

The Art and Science of Fall Prevention

Focus 2012

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# Understanding Falls and Falls Prevention

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# Objectives

At the end of this presentation you will be able to:

1. Understand the scope of the problem
2. Recognize falls as a problem in diverse health care settings
3. Discuss injuries and cost associated with injuries due to falls
4. Value current and emerging falls prevention strategies

Have you  
experienced a fall?



# Fall Facts



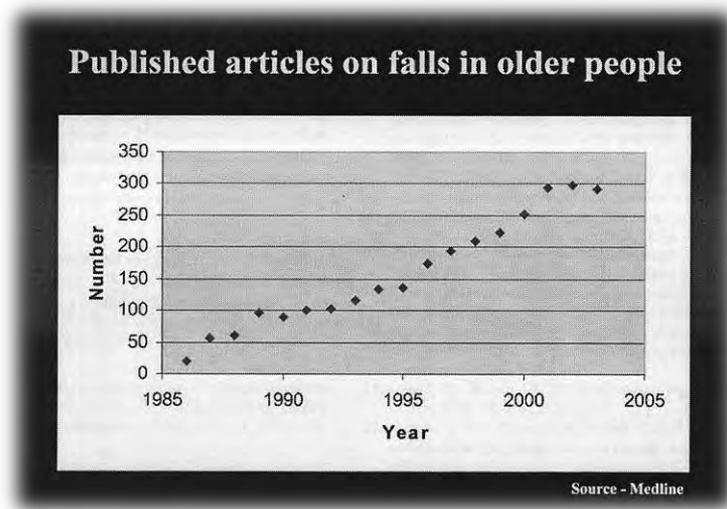
- 20-33% community dwelling seniors fall at least once every year
- 27-36% homecare services recipients fall (Fletcher & Hirdes, 2002, Cesari et al., 2002)
- Up to 50 % of long-term residents fall each year, many fall multiple times
- Highest rates of falls are 60% among old-old (Speechley et al, 2005) and the oldest old (Fleming et al., 2008; Linattiniemi et al., 2009)
- Falls are leading cause of hospital admissions (CIHI, 2002)
- 32% of in-hospital safety incidents in UK are related to falls (Oliver et al., 2008)
- 90% of in-hospital accidents are falls related (Goodwin & Westbrook, 1993)

# Fall Facts (Cont.)

- Falls are the second leading cause of unintentional injury in Canada with 2,225 deaths, 105,565 hospitalizations, and 883,676 non-hospitalizations per year (Economic Burden of Injury in Canada report, SMARTRISK, 2009)
- Residents of LTC have highest incidence of falls and fall-related injury (Rubenstein, 2006)
- Falls account for 40% of all injury-related deaths (WHO, 2007)
- 12-40% people die within a post-fracture year
- Falls cause psychological problems: post fall anxiety syndrome or fear of falling, self-imposed activity restrictions, loss of confidence, diminished self esteem, low self-efficacy, functional decline, depression, helplessness, social isolation, loss of independence ...
- Falls contribute to profound decline in quality of life



# Research about falling



(Close, 2005)

- In 2011 over 6,000 references (700 reviews) on unintentional falls in older adults
- Theory: Falls are multi-factorial (multiple causes)
- There are many risk factors associated with falls
- Some prevention strategies work (35%)

Biomechanics  
Epidemiology  
Geriatrics  
Gerontology  
Kinesiology  
Motor Control  
Nursing  
Rehabilitation  
Physiology  
Psychology  
Public health  
Sociology  
Tribology

# What causes Falls?

- We don't know!
- Multifactorial Risk Factor Theory of Falling:  
“Most falls in older adults are the result of the gradual accumulation of both normal age-related and specific disease-related declines in the key systems underlying postural stability “ (Speechley 2011, p. 24)
- We know a lot about RISK FACTORS (400)
  - Intrinsic - person related
  - Extrinsic - environment related
  - Behavioral

# Intrinsic Risk Factors



## IMMUTABLE

- Advanced age
- Gender (female)
- Ethnicity
- Cognition (dementias)

## MANAGABLE

- **Chronic illness** (incontinence, Parkinsonism, stroke, hypertension, arthritis, peripheral neuropathy...)
- **Sensory deficits** (vision, vestibular, neuropathy, proprioception, somatosensory)
- **Reduced redundancy of physiological systems**

## CHANGEABLE

- **Acute illness**
- **Depression**
- **Muscle weakness** (sarcopenia)
- **Dizziness** (syncope, postural hypotension)
- **Foot problems**
- **Fear of falling** (both cause and effect)
- **History of falling** (risk marker, not a factor)

# Behavioral Risk Factors

- Risk taking
- Balance between risks and personal freedoms
- Inattention
- Poor diet
- Diminished physical activity
- Fear of falling
- Alcohol use



# Extrinsic Risk Factors



- Architecture
- Environmental design
- Obstacles (clutter, pets, cords, carpets)
- Lighting
- Slippery floors
- Footwear
- Uneven pavements, stairs, lack of handrails
- Unmarried/living alone
- Polypharmacy
- Weather (snow, ice, wet leaves)
- Socioeconomic status (access to health, low income, education, housing)



# Mechanism of Falling

## Causal Pathways

- Balance
  - posture (static)
  - gait (dynamic)
- Perturbation
- Failure to rapidly regain balance
- Only when internal balance mechanisms are compromised external (environmental) hazards become a problem
- Temporal sequencing
  
- **Balance and Gait** are proximal systems through which distal risk factors combine



# Consequences of Falls - Injuries

- The consequences range from: no injury; minor, moderate and serious injuries, and death (Hitcho et al., 2004; Krauss et al., 2005)
- 50% fallers experience a minor injury
- Varying rates of serious injuries (fracture, dislocation, laceration requiring suture): 3% (O'Laughlin et al., 1993), 6% (Nevitt et al., 1991), 11% (Tinetti et al., 1988), 10-15% (Australian Commission on Safety and Quality in Health Care, 2009)
- Falls account for 18-49 % of emergency department visits (Ball et al., 2000; Davies & Kenny, 1996)
- 80% of all injury-related admissions to hospital are due to falls (Kannus et al., 2006, Peel et al., 2002)

# Consequences of Falls - Injuries

- Hip fracture rates 1,000/year are: community 5.0; group housing 11.3; residential homes with low care 36.1 and nursing homes 17.2 (Brennan et al., 2003)



- Fall related traumatic brain injuries account for 46% of fatal falls among older adults (Stevens et al., 2006)



# Consequences of Falls - Cost

- Indirect - societal productivity losses of fallers and family caregivers
- Direct Cost – treatment, rehab, medications
- Relevant economic burden regardless of medical system
- 0.85-1.5% of total health care expenditures in North America (Heinrich et al., 2009); 0.07% - 0.20% of the Gross Domestic Product
- Mean hospitalization cost: USD \$5,654 - \$42,840 (Heinrich et al., 2009)
- Direct cost high for fractures of females in hospital and LTC
- The most costly type of unintentional injury in Ontario: \$1.9 billion (more than motor vehicle collisions!)
- Need to calculate a UNIT of measure for serious injurious falls



# Cost of serious injuries due to falls

- Purpose: Estimate the cost of serious injurious falls in a Canadian acute care hospital
- Objectives:
  1. Estimate the total cost and length of stay (LOS) for patients who fell during the hospital stay
  2. Compare costs and LOS of fallers and non-fallers
- Data sources:
  - Risk Management database: number and severity of falls
  - Case Costing database: cost records for index and matched control cases
  - Chart review: Identify services related to falls

# Cost of serious injuries due to falls

- Study Period: 2.5 years (April 2005 – October 2007)

- Injury

1.	None	1,184	
2.	Minimal	1,418	
3.	Moderate	132	
4.	Serious	37	TOTAL: 2,771falls

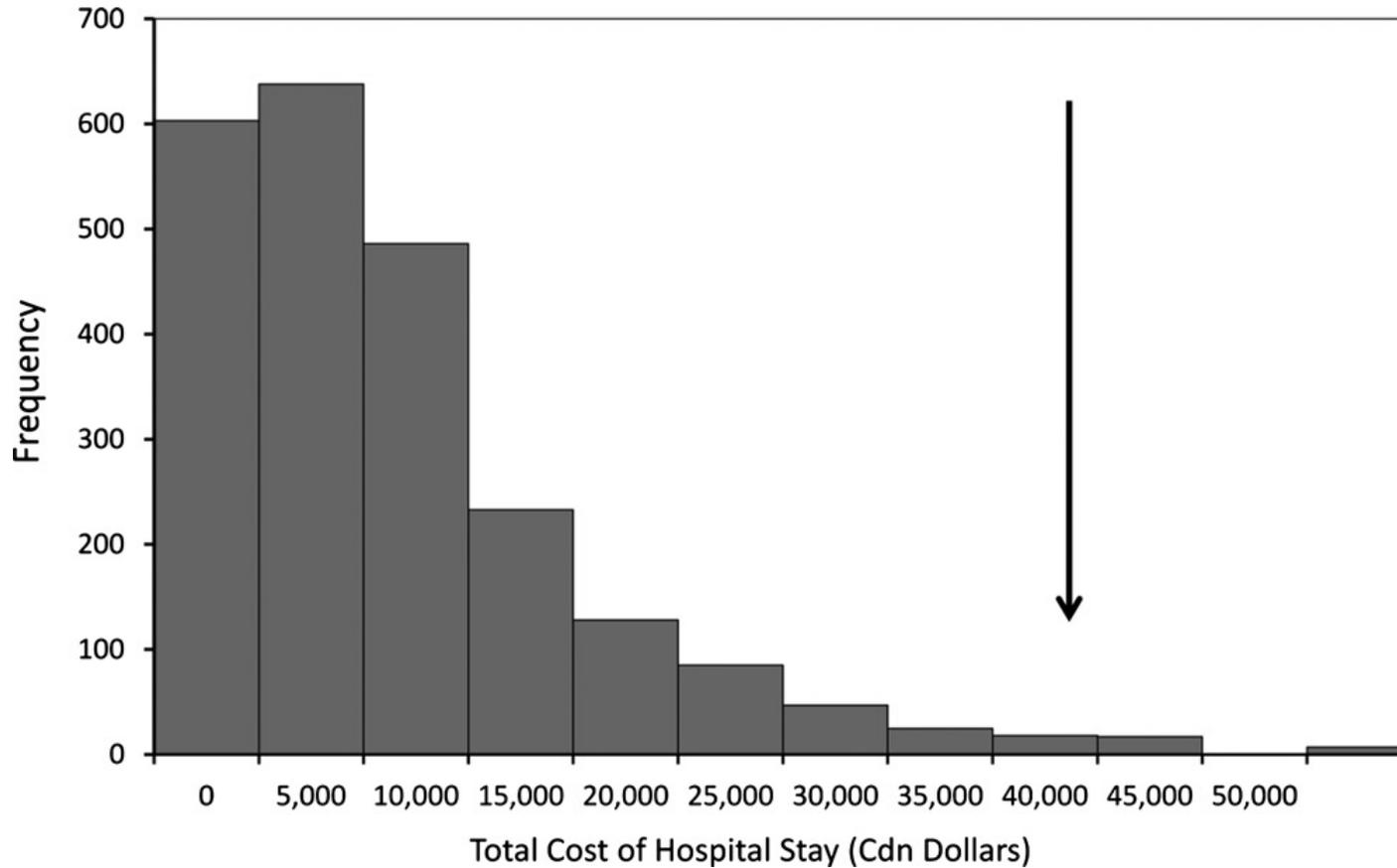
- Fallers: 37 serious injuries, gender: F=23, M=14; mean age: 74 (range 35-93)
- Matched controls: 2,113 (mean=63/case), matched by age (+/- 5 years), gender and most responsible diagnosis. Adjusted for Charlson's Comorbidity Index

# Estimating the Cost of Serious Injurious Falls in a Canadian Acute Care Hospital (Zecevic et al. 2012 Canadian Journal on Aging)

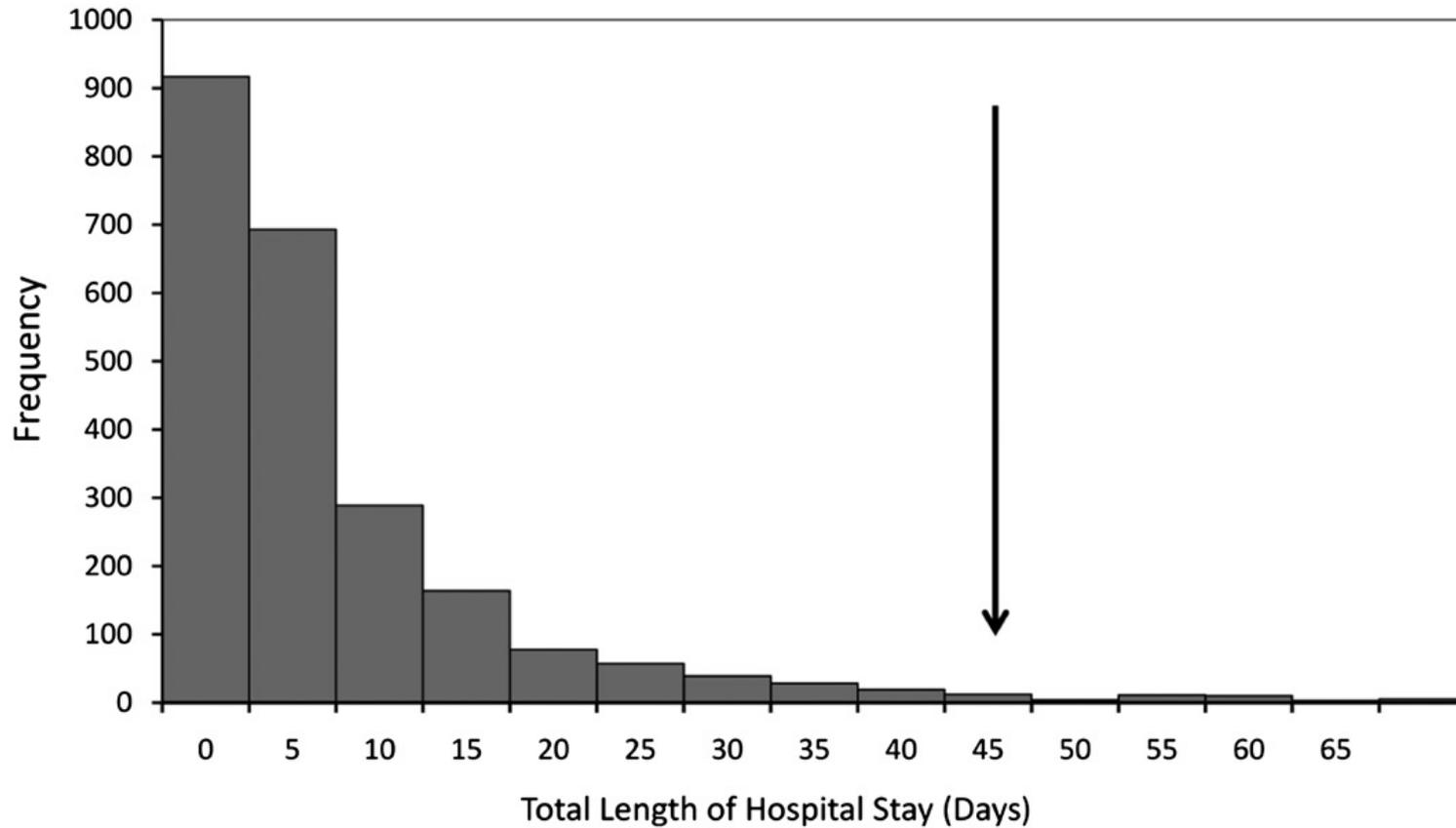
The average total cost for patients who were seriously injured after a fall during an in-hospital stay was \$44,203, which was **\$30,696** greater than \$13,507 for matched controls.



# Average Hospital Costs



# Average LOS



# Falls Prevention Interventions

- Comprehensive falls and injury prevention and management strategy is needed (Tideiksaar, 1998)
- Health Care Organizations
  - Hospitals: patient/resident safety & Risk management and quality improvement
  - Long Term Care (Cameron et al., 2010)
- Community based (Gillespie et al., 2012)
  - Independent living
  - Home care
  - Assistive living



# Interventions in Community (Gillespie et al., 2012)

159 RCT, 79,193 participants; Single interventions & multifactorial programs

Intervention	Rate of Falls	Risk of Falling
Multiple-component exercise (both group and home based)	✓	✓
Tai Chi	? (borderline)	✓
Multifactorial interventions with individual risk assessment	✓	⚠
Vitamin D	⚠	⚠
Home safety assessment and modifications	✓	✓
Vision treatments	⚠	⚠
Glasses adjustments from multifocal to single lens	✓(⚠)	-
First eye cataract surgery	✓(1 <sup>st</sup> ), ⚠(2 <sup>nd</sup> )	-
Pacemakers	✓	⚠
Withdrawal of psychotropic meds	✓	⚠
Medications modifications	-	✓
Anti-slip shoe	✓	-
Podiatry with foot and ankle exercises	✓	-
Cognitive behavioural interventions	⚠	⚠
Fall prevention education programs	⚠	⚠

# Interventions in LTC (Cameron et al., 2010)

41 RCT, 25,422 participants

Intervention	Rate of Falls	Risk of Falling
Supervised exercise	? (inconsistent)	?
Multifactorial interventions	⚡	⚡
Multifactorial interventions by multidisciplinary team	✓	✓
Vitamin D	✓	⚡

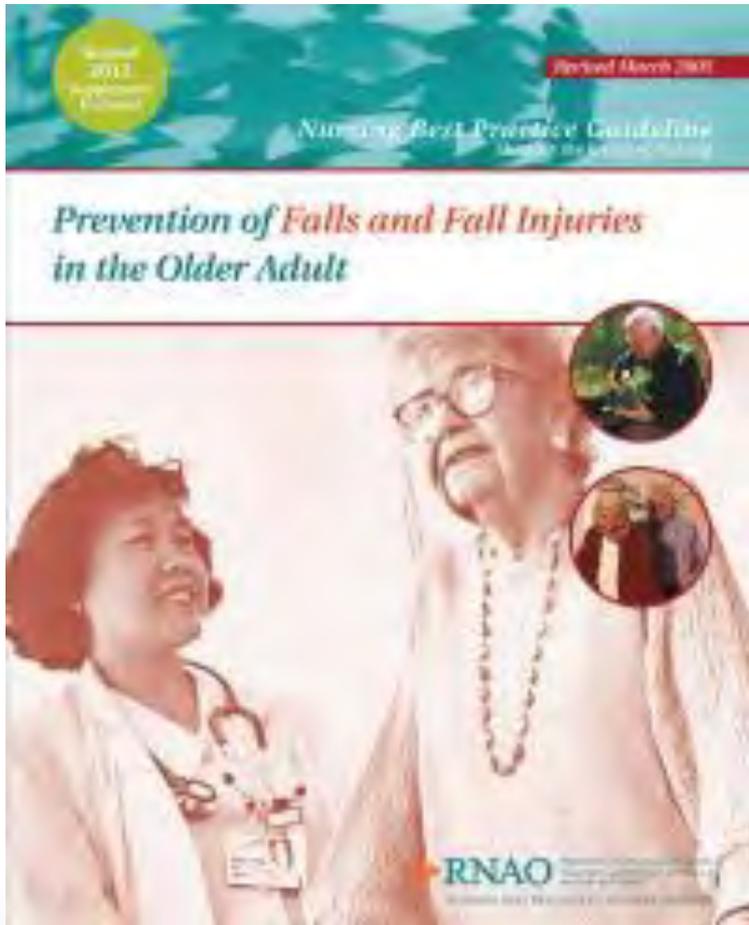


- Comprehensive, structured, individual assessments with specific safety recommendations
- Multidisciplinary program specific to residents
- Multifaceted intervention – (edu, enviro, balance & resistance, hip protector)
- Calcium and vitamin D supplementation
- Clinical medication review
- Multifactorial intervention (fall risk evaluation, specific and general interventions)

Neyens et al., 2011, (20 RCTs)

- Best assessment tools for LTC: Morse Fall Scale and Mobility Fall Chart (Kehinde, 2009). All LTC residents are high risk and need interventions (Scott et al., 2007)

# Best Practice Guidelines



- Registered Nurses' Association of Ontario
- Prevention of Falls and Fall Injuries in the Older Adult (2005)
- Recommendations include:
  - Morse Fall Scale
  - Reviewing contributing factors (e.g., medications)
  - Call system within reach
  - Bed alarms
  - Bed at appropriate height
  - Commode at bedside
  - Toileting regime
  - Uncluttered environment
  - Walking aids accessible

# What can seniors do to prevent falls?

- Keep active
- Adjust to environment and weather
- Modify indoor environment
- Be aware of medication side effects
- Use assistive devices and hip protectors
- Learn from near falls
- **TALK ABOUT FALLS!**



# Future of Healthcare

- Shaping tomorrow.com
- 10+ years translation lag from research into clinical practice
- 90% of research spending is on 10% of the illnesses
- Reactive planning

The screenshot displays the homepage of 'Shaping Tomorrow ... Make better decisions today'. The site features a navigation menu with 'Home', 'Scan', 'Plan', 'Act', and 'Network'. A left sidebar contains sections for 'Learn More' (with links for Free Tour, Free Training, Private & Partner Sites, Case Studies, and Make Money) and 'Member Comments'. The main content area includes a 'Get started to...' section with a list of actions (Scan, Plan, Act, Network, Learn, Ask, Privatize) and a 'Welcome to...' section listing recent users from various countries. A 'Trend Alerts' section shows two images: one of an elderly man with a walker and another of a futuristic tunnel. The right sidebar contains a registration/login form, a 'Free Access' section for content and newsletters, and a 'Learning' section with various topics.

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I have accessed your site as recommended by Professor Keith Alexander, one of our lecturers, and have found it to be an excellent resource that fellow students will benefit from.

Simon Ashworth, ZHAW (University) - Zürcher Hochschule für Angewandte Wissenschaften, Switzerland

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Esteban Borja Lopez Spain - 7 hrs ago  
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# Future of Healthcare



- Future:
  - Home becomes center of care
  - Smart technology (smaller, less invasive, faster, cheaper, earlier). Smart clothes, bathrooms, kitchens and houses; remote telehealth
  - Hospitals move from treatment into teaching centers (LOS in days)
  - LTC predominantly cares for cognitively impaired residents
  - Staff shortages
  - Medical tourism



# Thank you

Contact:

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## Questions?

This research was and is supported by:

