threshold strips
- Stairs without secure handrails on both sides
- Beds too high or too low; toilets too low
- Poor footwear — backless slippers, high heels, worn-out soles, socks-only on hardwood
- Pets underfoot — dogs and cats are a well-documented fall risk

4. ASSESSMENT AFTER A FALL OR NEAR-FALL

Every fall in an older adult deserves a medical evaluation, even if there is no obvious injury. The purpose is not primarily to treat the fall itself but to identify the combination of factors that produced it — and to prevent the next one. Roughly half of older adults who fall will fall again within a year.

The CDC STEADI Framework

The CDC's STEADI initiative (Stopping Elderly Accidents, Deaths & Injuries) provides the gold-standard algorithm used by most primary care and geriatrics practices. It has three components: Screen, Assess, Intervene.

Screening — Every Older Adult, Every Year

- Ask the three key questions: (1) Have you fallen in the past year? (2) Do you feel unsteady when standing or walking? (3) Do you worry about falling?
- A 'yes' to any question triggers a full assessment

Assessment — For Anyone Who Screened Positive

- **Timed Up and Go (TUG):** Rise from a standard chair, walk 10 feet, turn, walk back, sit. Under 10 seconds is normal; over 12 seconds signals high fall risk; over 20 seconds suggests need for mobility aid or supervision.
- **30-Second Chair Stand:** Count how many times the person can rise from a chair without using arms in 30 seconds. Below the age-and-sex norm signals lower-extremity weakness.
- **4-Stage Balance Test:** Feet side by side; semi-tandem; tandem; single-leg. Inability to hold tandem for 10 seconds signals balance impairment.
- **Orthostatic vital signs:** BP and pulse lying, sitting, and standing at 1 and 3 minutes. A drop of ≥ 20 systolic or ≥ 10 diastolic on standing is diagnostic.
- **Vision check:** When was the last eye exam? Any recent changes? Are bifocals worn on stairs?
- **Cognition screen:** Brief cognitive test such as Mini-Cog or MoCA to identify unrecognized cognitive impairment.
- **Feet and footwear:** Inspect for neuropathy, deformities, ulcers; check current shoes.
- **Comprehensive medication review:** List every prescription, over-the-counter, and supplement. Identify sedating, hypotensive, and anticholinergic agents.
- **Vitamin D and calcium status:** Serum 25-hydroxyvitamin D level; dietary calcium intake.
- **Bone density (DEXA):** Women ≥ 65 , men ≥ 70 , or younger adults with a fragility fracture or major risk factor.

Post-Fall Workup — What to Look For

When an older adult presents after a fall, the differential must go beyond the obvious injury. Key considerations:

- Was there loss of consciousness? Consider syncope — cardiac arrhythmia, orthostatic, vasovagal, aortic stenosis
- Any new neurologic symptoms? Consider stroke or TIA as cause, not consequence
- Head strike? Consider CT head — especially if on any anticoagulant or antiplatelet
- Pain in hip, groin, thigh? Consider occult hip fracture — X-ray, then MRI if X-ray negative and pain persists
- Rib pain? Consider fracture and monitor for pneumonia
- Any concern for spinal injury? Especially in patients with osteoporosis, vertebral compression can be missed
- Was the fall witnessed? Ask specifically about the moments before — dizziness, palpitations, tunnel vision
- Time on the floor? Prolonged time down (over 1 hour) is associated with rhabdomyolysis, pressure injury, hypothermia, and pneumonia

A fall is a sentinel event. Approximately one in three older adults who fall have a serious underlying medical cause — a heart rhythm problem, a small stroke, a new infection, uncontrolled diabetes, dehydration, or an adverse medication effect. The evaluation should ask 'why did this happen?' as forcefully as 'what got broken?'

5. ACUTE MANAGEMENT — HIP FRACTURE AND MAJOR INJURY

A hip fracture is a surgical emergency. Once suspected, the treatment pathway is well established: rapid diagnosis, medical stabilization, and surgery within 24 to 48 hours whenever feasible. Delays beyond 48 hours are associated with higher 30-day mortality, higher rates of pneumonia and delirium, and worse functional recovery.

Types of Hip Fracture

Fracture Pattern	Description	Typical Surgical Treatment
Femoral neck — nondisplaced	Crack within the joint capsule; bone alignment preserved	Percutaneous screws or sliding hip screw
Femoral neck — displaced	Bone ends separated; blood supply to femoral head compromised	Hemiarthroplasty or total hip arthroplasty
Intertrochanteric	Fracture below the femoral head, outside joint capsule	Sliding hip screw or cephalomedullary nail
Subtrochanteric	Fracture just below the trochanters, in upper femoral shaft	Long cephalomedullary nail
Periprosthetic (around a prior joint replacement)	Fracture around an existing hip implant	Revision surgery, plate and cables, or full revision

Time-to-Surgery Matters

Multiple large studies including the HIP ATTACK trial (2020) and Canadian and European hip-fracture registries show that surgery within 24 hours reduces one-year mortality and delirium risk. Modern guidelines now recommend surgery within 24 hours when medically safe, and within 48 hours in nearly all patients. Delays beyond 48 hours require a documented medical reason.

24 hrs target time to hip-fracture surgery in modern guidelines

20–30% one-year mortality after hip fracture in adults 65+

50% of hip-fracture survivors who do not regain prior walking function

Orthogeriatric Co-Management

The single most important structural advance in hip-fracture care in the past two decades is orthogeriatric co-management — a model in which the orthopedic surgery team and a geriatrician (or hospitalist trained in geriatrics) share responsibility for the patient throughout the hospitalization.

Randomized and observational studies show co-management reduces mortality, length of stay, delirium, and post-operative complications, and improves discharge to home.

- Geriatrician manages medications, delirium prevention, DVT prophylaxis, pain control, nutrition, and comorbidities
- Surgeon focuses on the fracture repair, wound care, and early mobilization
- Nursing, physical therapy, occupational therapy, pharmacy, and social work integrate into daily rounds
- If your loved one has a hip fracture, ask whether the hospital has an orthogeriatric or Geriatric Fracture Program — the American Board of Orthopaedic Surgery and the American Geriatrics Society jointly endorse this model

Preventing the Common Complications

- **Delirium:** Up to 50% of hip-fracture patients develop postoperative delirium. Prevention includes avoiding benzodiazepines and diphenhydramine, treating pain adequately, ensuring hydration, restoring hearing aids and glasses, and encouraging early mobilization.
- **Pneumonia:** Aggressive pulmonary toilet — sitting up, coughing, incentive spirometry — starting the day of surgery.
- **Venous thromboembolism (DVT/PE):** Chemical prophylaxis (typically low-molecular-weight heparin or a DOAC) is standard for at least 28 days post-op unless bleeding risk contraindicates.
- **Pressure injury:** Repositioning every 2 hours, specialty mattresses, heel offloading.
- **Urinary retention and UTI:** Foley catheters should be removed within 24 hours of surgery when possible.
- **Constipation and ileus:** A predictable consequence of opioids and immobility; treat proactively.

The 30 days after hip-fracture surgery are the most dangerous of the entire recovery. Complications during this window drive most of the 20–30% one-year mortality — and most are preventable with structured co-management, early mobilization, and vigilance about medication side effects.

Other Major Fractures — Brief Notes

- **Vertebral compression fracture:** Usually treated with pain control, bracing, and early mobilization. Kyphoplasty or vertebroplasty may be considered for severe, persistent pain that does not respond to conservative measures.
- **Distal radius (wrist):** Depending on displacement — casting, closed reduction and casting, or surgical fixation. Return to full function in 6–12 weeks in most cases.
- **Proximal humerus (shoulder):** Most nondisplaced fractures heal without surgery; displaced or comminuted may require surgery or reverse shoulder arthroplasty.
- **Pelvic fracture:** Stable pelvic fractures often treated with pain control and early ambulation with a walker. Unstable pelvic fractures may require surgical fixation.

- **Traumatic brain injury:** Any head strike in an older adult on anticoagulants requires urgent CT head; even a normal initial CT may need repeat imaging 4–6 hours later given the risk of delayed intracranial bleeding.

6. THE OSTEOPOROSIS MEDICATION LANDSCAPE (2026)

Modern osteoporosis therapy is remarkably effective. When taken as prescribed, current medications reduce vertebral fracture risk by 50–70% and hip fracture risk by 40–50%. Despite this, only about 20% of women with osteoporosis — and far fewer men — are on treatment. The gap between what is possible and what is delivered is one of the great missed opportunities in geriatric medicine.

Antiresorptive Medications — Slow Bone Breakdown

Bisphosphonates (First-Line for Most Patients)

- **Alendronate (Fosamax):** Weekly oral tablet; the most-studied medication in osteoporosis; generic and inexpensive.
- **Risedronate (Actonel):** Weekly or monthly oral tablet; may have slightly lower GI side effects.
- **Ibandronate (Boniva):** Monthly oral or quarterly intravenous; limited evidence for hip-fracture reduction.
- **Zoledronic acid (Reclast):** Once-yearly intravenous infusion; excellent adherence; often used in patients who cannot tolerate oral bisphosphonates or after a recent hip fracture.
- Key precautions: proper upright dosing to prevent esophagitis; adequate renal function; jaw and dental status assessed before starting; rare risk of atypical femoral fracture with very long-term use (usually reassessed at 3–5 years)

Denosumab (Prolia)

- Twice-yearly subcutaneous injection; monoclonal antibody against RANKL
- Comparable or slightly better fracture reduction than bisphosphonates
- Preferred in patients with impaired kidney function
- Critical caveat: rapid rebound bone loss and multiple vertebral fractures can occur if doses are missed or if the drug is stopped without transition to a bisphosphonate. Do not stop denosumab without a plan for follow-on therapy.

Anabolic Medications — Build New Bone

For patients at very high fracture risk — a recent vertebral or hip fracture, very low T-score (below -3.0), or failure on antiresorptive therapy — modern guidelines increasingly recommend starting with an anabolic (bone-building) agent, followed by an antiresorptive to preserve the gains.

- **Romosozumab (Evenity):** Monthly subcutaneous injection for 12 months; sclerostin inhibitor; both builds bone and reduces resorption. Contraindicated in patients with recent stroke or myocardial infarction due to cardiovascular signal in trials.
- **Teriparatide (Forteo) and abaloparatide (Tymlos):** Daily subcutaneous injection for up to 24 months; parathyroid-hormone analogs; strongly build bone. Followed by a bisphosphonate or denosumab to preserve the gains.

Other Agents

- **Selective estrogen receptor modulators (raloxifene):** Reduces vertebral fracture; also reduces breast cancer risk; does not reduce hip fracture. Increases risk of DVT.
- **Estrogen / hormone therapy:** Effective for postmenopausal osteoporosis but rarely used first-line due to breast cancer and thromboembolism risks; may be appropriate in younger postmenopausal women with vasomotor symptoms.
- **Calcitonin (Miacalcin):** Older agent; modest efficacy; sometimes used for painful acute vertebral fracture; largely superseded by newer drugs.

Foundation Therapy — For Everyone

- Calcium intake: 1,000–1,200 mg/day, preferably from dietary sources (dairy, leafy greens, fortified foods) supplemented as needed
- Vitamin D: most older adults need 800–2,000 IU/day; check 25-OH vitamin D level and target ≥ 30 ng/mL
- Adequate protein: 1.0–1.2 g/kg/day supports both bone and muscle
- Weight-bearing and resistance exercise: essential adjunct to medication
- Smoking cessation: smoking accelerates bone loss and impairs fracture healing
- Moderate or eliminate alcohol: more than 2 drinks/day accelerates bone loss and raises fall risk

The most common reason osteoporosis treatment fails is that it was never started. If your loved one has had a fragility fracture — wrist, spine, hip, shoulder, pelvis — and is not on an osteoporosis medication within 3 months of the fracture, ask the surgeon or primary care team directly why not. The window immediately after a fracture is when treatment matters most and is most likely to be forgotten.

7. PROMISING CLINICAL TRIALS — 2026 UPDATE

The falls-and-fractures research landscape in 2026 is unusually rich. Several new mechanisms of action, new adjuncts to existing therapy, and new device-based interventions are advancing through late-stage trials. The following is a snapshot of active or recently completed programs relevant to older adults.

Osteoporosis — Next-Generation Therapies

- **Blosozumab and setrusumab (sclerostin inhibitors):** Next-generation follow-ons to romosozumab in trials for osteoporosis and osteogenesis imperfecta. Setrusumab has FDA breakthrough designation for pediatric OI; osteoporosis trials in older adults ongoing.
- **Cathepsin K inhibitors:** A new class inhibiting the enzyme osteoclasts use to resorb bone. Odanacatib was withdrawn in 2016 due to stroke signal; newer cathepsin K programs in earlier-phase trials are attempting to preserve efficacy without the cardiovascular concern.
- **Sequential and combination therapy trials:** Multiple ongoing trials evaluating optimal sequence of anabolic followed by antiresorptive, and the emerging use of denosumab plus teriparatide in the highest-risk patients.

Sarcopenia and Muscle Preservation

- **Bimagrumab and similar myostatin/activin inhibitors:** Monoclonal antibodies that increase muscle mass by blocking pathways that normally limit muscle growth. Sarcopenia trials ongoing; also being studied in obesity, cachexia, and IBM.
- **Apitegromab:** Myostatin inhibitor originally developed for spinal muscular atrophy; being explored in age-related sarcopenia.
- **Combination trials with resistance exercise:** The clearest signal to date is that anabolic muscle drugs work best when paired with resistance training — a reminder that no medication replaces the exercise itself.

GLP-1 Receptor Agonists — Bone and Muscle Signals

Semaglutide, tirzepatide, and related GLP-1 and dual-agonist agents are now among the most widely prescribed medications in older adults. Their impact on bone density and muscle mass is under active investigation. Rapid weight loss on these medications appears to accelerate loss of muscle mass in older adults, potentially increasing fall and fracture risk. The STEP-HFpEF and SELECT extensions, and newer trials focused specifically on adults 65+, are quantifying this trade-off and testing whether combined GLP-1 plus resistance-training protocols preserve muscle while achieving cardiometabolic gains.

Fall Prevention — Technology-Based Interventions

- **Wearable fall-detection and fall-prediction systems:** Apple Watch, Google Pixel Watch, and Medtronic-linked devices now detect falls automatically and contact emergency services. Prediction algorithms — using gait velocity, cadence variability, and turn angles — are showing promise in identifying rising fall risk before the fall occurs.

- **Balance-training exergames:** Randomized trials of exergame-based balance training (Nintendo, VR-based platforms, custom rehab hardware) show fall-risk reductions comparable to traditional group exercise, with better adherence.
- **Hip protectors:** Padded undergarments that dissipate impact force. Effective in nursing home populations when consistently worn; adherence outside institutional settings remains a challenge.

Home Modification and Environment

- **CAPABLE program:** Community Aging in Place, Advancing Better Living for Elders — a structured home-based intervention combining occupational therapy, nursing, and handyman services. Randomized trials show significant reductions in disability and nursing home placement. Available in many U.S. communities through Area Agencies on Aging and Medicaid waiver programs.
- **Ambient sensors and smart-home tech:** Fall-detection sensors, smart lighting activated by motion at night, and voice-activated emergency systems are increasingly available and affordable.

Clinical trials for older adults are more accessible than most families realize. The NIH's ClinicalTrials.gov database can be searched by condition, location, and age. Most falls and osteoporosis trials welcome participants 65 and older. Many university-affiliated medical centers run fall-prevention research clinics — the participation itself often provides excellent free medical assessment.

8. REHABILITATION AND RECOVERY

Rehabilitation after a major fracture or fall is where independence is either regained or lost. The medical repair — the surgery, the cast, the drug — creates the possibility of recovery. What patients and families actually do in the weeks and months that follow determines whether that possibility is realized.

Post-Hip-Fracture Rehabilitation Pathway

Phase	Timing	Focus
Acute hospital	Day 0 to 5	Surgery, pain control, delirium prevention, initial mobilization on postoperative day 1
Inpatient rehab (IRF) or SNF rehab	Week 1 to 3+	Intensive daily therapy — 3 hours/day in IRF; skilled nursing and PT/OT in SNF
Home health rehab	Week 3 to 8	PT/OT visits at home; progressive weight bearing and gait training
Outpatient rehab	Month 2 to 6	Continued strengthening, balance, endurance; gym-based or clinic-based
Community exercise	Month 6 onward	Maintenance — falls-prevention classes, tai chi, resistance training, home program

Evidence-Based Rehabilitation Elements

- **Progressive resistance training:** The single most effective intervention for regaining lost muscle mass and strength. Studies consistently show that adults in their 70s, 80s, and 90s can significantly increase muscle mass with 8–12 weeks of supervised progressive resistance training.
- **Balance training:** Static balance, dynamic balance, and reactive balance (recovery from a stumble). Tai chi, Otago Exercise Programme, and the Stepping On program have the best evidence for fall reduction.
- **Gait training:** Focus on stride length, cadence, foot clearance, and turn strategy. Use of a walker or cane, when needed, should be prescribed and taught by a physical therapist — not chosen from a pharmacy shelf.
- **Endurance / aerobic training:** 30 minutes most days at moderate intensity — walking, stationary cycling, water aerobics. Cardiorespiratory fitness predicts recovery.

- **Functional task training:** Practice the actual tasks of daily living — getting out of bed, off the toilet, in and out of the car, off the floor. Repetition of the specific task is what generalizes to real life.
- **Vestibular therapy:** For dizziness-driven falls; specialized PT can retrain vestibular compensation.
- **Cognitive-behavioral therapy for fear of falling:** Fear of falling can be as disabling as the fall itself. CBT-based programs (such as A Matter of Balance) reduce fear and increase activity.

Nutrition — The Underrated Ingredient

- Protein: 1.0–1.2 g/kg/day; higher (1.2–1.5 g/kg) during active fracture recovery
- Adequate calorie intake: many older adults are chronically underfed and lose weight during hospitalization
- Vitamin D repletion: essential for both bone healing and muscle function
- Calcium 1,000–1,200 mg/day from all sources
- Screen for and treat malnutrition — dietitian consultation is warranted for anyone losing weight or with poor intake

The first 90 days after a hip fracture are the highest-yield rehabilitation window. Function recovered during this period tends to be preserved; function lost during this period is much harder to regain later. Every therapy session in weeks 1 through 12 matters more than any session that comes later. Missed rehab visits are a red flag.

9. THE CAREGIVER BURDEN

Caregiving after a fall or fracture is unusual among dependency-causing conditions in that it is often frontloaded — the most intense demands come in the first 3 to 6 months post-injury. Family members are asked, often without warning, to manage medications, help with bathing and toileting, drive to therapy, monitor for complications, and provide 24/7 supervision to prevent another fall.

30–40 hours/week typical family caregiver time in first 90 days post-hip-fracture

50%+ of hip-fracture caregivers who report significant psychological distress

60% of caregivers who are the spouse, adult daughter, or daughter-in-law

2x risk of caregiver injury from lifting and transferring in the first year

What Falls Caregivers Need to Know

- The first 90 days are the most intense — recovery is fastest, therapy is most frequent, and complications are most likely during this window
- Transfer training is essential — a physical or occupational therapist should teach the family how to help with sit-to-stand, bed transfers, and toilet transfers safely, before the patient comes home
- Home safety assessment — occupational therapists can perform a home evaluation and recommend grab bars, raised toilet seat, shower bench, ramps, and removal of tripping hazards
- Respite care — temporary relief for caregivers — is available through Medicaid waiver programs in most states, Area Agencies on Aging, and community-based nonprofits including many faith communities and veteran service organizations
- Home modifications (grab bars, ramps, walk-in showers, stair lifts) are essential; many Area Agencies on Aging offer modification grants or low-cost programs, and Veterans Administration benefits cover home modifications for eligible veterans
- Adult day programs provide structured daytime care while caregivers continue to work or recover — contact your local Area Agency on Aging (eldercare.acl.gov) to locate programs near you
- Home health aides dramatically reduce caregiver strain and delay nursing home placement; ask your rehab hospital case manager or Area Agency on Aging for agency referrals
- Support groups for caregivers of older adults are available through the Family Caregiver Alliance (caregiver.org) and most senior centers

The most dangerous caregiver is the spouse who tries to lift and transfer a partner recovering from a hip fracture without training, without help, and without equipment. Caregiver injury rates peak in the first year after hip fracture. Accepting help — a home health aide, an adult day program, a grab

bar, a lift chair — is not extravagance. It is the difference between sustainable care and a second fracture, this time in the caregiver.

10. KEY RESOURCES

Organization	What They Offer	Website
CDC STEADI	Fall risk screening tools, patient handouts, provider algorithms	cdc.gov/steady
National Council on Aging (NCOA)	Evidence-based fall-prevention programs (A Matter of Balance, Stepping On, Tai Chi for Arthritis)	ncoa.org/falls
Bone Health & Osteoporosis Foundation	Patient education; provider directory; support community	bonehealthandosteoporosis.org
American Academy of Orthopaedic Surgeons (AAOS)	Patient information on hip fracture, wrist fracture, and other injuries	orthoinfo.aaos.org
American Geriatrics Society (AGS)	Clinical guidelines; HealthInAging.org for patient education	healthinaging.org
National Institute on Aging (NIA)	Research-backed patient education on falls, bones, exercise	nia.nih.gov
NIH ClinicalTrials.gov	Database of active U.S. clinical trials; searchable by condition and location	clinicaltrials.gov
National Academy of Elder Law Attorneys (NAELA)	Locate an elder law attorney for advance directives and legal planning	naela.org
Family Caregiver Alliance	Caregiver education, support groups, respite guidance, condition-specific fact sheets	caregiver.org
AARP	Caregiver resources and Medicare guidance	aarp.org
Eldercare Locator	Federal service connecting older adults and families to local services (1-800-677-1116)	eldercare.acl.gov
Area Agencies on Aging (AAA)	Local case management, respite, adult day, home-modification help,	eldercare.acl.gov

Organization	What They Offer	Website
	transportation	

11. NEXT STEPS — REDUCE THE RISK, RESPOND TO THE EVENT

Falls are the most preventable of the major causes of dependency in older adults — and they are also the most under-addressed. The families who navigate this well are those who act on modifiable risk before the first serious fall, and who mobilize the right medical and community support the moment a fall occurs. You do not have to figure this out alone.

Whether you are working to prevent a first serious fall, recovering from a recent fracture, or caring for a loved one through rehabilitation, the following steps protect what matters:

Step 1 — Screen and Act on Fall Risk Now

Every adult age 65 or older — and any adult with a chronic condition affecting balance or mobility — should be screened annually. Ask your primary care team to complete a CDC STEADI screening at the next visit: three simple questions, a Timed Up and Go, orthostatic vitals, and a medication review. If any risk factor is present, ask specifically for a referral to physical therapy for balance and strength training.

Step 2 — Ask for a Medication Review

Bring every prescription, over-the-counter, and supplement to your primary care visit — including the sleep aid, the anxiety medication, the pain pill, the blood pressure pills, and the antihistamine used for allergies. Ask directly: 'Is anything on this list raising my fall risk? Can anything be reduced or stopped?' A geriatrician or pharmacist-led review can reduce fall risk in days.

Step 3 — Test for and Treat Osteoporosis

Women age 65 and older, men age 70 and older, and anyone who has had a fragility fracture should have a DEXA scan. If your T-score is at or below -2.5, or if you have already had a fragility fracture, you have osteoporosis and should be on treatment. Ask specifically whether an antiresorptive (bisphosphonate, denosumab) or anabolic (romosozumab, teriparatide) is right for you. Fill the prescription. Take the medication as directed.

Step 4 — Make the Home Safe

Ask for an occupational therapy home safety evaluation. Priority items: grab bars in the tub, shower, and beside the toilet; a raised toilet seat and shower bench if needed; night lights on the path from bed to bathroom; secure handrails on both sides of any stairs; removal of loose rugs and cords; sturdy, well-fitting shoes with non-slip soles worn indoors. Many Area Agencies on Aging offer home-modification programs at low or no cost.

Step 5 — Build Strength and Balance

The single most effective long-term fall-prevention intervention is a supervised progressive resistance and balance training program. Evidence-based options widely available in communities include Tai Chi

for Arthritis, A Matter of Balance, Stepping On, and the Otago Exercise Programme. The National Council on Aging (ncoa.org/falls) maintains a searchable directory of local programs. Any activity is better than none — but structured, progressive programs deliver the largest gains.

Step 6 — Execute Legal Documents While You Have Capacity

Before a serious fall happens, finalize:

- Durable Power of Attorney (financial) — allows a trusted person to manage finances if you cannot
- Health Care Proxy / Durable POA for Healthcare — allows a trusted person to make medical decisions
- Living Will / Advance Directive — specifies wishes for end-of-life care
- Will and trusts as appropriate — updated to reflect current circumstances

After a serious fall with significant cognitive impairment — from delirium, TBI, or medication effects — signing these documents may not be possible for weeks or months, and the family may need to seek guardianship through the courts.

Step 7 — Engage Your Medical Advocacy Team

If a fall or fracture has already occurred, your most important allies are the orthopedic surgery team, the geriatrician or hospitalist, the rehab hospital case manager, and the physical and occupational therapists. Ask directly for a written care plan that includes: rehab goals, medication reconciliation, follow-up appointments, home safety recommendations, and referrals to community-based support. If your loved one is admitted for a hip fracture, ask whether the hospital has an orthogeriatric or Geriatric Fracture Program — the co-management model reduces mortality and improves recovery.

Step 8 — Connect to Community and Caregiver Support

Contact your Area Agency on Aging (eldercare.acl.gov, 1-800-677-1116) for respite care, adult day programs, home modification help, transportation, and case management. Contact the Family Caregiver Alliance (caregiver.org) for caregiver education, support groups, and condition-specific fact sheets. Most rehabilitation hospitals also run family support groups. Connection with others who have navigated a serious fall or fracture is consistently cited as one of the most valuable resources.

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