WE ALL FALL DOWN

A Primer in Gait and Balance

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Key points

- Lots of elderly and more all the time
- Magnitude and implications of *falling elders*
- Tools to assess gait and balance in 60 seconds
- Evidence based techniques to decrease fall risk
- Coumadin use in patients who fall

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Falls

Definition: coming to rest inadvertently on the ground or at a lower level

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WHY STUDY FALLS?

- Falls are common

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WHY STUDY FALLS?

- Falls are common
- Falls are associated with functional disability

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WHY STUDY FALLS?

- Falls are common
- Falls are associated with functional disability
- Falls may be preventable

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EPIDEMIOLOGY

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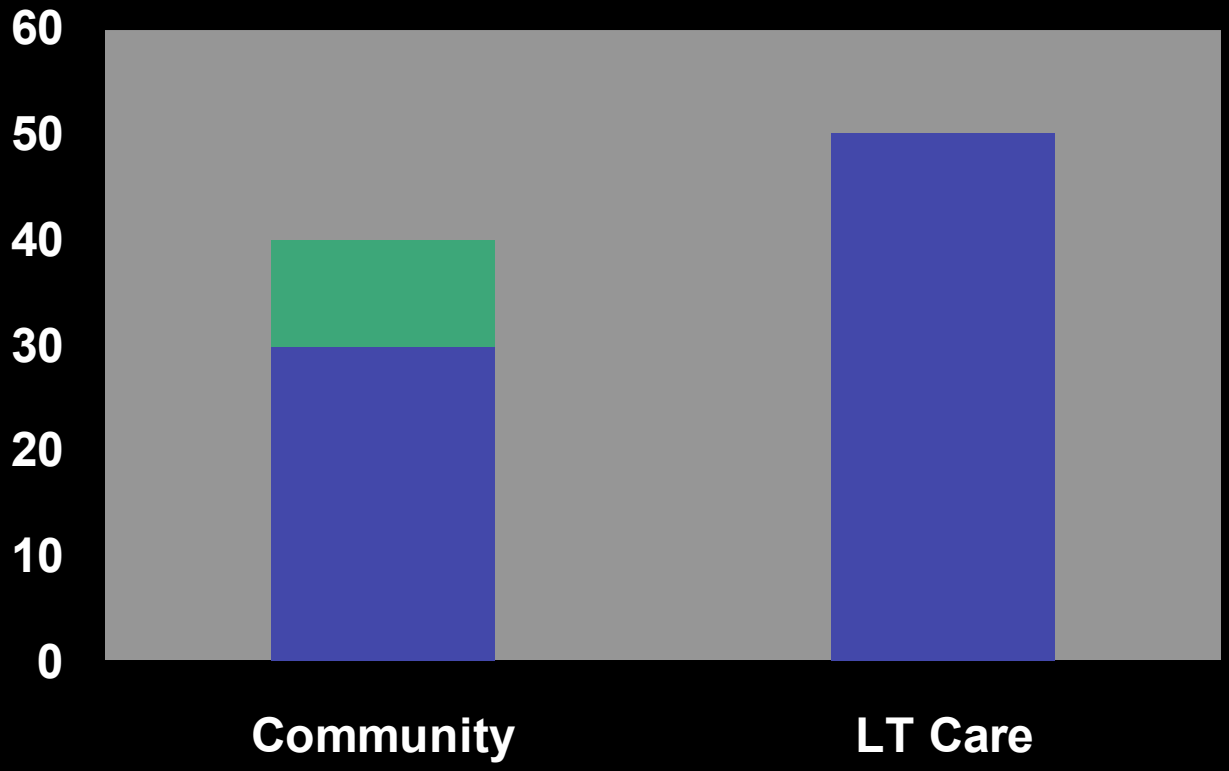
EPIDEMIOLOGY OF FALLS



Each year 30%–40% of community-dwelling persons aged ≥65, and about 50% of residents of long-term- care facilities, experience falls

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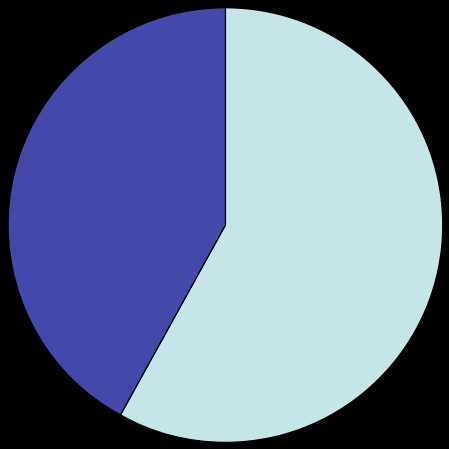
EPIDEMIOLOGY OF FALLS

- Annual incidence of falls is close to 60% among those with history of falls
- Complications of falls are the leading cause of death from injury in persons aged ≥65



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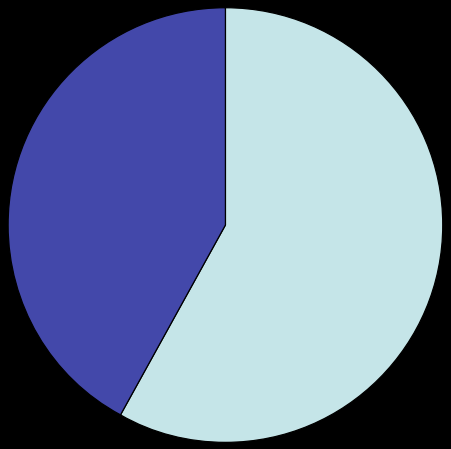

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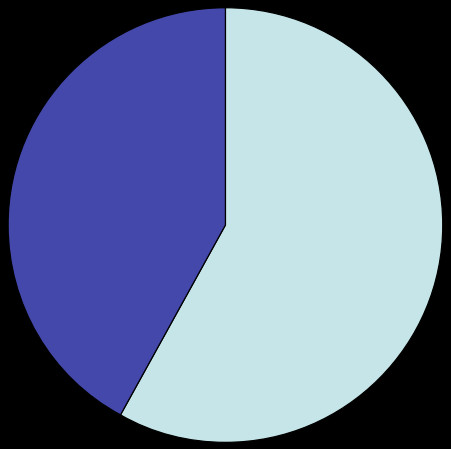

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In the next 17 seconds, an older adult will be treated in a hospital ED for injuries related to a fall.

In the next 30 minutes, an older adult will die from injuries sustained in a fall.

COST OF FALLS

- ↑ ED visits (8% of people > 70 annually for fall related injury)
- ↑ Hospitalizations (33% of these seen in ED)

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COST OF FALLS

- In 2000, falls among older adults in U.S. cost over $19 billion

  or $23.6 billion in 2005 dollars.

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1100 community dwelling individuals over the age of 71 followed for three years

Patients were assigned to four categories:

- ✓no falls
- ✓one fall without serious injury
- ✓two or more falls without serious injury
- ✓at least one fall causing serious injury

N Engl J Med 1997 Oct 30;337(18):1279-84

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1100 community dwelling individuals over the age of 71 followed for three years

- One fall
- Two or more falls
- At least one injurious fall

- ➢ decline in ADL and IADL
- ➢ decline in social activities
- ➢ decline in physical activity

N Engl J Med 1997 Oct 30;337(18):1279-84

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1100 community dwelling individuals over the age of 71 followed for three years

The risk of long-term admissions to nursing homes (compared with those with no falls)

with one noninjurious fall – RR 3.1

two or more noninjurious falls -- RR 5.5

or at least one fall with serious injury -- RR 10.2

N Engl J Med 1997 Oct 30;337(18):1279-84

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RISK FACTORS

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CONDITIONS THAT CONTRIBUTE TO GAIT DISORDERS

- Degenerative joint disease

Osteoarthritis of the knee may affect:

- mobility
- ability to step over objects and maneuver,
- postural stability (tendency to avoid complete weight bearing on a painful joint)

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CONDITIONS THAT CONTRIBUTE TO GAIT DISORDERS

- Intermittent claudications
- Postural hypotension

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CONDITIONS THAT CONTRIBUTE TO GAIT DISORDERS

- Acquired musculoskeletal deformities
- Impairments following stroke

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CONDITIONS THAT CONTRIBUTE TO GAIT DISORDERS

- Dementia
- Fear of falling

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Gait Speed and Survival

- 34,485 community-dwelling adults > 65 with baseline gait speed data
- mean age of 73.5
- followed 6 to 21 years

Gait speed in increments of 0.1 m/sec was highly correlated with survival.

JAMA 2011;305:50-58

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CAUSES OF FALLS BY OLDER ADULTS

1. Rarely due to a single cause
2. May be due to the accumulated effect of impairments in multiple domains

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CAUSES OF FALLS BY OLDER ADULTS

3. Complex interaction of:
   - Intrinsic factors (eg, chronic disease)
   - Challenges to postural control (eg, changing position)
   - Mediating factors (eg, risk taking)

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CAUSES: INTRINSIC

- Age-related decline
  - Changes in visual acuity, depth perception, contrast sensitivity, and dark adaptation
  - Proprioceptive system, vestibular system
- Chronic disease
  - Parkinson's disease
  - Osteoarthritis
  - Cognitive impairment
- Acute illness

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CAUSES: MEDICATION USE

- Specific classes, eg:
  - Benzodiazepines
  - Antidepressants
  - Antipsychotic drugs
- Recent medication dosage adjustments
- Total number of prescriptions

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Risk factors for injurious falls: a prospective study

1 in 10 falls left the faller unable to get up for at least 5 minutes, and

1 in 4 falls caused subjects to limit their activities.

J Gerontol 1991 Sep;46(5):M164-70

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Risk factors for injurious falls: a prospective study

The risk of major injury was increased
(age- and sex-adjusted odds ratio: 5.9,
95% confidence interval: 2.3-14.9)

in falls associated with loss of consciousness compared to nonsyncopal falls.

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Most falls are not associated with loss of consciousness

Cerebral white matter lesions, gait, and the risk of incident falls

- Prospective population-based study
- 294 independently mobile mean age 72.3
- Incident falls over a 12-month period.
- WMLs are strong risk factors for falls in the general older population

Stroke. 2009 Jan;40(1):175-80.

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EVALUATION

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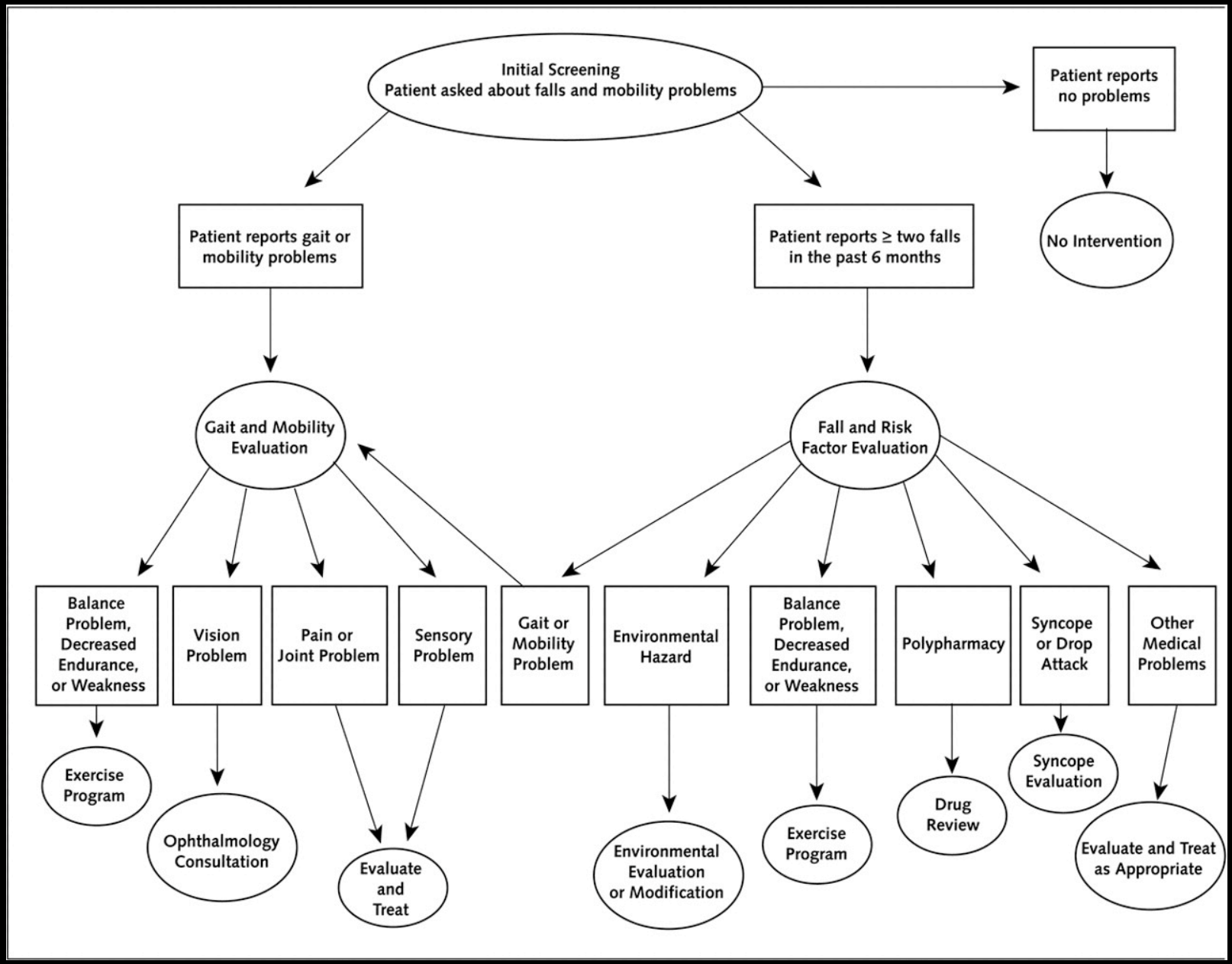

Ann Intern Med 2001;135:686-693

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FALLS ASSESSMENT: HISTORY

- ✓Ask about falls in past year
  - Single fall: check for balance or gait disturbance
  - Recurrent falls: perform complete falls evaluation

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FALLS ASSESSMENT: PHYSICAL EXAMINATION

- ✓ Blood pressure and pulse, both supine and standing
- ✓ Vision screening
- ✓ Musculoskeletal exam
- ✓ Neurologic exam

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FALLS ASSESSMENT: LABORATORY

- ✓CBC, Renal, glucose: can exclude anemia, dehydration, or hyperglycemia
- ✓Carotid sinus massage with continuous heart rate and BP monitoring: can uncover carotid sinus hypersensitivity
- ✓Other tests based on history & physical exam: (echocardiography, neuroimaging, radiographic studies of spine)

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FALLS ASSESSMENT: LABORATORY

- ✓Holter monitoring: no proven value for routine evaluation

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TIMED UP AND GO [TUG]

Record the time it takes a person to:

1. Rise from a hard-backed chair with arms
2. Walk 10 feet (3 meters)
3. Turn
4. Return to the chair
5. Sit down

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TIMED UP AND GO [TUG]

- Most adults can complete in 10 sec
- Most frail elderly adults can complete in 11 to 20 sec
- ≥14 sec = ↑ falls risk
- >20 sec → comprehensive evaluation
- Results are strongly associated with functional independence in ADLs

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STANDING BALANCE TEST

1. Side-by-side stance
2. Semi-tandem stance
3. Tandem stance
4. Standing on 1 foot

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FUNCTIONAL REACH TEST

1. Feet comfortable distance apart
2. Yardstick at humeral head
3. Shoulder at ~ 90° flexion.
4. Reach forward as far as you can along yard stick.

   (No touching yardstick or any surface, no stepping.)

Score < 6" predictive of falls; > 10" OK

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Tinetti Assessment Tool: Balance

Initial Instructions: Subject is seated in a hard, armless chair. The following maneuvers are tested.

Task Description of Balance Possible Score

1. Sitting Balance
2. Arises
3. Attempts to arise
4. Immediate standing balance
5. Standing Balance
6. Nudged
7. Eyes closed
8. Turning 360 degrees
9. Sitting Down

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Tinetti Assessment Tool: Gait

Initial Instructions: Subject stands with examiner, walks down hallway or across the room, first at "usual" pace, then back at "rapid, but safe" pace (using usual walking aids).

10. Initiation of gait
11. Step length and height
12. Step Symmetry Right and left step length not equal
13. Step Continuity
14. Path (estimated in relation to floor tiles, 12-inch diameter; observe excursion of 1 foot over about 10 feet of the course).
15. Trunk sway or uses walking aid
16. Walking Stance

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Tinetti Assessment Tool: Gait

The maximum score for the gait component is 12 points.
The maximum score for the balance component
is 16 points.

The maximum total score is 28 points.

In general, patients who score below 19 are at a high risk for falls.

Patients who score in the range of 19-24 indicate that the patient has a risk for falls.

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PREVENTION

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FALL RISK REDUCTION

- ✓ A program of muscle strengthening and balance retraining, individually prescribed at home by a trained health professional (14 trials, 2364 participants, 17%)

SOE – A

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FALL RISK REDUCTION

- ✓ A 15-week Tai Chi group exercise intervention (1 trial, 200 participants, 35%)

SOE – A

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FALL RISK REDUCTION

- ✓ Home hazard assessment and modification that is professionally prescribed for older people with a history of falling
  (2 trials, 491 participants, 44%)

SOE – A

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FALL RISK REDUCTION

- ✓ Withdrawal of psychotropic medication (1 trial, 93 pts, 66%)

SOE – B

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FALL RISK REDUCTION

- ✓ Cardiac pacing for fallers with carotid sinus hypersensitivity (1 trial, 175 pts, 5%)

SOE – B

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FALL RISK REDUCTION

- ✓ Vitamin D supplementation

Vitamin D supplementation appears to reduce the risk of falls among ambulatory or institutionalized older individuals with stable health by more than 20%.

SOE – A

JAMA 2004 Apr 28;291(16):1999-2006

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FALL RISK REDUCTION

- ✓ Assistive devices

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FALL RISK REDUCTION

- ✓ Footwear

Athletic and canvas shoes (sneakers) were the styles of footwear associated with lowest risk of a fall. Going barefoot or in stocking feet was associated with sharply increased risk, even after controlling for measures of health status (adjusted odds ratio=11.2)

SOE – B

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Falls and Blood Thinners

- The absolute risk of spontaneous ICH among 70-year-old subjects averages 0.15 percent/year.

- In those carefully, therapeutically anticoagulated with Coumadin (warfarin) the risk of ICH is increased to 0.3 to 0.8 percent/year.

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Falls and Blood Thinners

- This small absolute increase in ICH is generally offset by larger reductions in ischemic events.
- Even when taking anticoagulants, the risk of subdural hematoma is very low.

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Falls and Blood Thinners

- People with an average risk of stroke from atrial fibrillation (5 percent per year in the absence of anticoagulation) must fall approximately 300 times in a year for the risks of anticoagulation to outweigh its benefits.

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SUMMARY

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WE ALL FALL DOWN

- Falls among the elderly are common
- Falls predict disability and institutionalization
- Falls lead to death
- Falls are preventable

- Standing balance test – 40 seconds
- Timed Up and Go test – 20 seconds

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