Lecture 32

Editing file

MED438
KING SAUD UNIVERSITY

PRIMARY HEALTHCARE TEAMWORK

Falls in Elderly

Objectives:

- ★ Define falls and the mechanism of falls (mechanical vs. non mechanical)
- ★ Discuss the prevalence (local studies vs. international)
- ★ Explain falls risk factors (both intrinsic such as gait and extrinsic such as environmental hazards)
- ★ Discuss the consequence of falls such as hip fractures, lacerations, wounds, bleeding
- ★ Demonstrate the ability to identify falls and recurrent falls (Falls risk assessment) i.e. history and physical examination
- ★ Falls prevention and management in community dwelling elderly.

Color index:

Original text Important Doctor's notes Golden notes Extra

Introduction

Definition

Fall

An **unintentional** event that results in a person coming to rest on the ground, or another lower level, not as a result of a major intrinsic event such as stroke or epilepsy) or an overwhelming hazard (such as being pushed). Kellogg, 1987

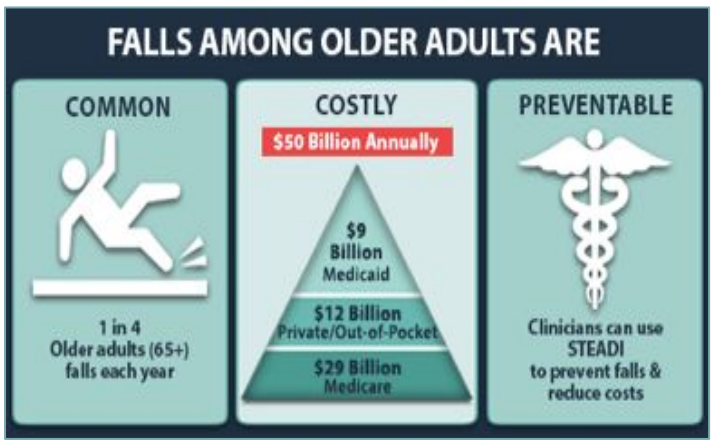
Types Of Falling

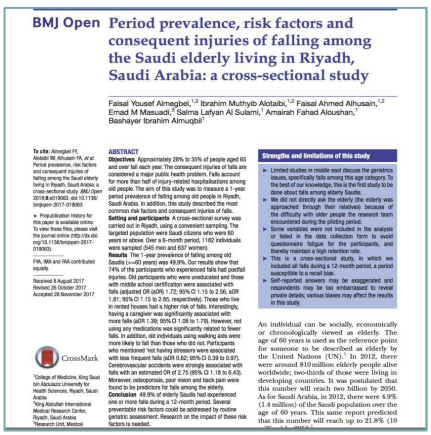
1 Community Dwelling

2 In the Hospital

Prevalence

- **30%** of community-dwelling people over the age of 65 years fall each year.
- **50%** for those 80 years and older.
- The 1 year prevalence of falling among old Saudis (>=60 years) was **49.9%.**
- **74%** of the participants who experienced falls had post fall injuries.





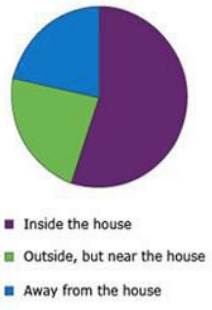
BMJ Open

Period prevalence, risk factors and consequent injuries of falling among the Saudi elderly living in Riyadh, Saudi Arabia: a cross-sectional study

Faisal Yousef Almegbel,[1,2] Ibrahim Muthyib Alotaibi,[1,2] Faisal Ahmed Alhusain,[1,2] Emad M Masuadi,[3] Salma Lafyan Al Sulami,[1] Amairah Fahad Aloushan,[1] Bashayer Ibrahim Almuqbil[1]

Consequences of Falls

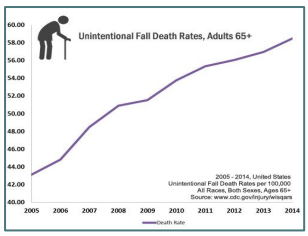
Background

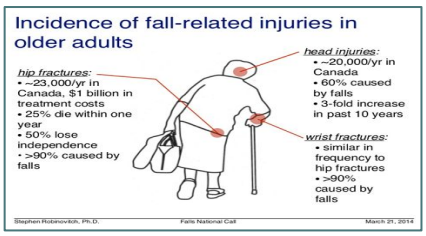


- **Recurrent Falls:**
  - 60% of those with a history of a fall in the previous year will have a subsequent fall.
  - No. 1 risk factor of a fall is a previous fall.
- **Gender:**
  - female > male , Falls are more likely to result in injury in women
- **When do falls occur?**
  - Statistics show that most falls occur in the daytime when people are more active.
  - Around 11am and between 4pm and 6pm.
- **Where do they fall? Respectively**
  - Inside the house.
  - Outside but near the house.
  - Away from the house.

Consequences Of Falls

Significant **morbidity and mortality** may result from falls in older individuals, Other causes:





- Physical injury.
- Emotional trauma.
- Psychological problems.
- Social consequences.
- Financial impact.
- ½ falls result in injury (10-15% in fractures).
- ¼ of all fallers limit their activities and lifestyle due to **fear of falling.**
- **Fall Severity Index**
  - **None** means no injury or disability.
  - **Minor Injury** means injuries, which are minor in nature. For example, abrasion, bruise, minor laceration and hematomas.
  - **Major Injury** means injuries that require medical or surgical intervention, increased hospital stays, or are disabling and/or disfiguring to a degree that the patient will have any degree of permanent lessened function or require surgical repair. For example, **hip fracture, head trauma and arm fracture.**
  - **Death** means fall related death.
- **Hip fracture:**
  - **1-2%** of falls result in a fractured hip.
  - **50%** Of those who suffer fractured femurs will not fully recover.
  - **25%** will die within 12 months.

“ 80 % of older women preferred death to a "bad" hip fracture that would result in nursing home admission’’

Risk Factors & Risk Of Falls

Fear Of Falling: Why Is It A Fall Risk Factor?

Costs of Fall:

- In US alone, the total cost of fall injuries for people 65 and older was $30 billion in 2012. (The cost covered 2.4 millions ER visits for non fatal injuries and more than 722,000 hospitalizations.)
- **Indirect Cost:**
  - Quality of life.
  - Loss of independence.
  - Caregiving requirements.

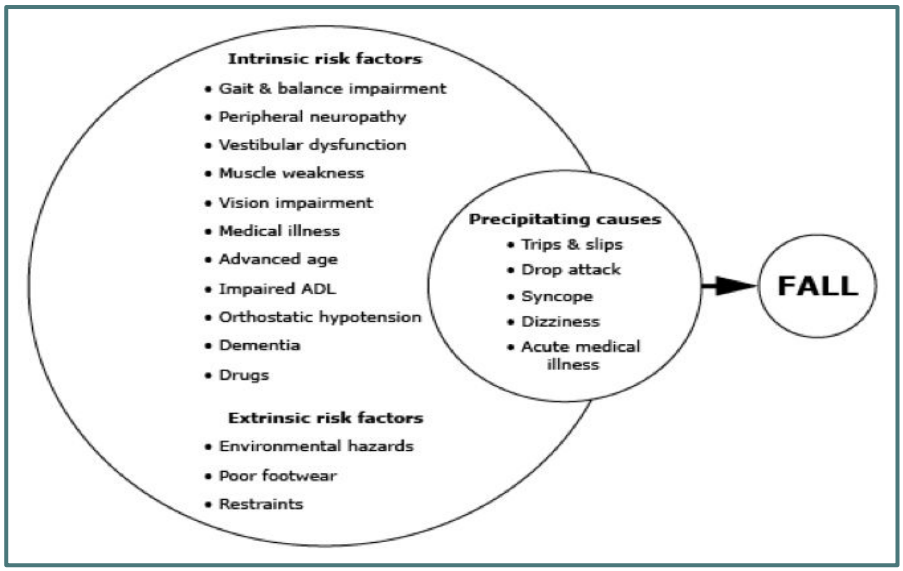
Why Fall Often Go Without Clinical Attention ?

- The patient never mentions falls.
- There is no injury at the time of the fall.
- The provider fails to ask the patient about a history of falls.
- Believes that falls are an inevitable part of the aging process.
- Treatment of injuries resulting from a fall does not include investigation of the cause of the fall.

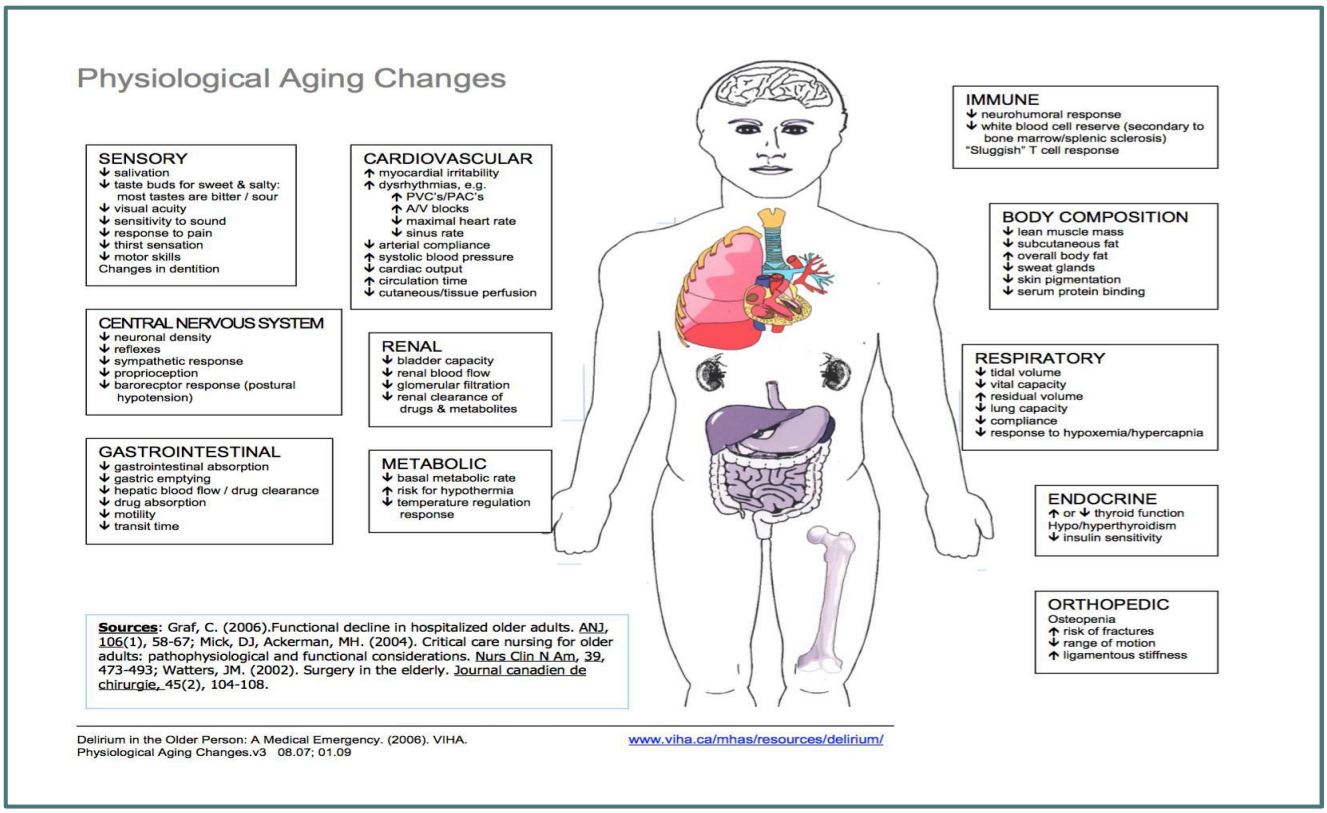
Theory: Why Do People Fall?

Theory of Why People Fall

- **Falls occur when:**
  - Older adults who are predisposed because of accumulated effect of diseases/impairments. (Intrinsic)
  - Are exposed to precipitating challenges. (Extrinsic)



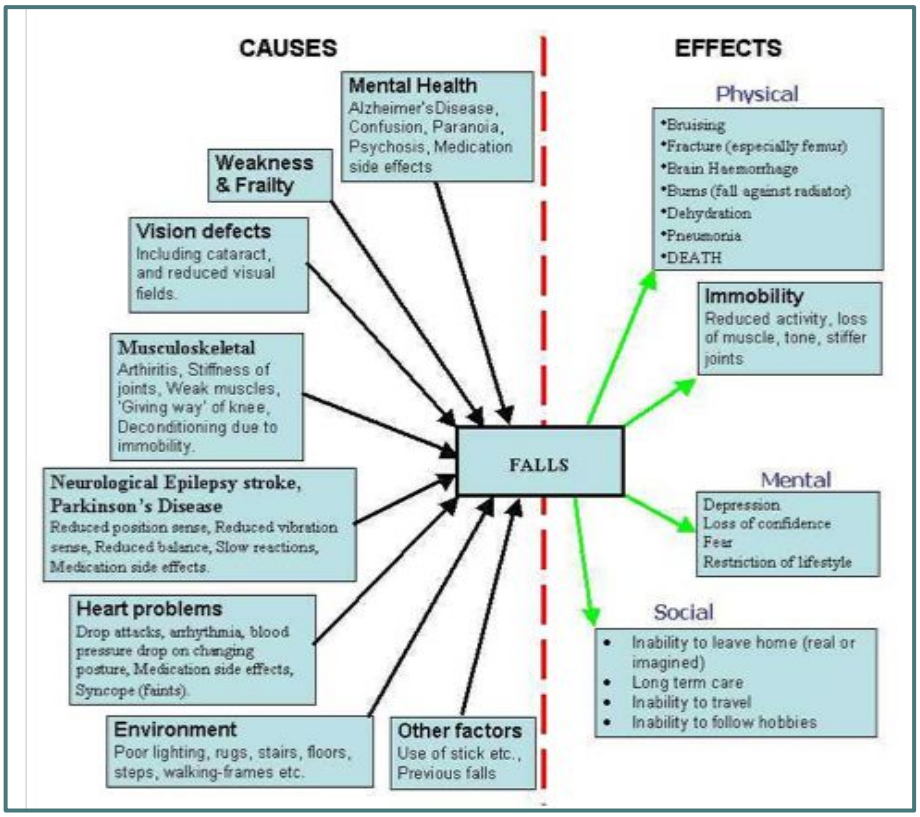
Physiological Changes With Aging



Causes Of Falls

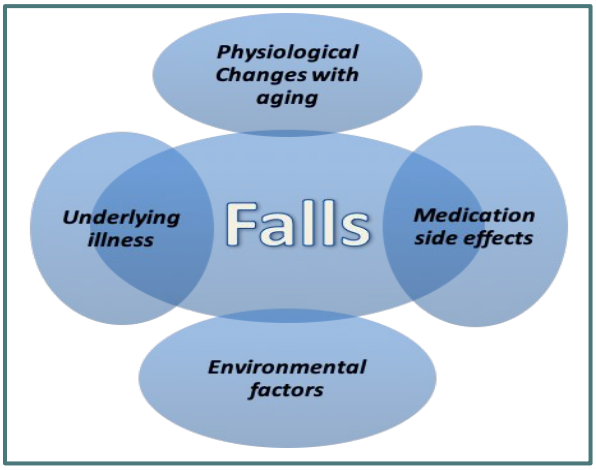
Causes Of Falls:

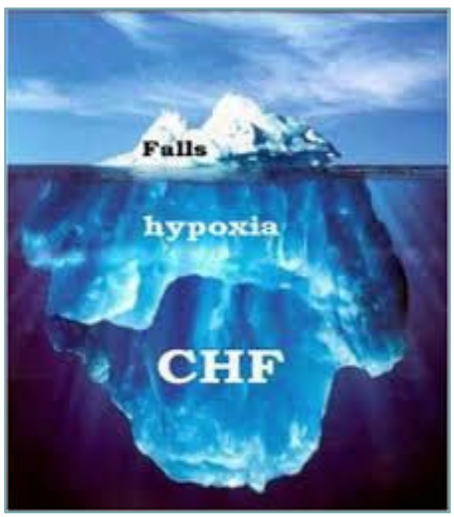
- A fall in a geriatric patient should be perceived as a symptom of a disease, to be investigated like any other serious symptom.



The Prediction Of Falls Among Older People In SA

- **This study found that the three main factors that affect older persons' likelihood of falling are:**
  - Number of medications taken per day.
  - Sedentary lifestyle.
  - Use of assistive devices.





Falls Risk Factors

Falls Risk Factors:

Table 3. Falls Risk Factors and Associated Relative Risk

RISK FACTOR	MEAN RELATIVE RISK RATIO (RANGE)
Muscle weakness	4.4 (1.5-10.3)
History of falls	3.0 (1.7-7.0)
Gait deficit	2.9 (1.3-5.6)
Balance deficit	2.9 (1.6-5.4)
Use of assistive device	2.6 (1.2-4.6)
Visual deficit	2.5 (1.6-3.5)
Arthritis	2.4 (1.9-2.9)
Impaired activities of daily living	2.3 (1.5-3.1)
Depression	2.2 (1.7-2.5)
Cognitive impairment	1.8 (1.0-2.3)
Age 80 or older	1.7 (1.1-2.5)

Source: Rubenstein LZ, Josephson KR. The epidemiology of falls and syncope. *Clin Geriatr Med* 2002 May;18(2):141-58.

Medications Associated With Falls

Table 2. Medication Types Associated with Falls Events Reported to the Pennsylvania Patient Safety Authority, 2009

	FALLS EVENTS AT BEHAVIORAL HEALTH HOSPITALS (N = 313)		FALLS EVENTS AT NON-BEHAVIORAL HEALTH HOSPITALS (N = 34,641)	
MEDICATION TYPE	Number	Percentage*	Number	Percentage*
Antipsychotics	55	17.6%	1,645	4.7%
Benzodiazepines	54	17.3%	2,825	8.2%
Antiseizures	33	10.5%	1,176	3.4%
Cardiovasculars	17	5.4%	3,915	11.3%
Opiates	7	2.2%	3,237	9.3%
Diuretics	6	1.9%	1,268	3.7%
Laxatives	4	1.3%	1,054	3.0%
Anticoagulants	1	0.3%	1,994	5.8%
Other	43	13.7%	2,826	8.2%
Total	**220**	**70.3%**	**19,940**	**57.6%**

* Percentages calculated on number of falls in each medication category, not accounting for the lack of medications involved nor multiple medications. Additionally, not all submissions noted medications.

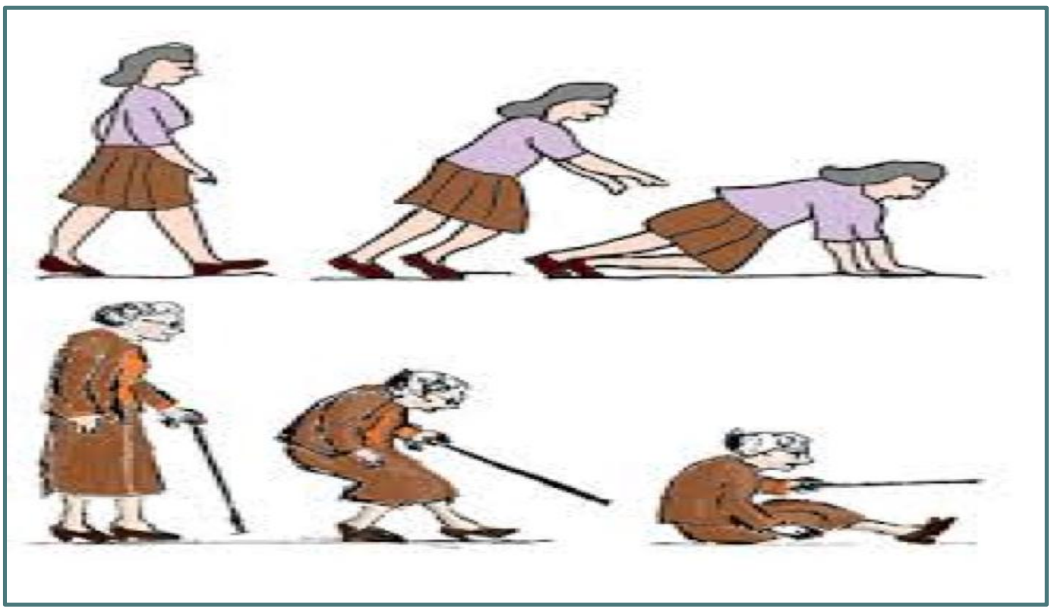
Mechanism Of Falls

Describe The Fall:

- **Accidental Fall** occurs when a patient is oriented but rolls out of bed or trips / slips due to environmental risk factors, or an infant is dropped by a parent or caregiver.
- **Assisted Fall** means that the patient was being assisted when the fall took place. While any fall is bad, assisted falls generally result in less injury than do unassisted falls.
- **Near Fall** describes a sudden loss of balance that does not result in a fall or other injury. This can include a person who slips, stumbles or trips but who is able to regain balance; a near miss.
- **Unwitnessed Fall** describes the event when a patient is found on the floor and neither the patient nor anyone else knows how he / she got there. (Worst type)

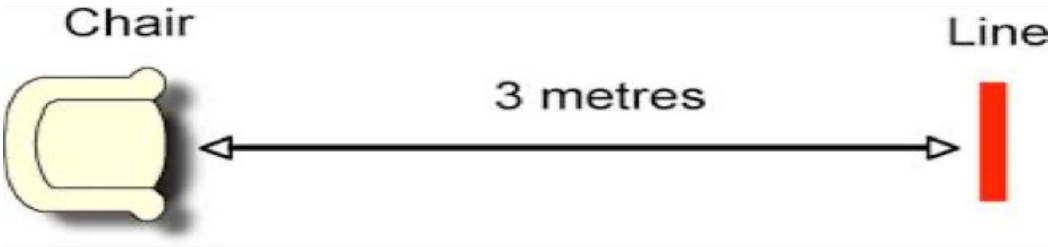
Mechanism Of Fall:

- Elderly fall usually on the **side or back** and cause hip fractures.
- Not like Young, adults they fall **into front.**



Tests To Assessing Risk Of Falling

1. Timed Up & Go Test (>12 Seconds)



As the time **increases** beyond 12s the risk of fall increases

The "Get up and go" test for gait assessment in older adult patients

The "Get up and go" test for gait assessment in older adult patients[1]	
Have the patient sit in a straight-backed high-seat chair	
Instructions for patient:	
Get up (without use of armrests, if possible)	
Stand still momentarily	
Walk forward 10 feet (3 meters)	
Turn around and walk back to chair	
Turn and be seated	
Factors to note:	
Sitting balance	
Transfers from sitting to standing	
Pace and stability of walking	
Ability to turn without staggering	
Modified qualitative scoring[2]	
(1) No fall risk	Well-coordinated movements, without walking aid
(2) Low fall risk	Controlled, but adjusted movements
(3) Some fall risk	Uncoordinated movements
(4) High fall risk	Supervision necessary
(5) Very high fall risk	Physical support of stand by physical support necessary
Timed test (record time from initial rising to re-seating)[3]	
Age (years)	**Mean time (seconds)**
60 to 69	8.1 (7.1 to 9.0)
70 to 79	9.2 (8.2 to 10.2)
80 to 99	11.3 (10.2 to 12.7

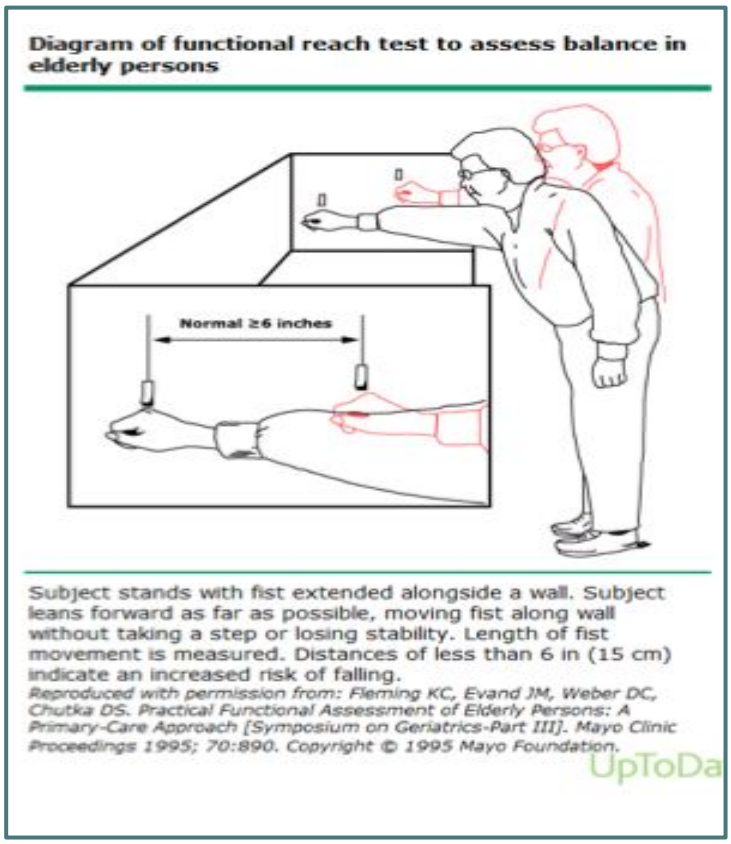
2. Coordination Assessment:

- **Abnormal if:**
  - Hesitant start.
  - Broad-based gait.
  - Path deviates.
  - Heels do not clear toes of other foot.
  - Extended arms.

3. 30-Second Chair Stand Test: (Dr just mentioned it)

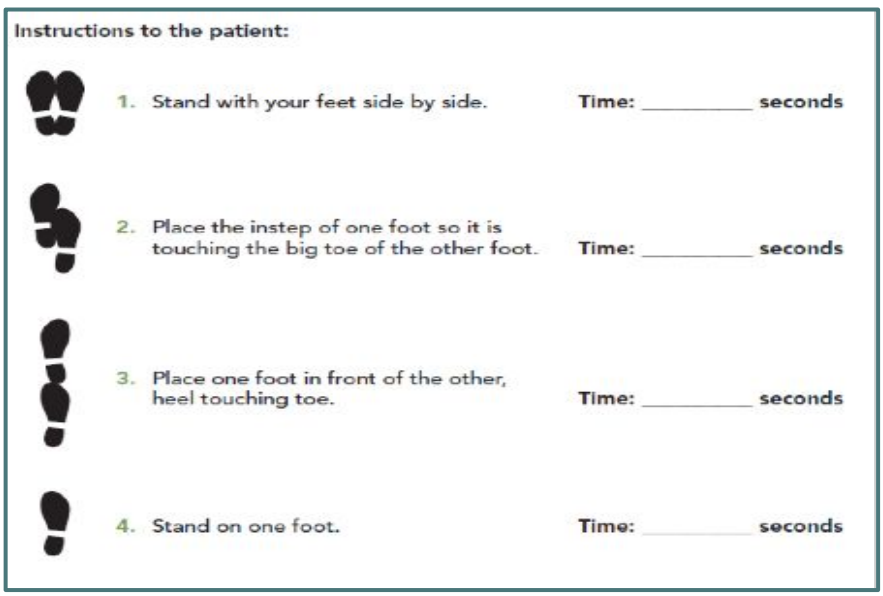
Tests To Assessing Risk Of Falling

4. Functional Reach Test



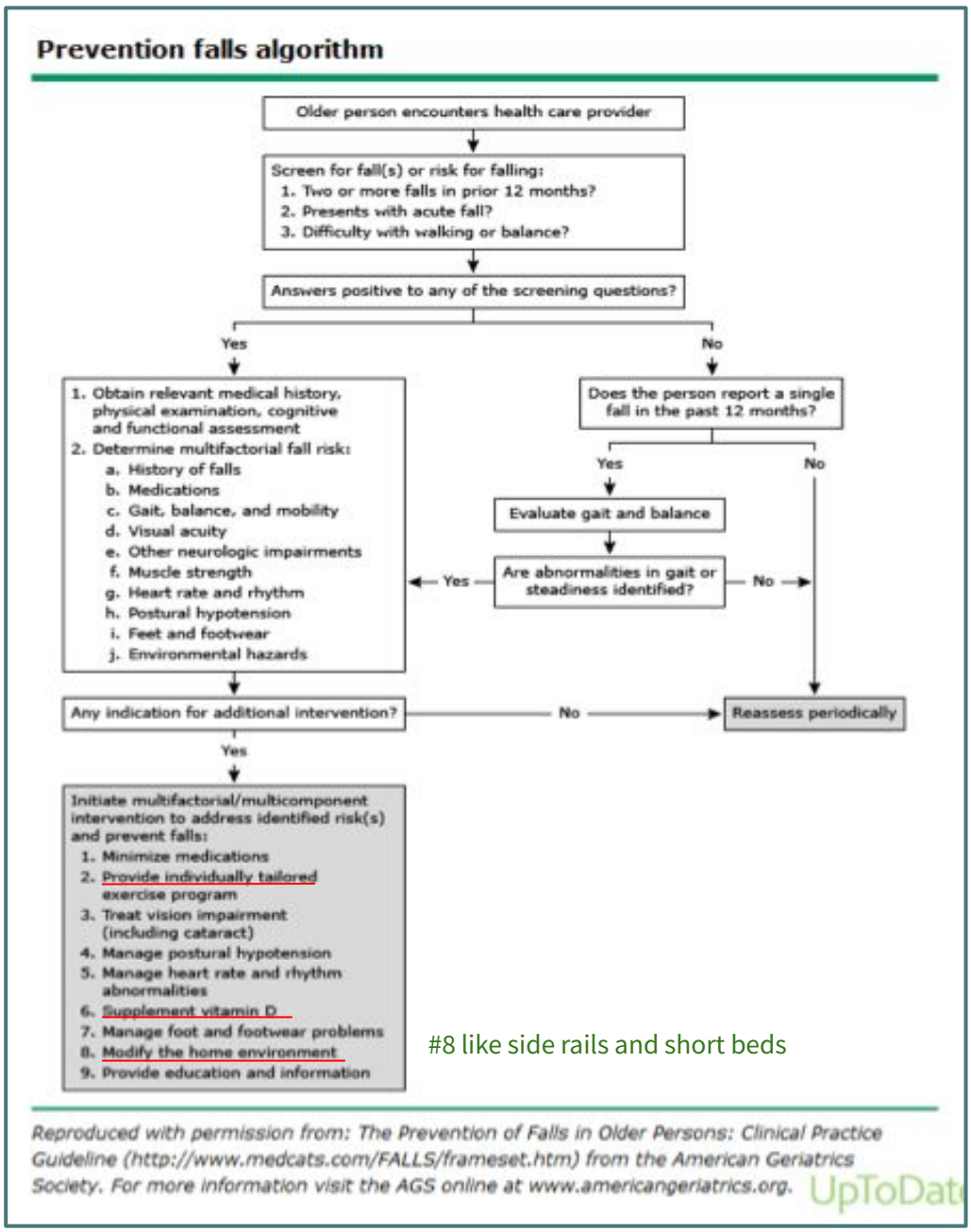
5. Stage Balance Test

- These are four standing positions that get progressively harder to maintain.
- The shorter the time they remain in each position the higher the risk of fall.



Assessment and Prevention

Prevention Of Falls Algorithm



Multifactorial Assessment With Targeted Intervention

- Most commonly studied & consistently effective.
- 20+ trials showing **27% (2-37%)** fall risk reduction for community dwelling older adults.

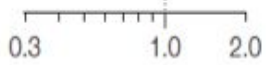
USPSTF Recommendation For Prevention

- Annual question about falls
- **Exercise or physical therapy and vitamin D supplementation to prevent falls** in community-dwelling adults aged 65 years or older who are at increased risk for falls.

A. Falls Prevention Checklist

Community-Dwelling Older People[a]

Intervention[b]	No. of Trials[c]	No. of Participants	Pooled Rate Ratio (95% CI)	Heterogeneity[d] I^2, %	Heterogeneity[d] *P* Value
Exercise programs (multiple-component)					
Group classes	16	3622	0.71 (0.63-0.82)	48	.02
Home-based programs	7	951	0.68 (0.58-0.80)	0	.97
Tai Chi classes	5	1563	0.72 (0.52-1.00)	72	.006
Multifactorial interventions	19	9503	0.76 (0.67-0.86)	85	<.001
Vitamin D supplementation	7	9324	1.00 (0.90-1.11)	69	.003
Selected for lower levels of serum vitamin D	2	260	0.57 (0.37-0.89)	0	.79
Not selected for lower levels	5	9064	1.02 (0.93-1.13)	70	.009
Home safety assessment and modification	6	4208	0.81 (0.68-0.97)	64	.02
Higher risk of falling	3	851	0.62 (0.50-0.77)	0	.54
Not selected on fall risk	3	3357	0.94 (0.84-1.05)	0	.44
Cardiac pacing[e]	3	349	0.73 (0.57-0.93)	51	.13



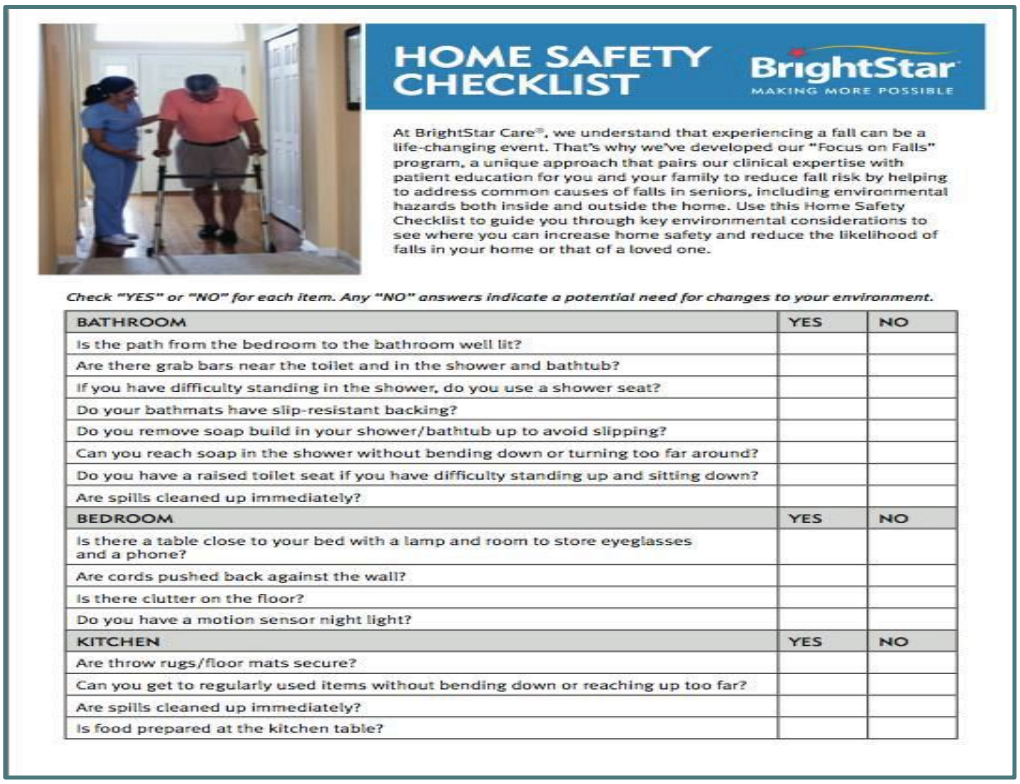
Fall Prevention Checklist

- ❑ Install sturdy handrails on both sides of stairs.
- ❑ Keep your home free of clutter. Be aware of tripping hazards; animals, small rugs, uneven flooring, and unsecured bedding.
- ❑ Place a slip-proof mat in the tub.
- ❑ Keep phone and electrical cords out of any pathway.
- ❑ Get a portable phone or medical alert device.
- ❑ Install good lighting and use night-lights throughout your home.
- ❑ Install handrails in bathtub and toilet areas.
- ❑ Walkers, canes, and other assistive devices, should be kept in good condition and used at all times rather than using furniture or walls for balance.
- ❑ Wipe up any spills immediately.

Prevention

B. Home Safety

- Done by special care providers to assess the barriers in houses and modify it to become elderly friendly.



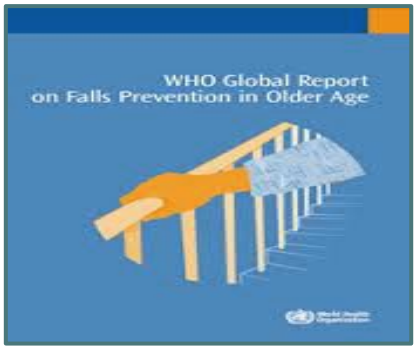
HOME SAFETY CHECKLIST

BrightStar MAKING MORE POSSIBLE

At BrightStar Care®, we understand that experiencing a fall can be a life-changing event. That's why we've developed our "Focus on Falls" program, a unique approach that pairs our clinical expertise with patient education for you and your family to reduce fall risk by helping to address common causes of falls in seniors, including environmental hazards both inside and outside the home. Use this Home Safety Checklist to guide you through key environmental considerations to see where you can increase home safety and reduce the likelihood of falls in your home or that of a loved one.

Check "YES" or "NO" for each item. Any "NO" answers indicate a potential need for changes to your environment.

BATHROOM	YES	NO
Is the path from the bedroom to the bathroom well lit?		
Are there grab bars near the toilet and in the shower and bathtub?		
If you have difficulty standing in the shower, do you use a shower seat?		
Do your bathmats have slip-resistant backing?		
Do you remove soap build in your shower/bathtub up to avoid slipping?		
Can you reach soap in the shower without bending down or turning too far around?		
Do you have a raised toilet seat if you have difficulty standing up and sitting down?		
Are spills cleaned up immediately?		
BEDROOM	**YES**	**NO**
Is there a table close to your bed with a lamp and room to store eyeglasses and a phone?		
Are cords pushed back against the wall?		
Is there clutter on the floor?		
Do you have a motion sensor night light?		
KITCHEN	**YES**	**NO**
Are throw rugs/floor mats secure?		
Can you get to regularly used items without bending down or reaching up too far?		
Are spills cleaned up immediately?		
Is food prepared at the kitchen table?		



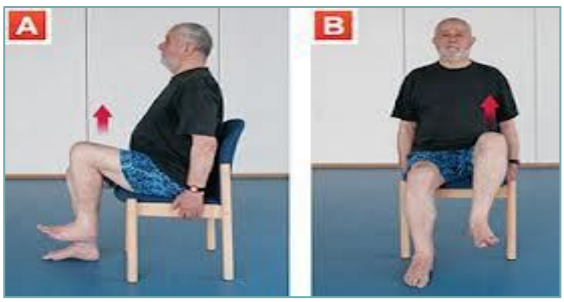
C. Vitamin D

- Many older adults will need higher supplement levels (eg, at least 1000 IU daily) to achieve 25 hydroxyvitamin D levels sufficient for falls and fracture prevention. (The American Geriatrics Society)

D. Environment Assessment

E. Exercise

Tai Chi



F. Preventing The Complications Of Falls

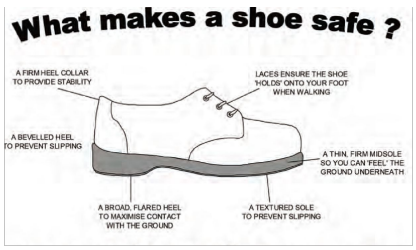
Assistive Devices

Better than the single headed cane

Hip Protectors

- Effectiveness??.
- Compliance?? (Not good)
- Setting.

The Ideal Shoes



Time on floor

Anticoagulation

Case 1: Fatma

Case Study 1

Mrs. Fatma is a 75 year old lady was brought by her daughter. The daughter tells you her mother had a fall last week. **What questions do you want to ask about fall?**

- **History.** From the patient or a witness of the fall
- **Describe the fall.**
- **Ask questions to R/O syncope, pre fall symptoms.**
- **Use systematic method to look into etiology of falls.**
- Drug history.

1- History:

- Lives alone in her 2 storey house.
- Patient fell 2 days earlier while rushing to answer the phone as she was putting away the groceries.
- Felt unsteady just prior to the fall as she tripped on kitchen mat. She was wearing shoes. Adequate lighting. Was able to get up right way. Uses no assistive walking devices at baseline
- Reports new left arm pain immediately after the fall. Scattered bruising and swelling of Left forearm.
- No Head trauma, LOC, syncope or presyncope, vertigo, visual changes, bowel or bladder incontinence, eating and drinking as usual, no medication changes.
- Prior fall was 1 year ago while rushing down the stairs. No injury was incurred. (The number 1 risk factor for falls is history of prior falls)
- Had many near falls while running barefooted on waxed, wooden floors.
- PMHx:
  - DM neuropathy >loss of proprioception.
  - HTN.
  - Atrial fibrillation.
  - Left hip osteoarthritis.
  - Depression.
  - Insomnia.

2- Drug history:

- Insulin → Hypoglycemia
- Lisinopril Amlodipine → Hypotension
- Warfarin + digoxin.
- Tylenol regular + Tylenol #3 PRN (Contains codeine)
- Citalopram → SSRI → Fall
- Zolpidem Q HS → Sleeping pills → Sleepiness → Fall

Case 1: Fatma

3- Physical Examination:

- Check orthostatic blood pressure
- Perform a visual exam
- Evaluate cognition ,NEUROLOGICAL EXAM.
- Gait Assessment:
- Motor + Balance + Coordination

4- Physical Examination Findings:

- Orthostatic:
  - Sitting: 135/70 (88).
  - Standing: 120/65 (100).
- Eye: Cataract, Visual acuity: 20/40 L and 20/80 R and Corrected with bifocals.
- Gait:
  - Motor: Bilateral Quad weakness, decreased sensation in her feet.
  - Hesitant at start but walks with normal path, walks with extended arms, no wide based gait, no foot drop, heel clears toes of other foot. Slow turn with outstretched hands.
  - Gait Cognition: 1/3 on 3 item recall.
- Timed Up and Go test: 18 Sec.
- Balance: Semi tandem and tandem stances <10 sec, one leg stand< 10 secs.
- Neuro: No Parkinsonian features or focal weakness.
- **What are the possible predisposing 'intrinsic' risk factors and 'extrinsic' precipitants of her fall?**
  - **Multi-factorial:**
    - **Unmodifiable predisposing factors:** Age, female and prior history of falls
    - **Modifiable predisposing and precipitating factors:**
      - Mild weakness + moderate balance impairment.
      - Has cataracts + refractive error +wears bifocals.
      - Takes 4+ medications, including high risk meds Bp meds, digoxin, citalopram and zolpedem.
      - Borderline orthostasis.
      - Cognitive impairment, depression.
      - Unsafe environment and behaviors (kitchen matt, waxed floor. barefoot, rushing).
- **What evidenced-based interventions can you recommend to prevent future falls for this patient?**
  - Multifactorial Assessment With Targeted Intervention.

Case 2: Ahmad

Case Study 2

Mr. Ahmad, 82-year-old woman who recently fell at home (Slipped while in the bathroom) History of two previous falls one coming down stairs four months ago; no serious injury and one on her driveway last year: right distal radial wrist fracture. Now she has a fear of falling and needs your management!

1- Physical Examination

- Height: 155 cm (61 inches) “I used to be 5’ 4” because of kyphosis
- Weight: 54.5 kg (120 lbs)
- Body mass index (BMI): 22.7
- Blood pressure: supine,125/80 mmHg; standing 105/70 mmHg. Decease in 20 systolic and 10 in diastolic consider orthostatic hypotension.
- Rib-to-pelvis: one finger The distance from superior iliac to last rib normally it’s 4 fingers here it’s decreased because of kyphosis.
- Get-up-and-go test (timed): Can’t rise from chair without arm rests; Needs to steady herself before walking; 16 seconds for 3 m. Normal reference: less than 12 seconds, more means 12 seconds he is at increased risk of falling.
- Mild kyphosis. sign of osteoporosis

2- Medications

- Hydrochlorothiazide 25 mg daily
- Amlodipine 10 mg daily
- Ramipril 10 mg daily
- Sertraline 100 mg daily
- Lorazepam 1 mg daily (at bedtime)
- Calcium 500 mg daily
- Multivitamin 1 daily

Case 2: Ahmad

Findings

Patient has recurrent falls, elderly, polypharmacy, mild kyphosis, orthostatic hypotension and delayed go and times test.

Social History

- Lives alone in the community in a small two-storey house (her home of 40 years)
- One supportive daughter
- Non-smoker (never smoked)
- Relatively inactive physically
- Husband died seven years ago
- Retired teacher

Family History

- Mother became very stopped, but no history of fractures
- Father had hypertension

Cognitive Assessment

- Montreal Cognitive Assessment: 27/30 Normal range: 26 and above
- Geriatric Depression Scale (15-item): 4/15. special for Geriatric, Normal range: less than 7.

Past Medical History

- Hypertension
- Depression (after death of her husband seven years ago); no prior episodes
- Insomnia
- Gastroesophageal reflux (GERD)
- Dependent pedal edema
- Cholecystectomy

Functional History

- Independent in all basic activities of daily living. like dressing , toiling, and feeding.
- Daughter assists with weekly shopping; she is independent in all other instrumental daily activities (e.g., medication management, telephone, financial issues , laundry and housekeeping).

Case 2: Ahmad

Case Study 2 Discussion:

- **Discuss the indications for osteoporosis screening in postmenopausal woman?**
  - Post-menopausal woman at 65 years according for us, 60 at Saudi guideline and men at 70 years. We don't have reference for our population for common disease including osteoporosis that's why do it early to detect osteoporosis more. History of use of chronic corticosteroids use. History of fractures. The patients age above 50 with other risk factors we screen it.
- **What impact does the fall history have on Mrs. FB's risk for osteoporosis and future fractures?**
  - Home safety assessment, exercise for resistance and balance, medication reconciliation, medication vitamin D and calcium, hazards assessment.
- **Based on the history and results of investigations (results: BMD Femoral Neck T score = -2.3 Lumbar spine (L1-L4) T-score = -1.9, What is Mrs. FB's risk level for future fracture?**
  - We Calculate the risk of fractures using FRAX score : fracture risk assessment tool , this website calculate it for you: https://www.sheffield.ac.uk/FRAX/tool.aspx?country=9
  - You should know what involved in this calculation to ask about them in history
- **What would you recommend for treatment to reduce Mrs. FB's risk of future fracture?**
  - First-line: Bisphosphonates. All medication has the same effect for preventing fractures.Drink water and sit for at least half an hour to prevent regurgitation.Second-line: injection denosumab.
- **Does Mrs. FB's other medical history raise any possible concerns with pharmacologic therapy for osteoporosis?**
  - Means the side effect of **Bisphosphonates. She does have reflux so maybe she don't tolerate oral so we give iv** Zoledronic acid or denosumab injection every 6 months. She is taking diuretics, all BNZ and SSRI not save for elderly, For hypertension medication deprescribe or taper down the dose especially diuretics and calcium channel blocker. Not depressed and cognitive is normal.

Osteoporosis

Osteoporosis & Osteosarcopenic

- **Osteoporosis:** is the most common bone disease in humans.
- Older persons are at higher risk of osteoporotic fractures that also result in poor quality of life, disability, loss of independence, institutionalization, and higher mortality.
- Osteoporosis shares a distinct pathophysiologic relationship with sarcopenia, an age-related disease comprising declines in muscle mass, strength, or function. The combination of these two diseases is known as **osteosarcopenia.**
- **Osteosarcopenia** was proposed to describe those patients with a concomitant occurrence of osteoporosis and sarcopenia who have been identified as at **higher risk of poor outcomes.**
- Although the individual risk of fracture is greatest in those with osteoporosis, **an absolute majority of fractures occur in those with low bone mineral density (BMD), identified as osteopenic, rather than in those with osteoporosis.**
- Recent studies of Australian persons with falls reported that **40%** of this high-risk population could be **classified as osteosarcopenic**.
- The most common osteoporotic fractures are of the vertebral bodies (27%). Other common sites due to minimal trauma include fractures of Wrist (19%), Hip (14%) and Pelvis (7%). **The lifetime risk of fractures at any of these sites in women is approximately 40%.**

Morbidity & Mortality Of Osteoporosis & Osteosarcopenic

- Osteoporotic fractures are associated with increased morbidity, loss of independence, and a 20% increase in mortality at 1 year.
- Hip fractures carry the greatest risks and are associated with between 8% and 36% increased mortality at 1 year.

Osteoporosis & Osteosarcopenic Presentations

- Osteoporosis is an **insidious** disease, and symptoms are never present **until the point of fracture.**
- **Osteosarcopenic persons can experience weakness, weight loss, decline in physical function, falls, and falls-related injuries.**
- Osteosarcopenia should be suspected in men older than 60 years and postmenopausal women older than 50 years, especially in those with the presence of risk factors, previous history of falls or fractures, or suspicion of secondary causes.

DXA & Bone Mass Density (BMD)

- **BMD assessment is the key diagnostic tool for osteoporosis,** and the most widely used tool, recommended by the National Osteoporosis Foundation (NOF) and WHO.
- **The indications for BMD assessment vary, but in general, assessment should be considered in these groups:**
  - Women 65 years and older and men 70 years and older.
  - Younger postmenopausal women and women in menopausal transition.
  - Men age 50 to 69 years with risk factors for fracture
  - Adults who have a fracture age 50 years or greater
  - Adults with a condition (eg, rheumatoid arthritis) or taking medications (eg, glucocorticoids) associated with low bone mass or bone loss.
- In those with a diagnosis of osteoporosis, assessment of BMD should not delay treatment.

Osteoporosis and Osteopenia Based on BMD By DEXA Scan

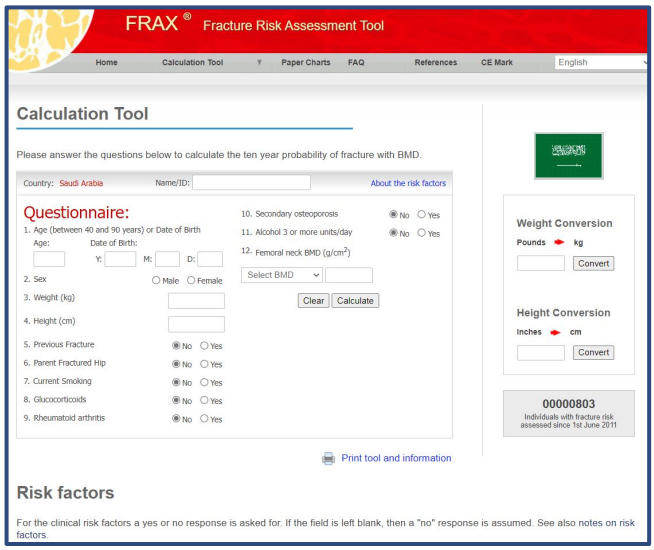
Table 1. Definition of Osteoporosis and Osteopenia Based on BMD

Classification	BMD at the femoral neck	T-Score
Normal	<1 SD of the mean level for young adult reference population	T-score at –1.0 and above
Osteopenia	Between 1.0 and 2.5 SDs below the mean level for young adult reference population	T-score between –1.0 and –2.5
Osteoporosis	2.5 SDs or more below the mean level for young adult reference population	T-score at or below –2.5
Severe or established osteoporosis	2.5 SDs or more below the mean level for young adult reference population	T-score at or below –2.5 with one or more fracture

- DEXA scores are reported as **T-scores and Z-scores.**
- **The T-score** is a comparison of a person's bone density with that of a **healthy** 30-year-old **of the same sex.**
  - A T-score within 1 SD (+1 or -1) of the young adult mean indicates normal bone density.
  - A T-score of 1 to 2.5 SD below the young adult mean (-1 to -2.5 SD) indicates low bone mass.
  - A T-score of 2.5 SD or more below the young adult mean (more than -2.5 SD) indicates the presence of osteoporosis.
- **The Z-score** is a comparison of a **person's bone density with that of an average person of the same age and sex.**

Risk Calculation Tools (FRAX)

- **All individuals undergoing assessment for osteoporosis should have their fracture risk calculated using a validated tool.**
- Calculators integrating several risk factors that provide a 10-year fracture risk calculation include the **FRAX**.
- **The FRAX is the most widely used calculator** with models covering 80% of the global population.
- The FRAX also incorporates the **risk of mortality** into the risk of fracture calculation.
- It **can be applied without an assessment of BMD** and can predict risk of fractures comparably with the use of BMD alone. Therefore it is appropriate to use the FRAX in calculating fracture risk for individuals in settings where BMD assessment techniques are not available. Thw tool is available at www.shef.ac.uk/FRAX



General Management

- Vitamin D and calcium, participation in weight bearing and muscle-strengthening exercise, addressing modifiable risk factors (smoking and alcohol), pharmacologic treatment of osteoporosis, and management of falls risk factors.

Pharmacologic Management

- **NOF recommends that therapy be initiated in an older adult meeting any of these criteria:**
  - Minimal trauma vertebral or hip fracture.
  - Hip or lumbar spine T-score −2.5 or less on DXA.
  - or Low bone mass and a **FRAX 10-year fracture risk of the hip 3% or greater or of any major osteoporosis-related fracture 20% or greater.**
- Treatment needs to be individualized through consideration of the risk assessment using a validated fracture risk calculator.

Pharmacologic Agents for the Treatment of Osteoporosis

Table 3. Pharmacologic Agents for the Treatment of Osteoporosis

Class	Drug name	Mechanism of action	Formulation, treatment dosage	Patients studied	Efficacy	Key side effects/Precautions
Bisphosphonate	Alendronate (Fosamax, Binosto, generic)	Inhibition of osteoclast activity	70 mg weekly orally	Men and postmenopausal women with osteoporosis Corticosteroid-induced osteoporosis	Reduced hip and vertebral fractures by approx. 50% over 3 y[45]	Contraindicated eGFR <35 mL/min Common: Gastrointestinal Uncommon: Eye inflammation Rare: ONJ (highest risk in patients with cancer), atypical femoral fracture (>5 y use)
	Ibandronate (Boniva, generic)		150 mg monthly tablet or 3 mg intravenously every 3 mo		Reduced vertebral fractures by approx. 50% over 3 y[46]	
	Risedronate (Actonel, Atelvia, generic)		35 mg weekly, 75 mg on 2 consecutive days monthly, or 150 mg monthly orally		Reduce vertebral fractures by 41%-49% and nonvertebral fractures by 36% over 3 y.[47] Approved for use in patients on glucocorticoid therapy.[48]	
	Zoledronic acid (Reclast, Aclasta)		5 mg intravenous infusion yearly		Reduced vertebral fractures by 70%, hip fractures by 41%, and nonvertebral fractures by 25% over 3 y[49]	
Synthetic parathyroid hormone	Teriparatide (Forteo)	Anabolic activity resulting in new bone formation	20 μg daily subcutaneous injection for maximum 24 mo	Men and women with osteoporosis Corticosteroid-induced osteoporosis	Reduced risk of vertebral fractures by 65% and nonvertebral fractures by 53% after 18 mo[50]	Caution or avoidance in those at increased risk of osteosarcoma; Paget's disease, previous radiation therapy, hypercalcemia, skeletal metastases, or those with a history of prostate cancer prostate cancer, lymphoma. Common: legs cramps, nausea, and dizziness. Increased risk of osteosarcoma shown in rats
Parathyroid hormone-related protein (PTHrP) analog	Abaloparatide (Tymlos) [approved in some locations]		80 μg daily subcutaneous injection for maximum 24 mo	Postmenopausal women with osteoporosis	Reduced risk of vertebral fractures by approx. 57%[51]	

(Continues)

Table 3 (Contd.)

Class	Drug name	Mechanism of action	Formulation, treatment dosage	Patients studied	Efficacy	Key side effects/Precautions
Biologic: RANK-ligand inhibitor	Denosumab (Prolia)	Inhibits coupling of osteoclasts and reduces bone resorption	60 mg every 6 mo subcutaneous injection	Men with low bone mass and postmenopausal women Corticosteroid-induced osteoporosis	Reduced vertebral fractures by 68%, hip fractures by 40%, and nonvertebral fractures by 20% over 3 y[52]	Rapid bone loss after cessation Uncommon: Hypocalcemia, cellulitis, skin rash Rare: Weak immunosuppressant with increased risk of bacterial infections, ONJ, atypical femoral fracture
Hormone Replacement Therapy (HRT)	Various	Maintenance estrogen levels Prevents bone resorption	Oral or transdermal in wide variety of formulations	Postmenopausal women or women with hysterectomy	WHI study 5 y HRT reduced vertebral fractures by 34% and other fractures by 23%[53]	Increased risk of myocardial infarction, breast cancer, pulmonary emboli, deep vein thrombosis No increase in cardiovascular disease if starting within 10 y of menopause
Selective estrogen receptor modulators (SERMs)	Raloxifene (Evista)	Estrogen agonist in bone preventing resorption	60 mg daily orally	Postmenopausal women	Reduced risk vertebral fractures by approx. 30% in patients with prior vertebral fracture, and by 55% in those without a prior vertebral fracture over 3 y[54]	Uncommon: Leg cramps, deep vein thrombosis
	Bazedoxifene (Duavee)		0.45 mg/20 mg daily orally		Reduced incidence of vertebral fracture by approx. 30% at 3 y[55]	Uncommon: muscle spasms, gastrointestinal complaints, dizziness, neck pain Uncommon: deep vein thrombosis

Abbreviations: eGFR, estimated glomerular filtration rate; ONJ, osteonecrosis of the jaw; WHI, women's Health Initiative.

Summary Of Fall In The Elderly

- It is common in elderly.
- The cause is always **multifactorial**.
- The most important risk factor is **a previous fall**.
- The prevention is **Multifactorial Assessment with Targeted Intervention.**
- We need to know the risk of falls in **any patient** in the hospital **at all times.**
- **Falls are preventable.**

Osteoarcopenic

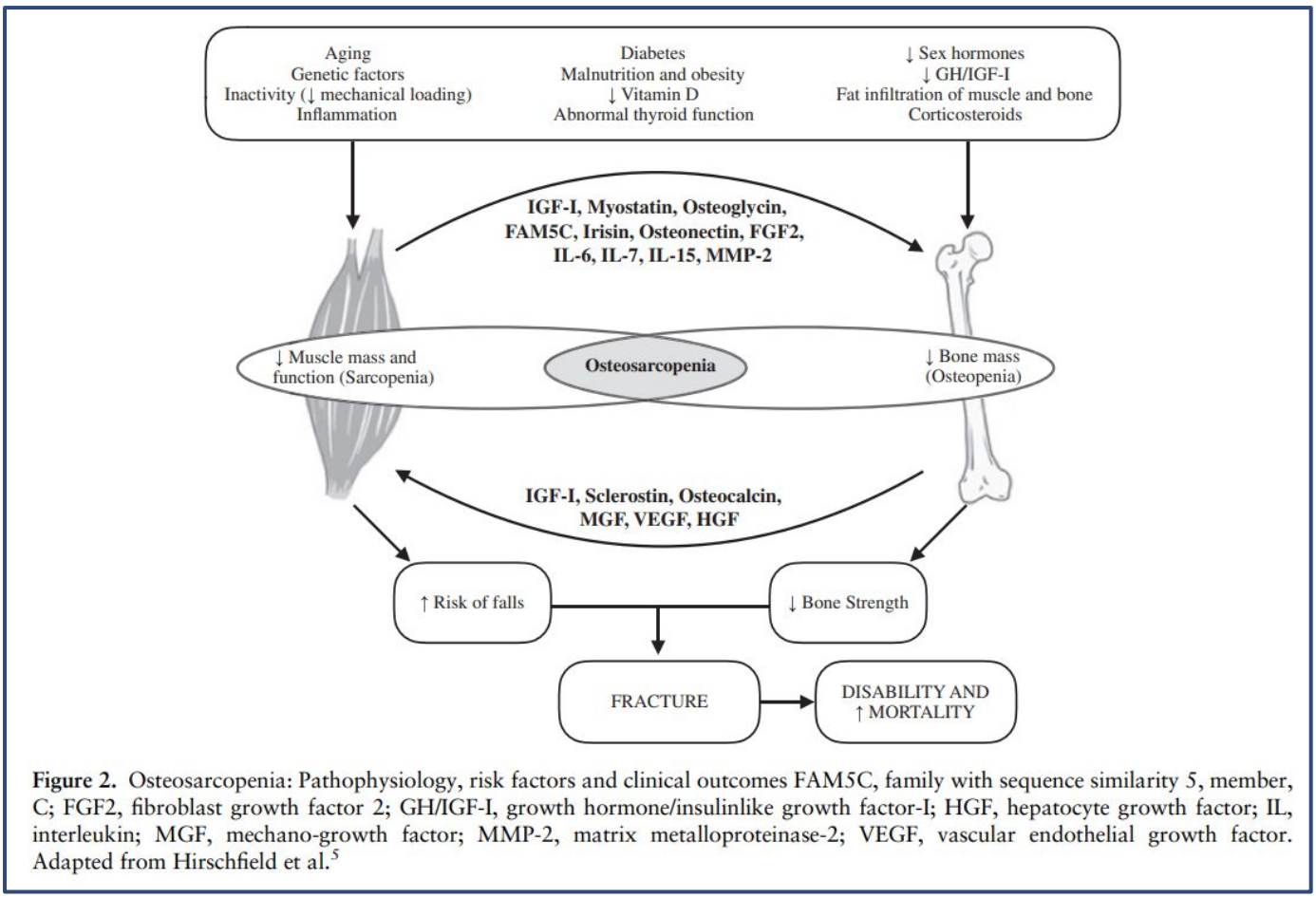


Figure 2. Osteosarcopenia: Pathophysiology, risk factors and clinical outcomes FAM5C, family with sequence similarity 5, member, C; FGF2, fibroblast growth factor 2; GH/IGF-I, growth hormone/insulinlike growth factor-I; HGF, hepatocyte growth factor; IL, interleukin; MGF, mechano-growth factor; MMP-2, matrix metalloproteinase-2; VEGF, vascular endothelial growth factor. Adapted from Hirschfield et al.[5]

Lecture Quiz

Q1: What is the most common place for falls?
A- Outside but near the house
B- Away from the house
C- Inside the house
D- No difference in falls incidence among community dwelling elderly

Q2: A 78 Y/O female presents to the emergency department complaining of right buttock and hip pain after she fell. She denies loss of consciousness. Her daughter was at the scene quickly and found the patient awake, alert and moving all extremities. Her vital signs are normal. Other than right hip tenderness, her examination is unremarkable. Which of the following is most likely to assist you in determining the cause of her fall?
A- ECG
B- CT Scan
C- Serum lipids
D- More history

Q3: regarding falls risk assessment among elderly, which one of the following intervention would most likely reduce the risk of falls:
A- Multivitamins
B- Tailored exercise program
C- Limiting physical activity
D- USe of hip protector

Q4: A 70-year-old diabetic male presents to your clinic for medications refill, when you asked about history of falls, he stated that he had fallen once during the past 12 months. Which of the following would help you in an assessment of this patient's future risk of fall?
A- Rapid alternating hand movement
B- Pulsus paradoxus
C- Spine flexibility test
D- Functional reach test

Q5: 74 - year-old woman with a history of recurrent falls is seen in your clinic with her daughter . She has been following with your clinic for dyslipidemia, type 2 diabetes mellitus and depression. She takes metformin, linagliptin, simvastatin and fluoxetine. Her physical examination is remarkable for decreased proximal lower-extremity muscle strength. Which drug from her medication list is most likely lead to increase her risk of falls ?
A- Metformin
B- Fluoxetine
C- Linagliptin
D- Simvastatin

Q6: 77-year-old man came with his son for a general checkup (follow-up). The son is concerned with his father risk for falling since he can not walk for long distances. Which of the following tests can be used to assess his risk?
A- Timed up and go test
B- Straight line
C- Sit down and stop test
D- Two hands one foot test

Q7: Geriatric patient with history of repeated falls upon standing up from setting position in the bathroom. The patient has osteoarthritis and on paracetamol and codeine. Which of the following is the cause of her fall?
A- Vasovagal
B- Bathroom is not well-lighted
C- Side effect of codeine
D- Worsening of osteoarthritis pain

Answers: Q1:C | Q2:D | Q3:B | Q4:D | Q5:B | Q6:A | Q7:A

The Team leaders would like to thank all the participating members for their efforts and SPECIAL Thanks! to our GOLDEN members
Hashem Bassam, Abdulaziz AlGhamdi & Mohammed Alhumud
for their Enormous efforts:

- ★ **Hashem Bassam**
- ★ **Mohammed Alhumud**
- Nawaf Albhijan
- Mohammed Ajarim
- Ahmed Alajlan
- Muaath AlJehani
- Khalid Alharbi
- Faisal Alzahrani
- Omar Alotaibi
- Suhail basuhail
- Omar alghamdi
- Abdulrahman Alsayed
- Jehad Alorainy
- Mohammed Alshalan
- Sultan Alsowiegh

- ★ **Abdulaziz AlGhamdi**
- Mohammed Alshoieer
- Khayyal Alderaan
- Saud Alaqeel
- Bader Alhammad
- Abduallah Alghamdi
- Bader Aldhafeeri
- Abdulaziz Alangari
- Hussam Almutairi
- Mohannad Alqarni
- Tariq Aloqail
- Naif Al-Husainy
- Mashal Aba Alkhail
- Mohammed K Alqahtani
- Saud Bin Queid

PRIMARY HEALTHCARE TEAMWORK

THANKS!!

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Send us your feedback:
We are all ears!