Consider these?

- What occurs to 30% of pop age >65 & 50% age >80?
- What leads to significant lifestyle changes in the population?
- What is 5th leading cause of Death in Elderly?
FALLS!

- Case
- Geriatric Syndromes
- Aetiology
- Management
- Specific Interventions
Falls – Health Pathways

- Falls
- Collaboration between Metro North HHS and Brisbane North PHN
- https://brisbanenorth.healthpathwayscommunity.org/index.htm
Case  Mrs DC

- 83 yr lives with 82 yr husband
- 4 falls in last 12 months
- Previous wrist fracture
- Presents after fall at home
- Unable to mobilise due to L Hip Pain
- Family concerns with cognition
- Daughter living with them since recent MI
- Home help 2 hours a fortnight
Past History

- Epilepsy – 40 years no fits for 25 years
- IHD, 3 MIs last one 9 weeks ago
- R CVA with good recovery
- R DVT
- Glaucoma
- Deaf – bilateral hearing aids
- Recent hyponatremia - ? Drug induced
- Recurrent UTI
Medications

- Phenytoin 100 mg tds
- Oxazepam 15mg nocte
- Pantoprazole 40 mg daily
- Senna ii daily
- Digoxin 0.125 mg nocte
- Simvastatin 40 mg daily
- Nitrofurantoin 50 mg nocte
Examination

- BP 120/70 lying, no previous postural drop
- Pulse 55 reg
- MMSE 22/30 MSQ 9/10
- L Leg shortened & externally rotated
- Hyperreflexic LUL LLL
- Distal sensory neuropathy
- Left Carpal Tunnel
- Absent foot pulses
Case Mrs D.C
What’s your next step?
Falls

- WHO definition “An event which results in a person coming to rest inadvertently on the ground or other lower level against their will” (excludes violent blow, loss of consciousness, sudden onset of paralysis or epileptic seizure)
- is symptom not a diagnosis
- may be the herald of severe or fatal illness

Important Questions
- Where?
- When?
- Why?
Falls resulting in patient harm in hospitals (NHA), 2007-08

<table>
<thead>
<tr>
<th>Age group</th>
<th>Per 1,000 hospitalisations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–24</td>
<td>0</td>
</tr>
<tr>
<td>25–44</td>
<td>0.5</td>
</tr>
<tr>
<td>45–64</td>
<td>1</td>
</tr>
<tr>
<td>65–84</td>
<td>1.5</td>
</tr>
<tr>
<td>85 or over</td>
<td>2</td>
</tr>
</tbody>
</table>

Socio-economic group

1 - Lowest
2 - Socio-economic group
3
4
5 - Highest

Per 1,000 hospitalisations
Falls Facts

- 1/3 age > 65 fall each yr
- 50% age > 85 fall each yr
- 40% Multiple falls
- 7-10% falls result in fractures
- 5-10% result in significant soft tissue injuries
- Risk doubles in res care
Falls - Consequences

- Personal
  - Fear of falling
  - Limited activity
  - Risk of institutionalization

- Societal
  - Costs

- Medical
  - Mortality, morbidity
Falls - Multi-factorial Causes

Patient Factors
- Chronic illness
- Ageing
- Medications

Predisposing factors

Precipitating factors

Environment
Predisposing factors for Falls

- Gait changes with ageing
  - Decreased arm swing, step length, step height, velocity, cadence
  - Increased double limb support time
- Postural instability
  - Central processing
  - Baro-receptor responses
  - Reduced Cerebral autoregulation of blood flow
- Sensory factors
  - vision, vestibular
  - somato-sensory, proprioceptive
Balance

Detection of Instability
• vision
• proprioception
• vestibular

Central Processing

Correction of Displacement
• response time
• muscle strength and flexibility
Physiology – Afferent limb

- **Visual**
  - ↓ Visual acuity
  - ↓ Contrast sensitivity
  - ↓ Visual field
  - ↓ Depth perception

- **Vestibular**
  - ↓ Hair cells
  - Fragmentation of otolith

- **Proprioception**
  - ↓ Vibration sensation
  - ↓ Joint position sense
  - ↓ Nerve Conduction
  - ↑ Nerve excitation threshold
  - Degeneration of cervical mechanoreceptors
Vision Changes in Elderly

Normal

Maculopathy
Vision Changes in Elderly

Glaucoma

Cataract
Falls Risk with Age

- Speed
- Stability
- Coordination
- Endurance
- Strength
- Range
- Accuracy
# Chronic Disease & Falls.

<table>
<thead>
<tr>
<th>Musculoskeletal</th>
<th>Osteoporosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Osteoarthritis</td>
</tr>
<tr>
<td>Foot disorders</td>
<td></td>
</tr>
<tr>
<td>Neurological</td>
<td>Dementia</td>
</tr>
<tr>
<td></td>
<td>Extrapyramidal disorders</td>
</tr>
<tr>
<td>Stroke</td>
<td></td>
</tr>
<tr>
<td>Peripheral Neuropathy</td>
<td></td>
</tr>
<tr>
<td>Cervical myelopathy</td>
<td></td>
</tr>
<tr>
<td>Visual</td>
<td>Cataracts</td>
</tr>
<tr>
<td></td>
<td>Glaucoma</td>
</tr>
<tr>
<td></td>
<td>Macular Degeneration</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>Orthostatic hypotension</td>
</tr>
<tr>
<td></td>
<td>Arrhythmia</td>
</tr>
<tr>
<td>Psychological</td>
<td>Depression</td>
</tr>
<tr>
<td></td>
<td>Anxiety</td>
</tr>
</tbody>
</table>
Intrinsic Causes - Cardiovascular

- arrhythmias
- structural - eg aortic stenosis
- carotid sinus hypersensitivity
- postural hypotension
- situational syncopes –
  - Vasovagal
  - Micturition
  - Cough
  - Valsalva
Syncope

- Cardiac Causes
- Altered Cerebral Autoregulation
- Altered Volume Regulation
- Carotid sinus hypersensitivity
  - vasodepressor
  - cardioinhibitory - pacemaker may be helpful
Intrinsic Causes - Neurological

- Cerebrovascular Disease
- Parkinson’s
- Dementia
- Epilepsy
- Vertebrobasilar Insufficiency
Polypharmacy

- >4 regular medications
### Medications and Falls

<table>
<thead>
<tr>
<th>Central</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzodiazepines</td>
</tr>
<tr>
<td>Oral Hypoglycaemic agents</td>
</tr>
<tr>
<td>Alcohol</td>
</tr>
<tr>
<td>Anticonvulsants</td>
</tr>
<tr>
<td>Antiemetics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mixed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedative agents and Antipsychotics</td>
</tr>
<tr>
<td>Antidepressants, including SSRI’s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Peripheral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1 antiarrhythmics</td>
</tr>
<tr>
<td>Antihypertensives, including diuretics</td>
</tr>
<tr>
<td>Drugs for Parkinson’s Disease</td>
</tr>
</tbody>
</table>
## Falls Risk Factors

Univariate Analysis from 16 studies

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Mean RR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle weakness</td>
<td>4.4</td>
</tr>
<tr>
<td>Previous Falls</td>
<td>3.0</td>
</tr>
<tr>
<td>Gait Deficit</td>
<td>2.9</td>
</tr>
<tr>
<td>Balance Deficit</td>
<td>2.9</td>
</tr>
<tr>
<td>Use of Assistive Device</td>
<td>2.6</td>
</tr>
<tr>
<td>Visual Deficit</td>
<td>2.5</td>
</tr>
<tr>
<td>Arthritis</td>
<td>2.4</td>
</tr>
<tr>
<td>Impaired ADL</td>
<td>2.3</td>
</tr>
<tr>
<td>Depression</td>
<td>2.2</td>
</tr>
<tr>
<td>Cognitive Impairment</td>
<td>1.8</td>
</tr>
<tr>
<td>Age &gt;80</td>
<td>1.7</td>
</tr>
</tbody>
</table>
Hip Fractures

- 25000 Hip Fractures annually (ANZ)
- ¾ Female
- Median Age 83
- Quadruple by 2051
- 7-10% Inpatient 30 day mortality
- 12-37% 1 yr mortality
Cost of Hip Fractures

- Cost to community
  ~$1.9 billion
- Average hospital episode cost
  $15,346
- Total costs
  - 32% direct hosp care
  - 67% social care

WHAT ABOUT QUALITY OF LIFE MEASURES?
Impact of hip fractures on long-term health

stranded hip fracture patient
The Prince Charles Hip Fracture Unit

- Single Site co-located partnership between Orthopaedics and Geriatric Medicine
- Service 900000 MetroNorth HHS Brisbane
- Early Multidisciplinary Rehabilitation Model
Hip Fracture Patient
Benefit of Multi-disciplinary Care

- High Risk Surgery
- Delays to OT
- Multi Morbidity
- Malnutrition
- Frailty
- Rehabilitation
- Improved Outcomes
- Falls & Fracture Prevention
Hip Fractures

1. Femoral neck (45%) – b/w femoral head and trochanters

2. Intertrochanteric (45%) – b/w greater and lesser trochanters

3. Subtrochanteric (10%) – inferior to trochanters
Surgery

A Internal Fixation for a Nondisplaced Femoral-Neck Fracture
- Nondisplaced femoral-neck fracture
- Internal fixation with multiple cancellous screws

B Internal Fixation for a Fracture at the Base of the Femoral Neck
- Nondisplaced fracture at the base of the femoral neck
- Internal fixation with sliding hip screw

C Arthroplasty for a Displaced Femoral-Neck Fracture
- Displaced femoral-neck fracture
- Hemiarthroplasty
- Femoral head
- Femoral stem

- Total arthroplasty
- Femoral head
- Polyethylene liner
- Acetabular cup
- Femoral stem
Hip Fractures

- Without surgical treatment:
  - 70% one-year mortality
  - 80% severely disabled

- With surgical treatment:
  - 30% one-year mortality
  - 40% severely disabled
  - NNT 7
## Internal fixation vs arthroplasty

<table>
<thead>
<tr>
<th></th>
<th>Internal fixation</th>
<th>Arthroplasty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaesthetic risk</td>
<td>Lower</td>
<td>Higher</td>
</tr>
<tr>
<td>Post-op pain</td>
<td>Higher</td>
<td>Lower</td>
</tr>
<tr>
<td>Mobility outcome</td>
<td>Poorer</td>
<td>Better</td>
</tr>
<tr>
<td>Functional outcomes</td>
<td>Poorer</td>
<td>Better</td>
</tr>
<tr>
<td>Transfusion</td>
<td>Less</td>
<td>More</td>
</tr>
<tr>
<td>Re-operation</td>
<td>40%</td>
<td>5%</td>
</tr>
<tr>
<td>Death at 2 yrs</td>
<td>35%</td>
<td>35%</td>
</tr>
</tbody>
</table>
Reduced Survival Post Fracture

75+ yrs

Women

Men

Survival

Time

Population

Minor

Major

Vertebral

Hip

Bliuc et al 2009, JAMA 301:513-21
Hip precautions

DO NOT do the following:
- Cross your legs
- Turn your toes in (pigeon-toed)
- Sit in low chairs or sofas, including a low toilet seat
- Lean towards non-operated side
- Sit in a tub
- Bend your hip at an angle greater than 90 degrees

DO the following:
- Keep your legs apart
- Keep your toes pointing forward
- Use hip cushion, or two pillows when sitting
- Sit with your weight evenly distributed
- Use a shower seat or tub bench for bathing
Nutrition

- 15% - 30% community elderly deficient
- 25-40 kcal/kg/day caloric requirement
- 1-1.5 g/kg protein intake
- Fluid intake 30 ml/kg
- Need for supplementation
- Oral and dental check
Osteoporosis & Falls Prevention

Reducing Fracture Risk
A Joint Approach to Prevention

Increasing Age (75+)

Bone Health

Falls Prevention
GP’s role in osteoporosis prevention

Importance of early screening and intervention to reduce modifiable risk factors

- **Well-person’s health check** – detect chronic diseases early in middle-aged patients with identifiable risk factors

- **Support lifestyle and risk modification** – refer to services that assist in making lifestyle changes

- **Early intervention** – reduce further bone loss and fracture risk; may improve long-term outcomes and quality of life

Osteoporosis PBS Guidelines

- Age >70 with BMD of <-3.0
- Minimal trauma fracture demonstrated radiologically (NOF, Vertebral, Wrist)
- Corticosteroid induced Osteoporosis (7.5mg Prednisone for >3/12 & BMD <-1.5)
- Should exclude
  - hypothyroidism, hypogonadism in males
  - Vitamin D deficiency (common)
Osteoporotic fractures often go untreated

Only 1 in 5 women with a fracture will receive treatment\(^1,2\)

![Graph showing the numbers of patients with fractures identified by study radiologists, noted in radiology reports, noted in medical records, and received osteoporosis treatment.](image)

- Fracture identified by study radiologists: 132 patients
- Fracture noted in radiology report: 65 patients
- Fracture noted in medical record: 23 patients
- Received osteoporosis treatment: 25 patients

n=934 women >60 years old

Fracture risk is greatest after a fracture

Time course of fracture risk in women aged 60 years following a vertebral fracture requiring hospitalisation compared with the general population

Adapted from Johnell et al. 2001.

Majority of fragility fractures are non-vertebral

Overall fragility non-vertebral and vertebral fracture rates and proportions

Non-vertebral fractures:
- Represent >70% of fragility fractures*
- Account for >90% of fracture costs*

Adapted from Adachi et al. 2006.
*US observational study involving >2.5 million women, aged 50-99 years.

# Pharmacotherapy Regimens

<table>
<thead>
<tr>
<th>DRUG</th>
<th>INDICATION</th>
<th>ADMINISTRATION</th>
<th>ACTION</th>
</tr>
</thead>
</table>
| Bisphosphonates | • Previous fracture  
• Age >70 yrs, no fracture, high risk  
• Corticosteroids treatment (7.5 mg for ≥3 months) - Low BMD | Oral tablet (daily, weekly or monthly)  
Once yearly infusion – zoledronic acid | Antiresorptive |
| Denosumab   | • Previous fracture  
• Age >70 yrs, no fracture, high risk | 6 monthly injection | Antiresorptive |
| SERMS       | • PMO - previous fracture | Oral tablet daily | Antiresorptive |
| HRT         | • Osteoporosis (<60 yrs) woman | Cream, skin patch, tablets | Slows bone loss |
| Teriparatide | • Severe osteoporosis, very low BMD, minimum 2 fractures (1 while on medication) | Daily injections | Stimulate bone formation |

SERMS: Selective oestrogen receptor modulators; HRT: Hormone replacement therapy; PMO: Post-menopausal osteoporosis.

Drug Prescribing Post Hip Fracture UK

- Increase from 7-46% post Hip Fracture in decade
- Highest Age >75
- Large increase in Anti-resorptives
- Fracture Gap

Klop C Osteoporosis Int 2015; 26:1919-28
Horizon Recurrent Fracture Trial
Cognitive Impairment

- Zoledronic Acid 5mg yearly reduced secondary fracture for all patients post hip fracture
- Multicentre RCT Zoledronic acid vs placebo
- Reduced secondary fracture in cognitive impairment
- Benefit of therapy > 6mth survival post hip fracture in Cognitive Impairment

Prieto-Alhambra Osteoporosis Int (2014) 25:77-83
Hip protectors

- Very effective when worn
- Compliance is major issue
## Specific Interventions Evidence

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Relative Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle strengthening balance retraining</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>(0.66-0.98)</td>
</tr>
<tr>
<td>Home hazard assessment and modification</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td>(0.54-0.81)</td>
</tr>
<tr>
<td>Halting antipsychotics</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td>(0.16-0.74)</td>
</tr>
<tr>
<td>Tai Chi 15wks</td>
<td>0.51</td>
</tr>
<tr>
<td></td>
<td>(0.36-0.73)</td>
</tr>
<tr>
<td>Multidisciplinary reviews</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td>(0.73-0.60)</td>
</tr>
</tbody>
</table>
Summary for Falls Prevention & Injury Minimisation

- Medication review
- Cognitive Screen
- Improve sensory input
- Osteoporosis Management
- Physiotherapy for balance & gait training
- OT home assessment
- Maximise domiciliary nursing & supports
Stay On Your Feet®
Falls Prevention
Toolkit
To prevent falls and keep patients on their feet.

- Encourage physical activity
- Review walking aids
- Check footwear
- Encourage good nutrition
- Review medicines
- Ensure access to glasses
- Manage incontinence

COMPREHENSIVE CARE STANDARD

For more information visit www.health.qld.gov.au/stayonyourfeet
Falls Prevention Strategies

- Australian Committee on Safety & Quality in Health Care
- Falls Injury Prevention Collaborative
- “Stay On Your Feet”
**HIP FRACTURE CARE**

A hip fracture is a break at the top of the thigh bone (femur), near the pelvis.

Estimated number of patients aged 50+ that are hospitalised for hip fracture each year:

- **19,000** Australia
- **3,500** New Zealand

**Hip fractures are expected to increase**

Most hip fractures occur in people aged over 65. This will increase with an ageing population.

Despite well-developed treatment guidelines, there is much variation in care.

**Right care, right time, right place**

The Hip Fracture Care Clinical Care Standard relates to the care that patients with a suspected hip fracture should be offered from presentation to hospital through to completion of treatment in hospital. This care should involve:

- **48hr**
  - Surgery within 48 hours of arriving at hospital, if appropriate.
  - Patients getting back on their feet within a day if possible.

- Timely assessment and treatment of pain and medical conditions.

- Coordinated orthopaedic and geriatric services.

- A care plan outlining ongoing treatment and ways to prevent more fractures.

Mrs D.C

- L Displaced Transcervical NOF #
- Proceeded to OT
- Smooth Post Operative course
Case Mrs DC
Post Operative Assessment

- Multifactorial falls
  - Postural Hypotension
  - Distal neuropathy
  - Poor Vision 6/18
  - Cerebrovascular disease
  - Poor central balance
  - Drug effects – Phenytoin, Oxazepam, Nitrofurantoin
Case Mrs DC
Medication changes

- Phenytoin 100 mg tds
- Oxazepam 15mg nocte
- Pantoprazole 40 mg daily
- Senna ii daily
- Digoxin 0.125 mg nocte
- Simvastatin 40 mg daily
- Nitrofurantoin 50 mg nocte
Mrs DC
Management - Medical

- Cognitive Screen
- Workup for neuropathy
- Found to have diabetes on fasting BSL
- Give Phenytoin as single nocte dose
- Wean and cease hypnotic
- Alternative bladder prophylaxis
- Check Digoxin level
- Commenced Calcium and Vitamin D
- Antiresorptive Therapy
Mrs DC
Management Allied Health

- Physiotherapy - Balance & strengthening program
- OT - Home visit with modifications
- Nursing - Community supervision of BSL & BP monitoring
- Discharged Home 2/52 with increased services
Questions?