Fragility Fractures in the Elderly
Geriatric Pre-operative and Post-operative Care

Dr David Dai
Prince of Wales Hospital
15/4/07
The Riddle of the Sphinx

“What is it that has one voice and yet becomes four-footed and three-footed?”
Hip Fracture is a Geriatric Syndrome
**Traditional Medical Syndrome**

- Specific morbid process
- Multiple phenomenologies
  - “Moon facies”
  - “Buffalo Hump”
  - Truncal obesity
  - Proximal muscle weakness
  - Easy bruisability
  - Skin thinning
  - Osteoporosis
- Cortisol excess

**The Geriatric Syndrome**

- Dementia
- Dehydration
- Severity of illness
- Sensory impairment
- Medication effects
- Sleep disturbance
- Older age
- Delirium syndrome

**Traditional medical syndromes and geriatric syndromes**

JAGS Vol 51(4) 2003:574-576
The Fragility Fracture Syndrome

Old Age
Frailty (Reserve) and Vulnerability
Osteopenia
Sarcopenia
Falls
Premobid multiple comorbidities
Pre-operative medical instability (metabolic, CVS, resp)
Hospitalisation syndrome (Delirium, infection, polypharmacy)
Post-operative instability (CVS, neurological, metabolic, respiratory, fever)
Functional decline
Psychosocial issues
Post-discharge support

Post discharge period “1 year”
Exhaustion of Reserve to 30%

Figure 1. Frailty threshold.
Figure 1. Schematic representation of the relationship between maximal (broken line) and basal (solid line) physiologic function. Functional reserve is the difference between maximal and basal function. Aging inevitably reduces functional reserve even in individuals who are physiologically “young.” The configuration of the curve for basal function is adapted from longitudinal measurements of total (not weight-specific) basal metabolic rate. Reprinted with permission: Muravchick S. Geroanesthesia: principles for management of the elderly patient. St. Louis: Mosby, 1996 (Figures 1–3).
Declining Physiological Reserves
(Crit Care Med 2004; 32(suppl): S92-S101)

- Cardiac
- Respiratory
- Renal
- GI
- Hepatobiliary
- Body composition and energy use
- CNS and pain
- Immune function
- Haemopoietic
Frailty (Fried 2001)

- **Sarcopenia**
- Neuroendocrine dysfunction
- Immune dysfunction
- Weight loss
- Low grip strength
- Low energy (exhaustion)
- Slow gait speed
- Low physical activity
Age, Genes, Education

- Anorexia
- Inactivity
  - Lack of Exercise
- Pain
- Depression

- Weight Loss
  - Low Body Weight
  - Dehydration
- Sarcopenia
- Atherosclerosis
- Cognitive Impairment
  - Fear of Falling
  - Diabetes

- Heart Disease
  - Stroke
- Delirium
  - Diuresis
  - Low Education
  - Low income
  - Lack of Family
  - Lack of Community Support

Etiology of Frailty
Frailty
Frailty → ↓ Function → Hospitalization → Institutionalization → Death

- Mobility
- Fall
- Osteopenia
- Hip Fracture
- Fear of Falling

↓ Social Activity

Stroke

Incontinence
A Geriatric Syndrome

Not managed by the geriatrician or orthopedic surgeon alone
Ortho-geriatric Co-management at PWH
1) Ortho-geriatric rounds 3 times per week; 1-1.5 hours per session
2) Pre-operative geriatric assessment and medical optimization
3) Post-operative medical optimization and further geriatric assessment
4) Discharge and transitional care planning:
   a) continuity of care at TPH
   b) direct discharge to home or OAH
   c) arrange CNS/CGAT/GDH support
1) **Geriatric Liaison Nurse screening assessment before round:**
   (background medical/geriatric information; pre-morbid function and living environment; psychosocial issues)

2) **Geriatric clinical assessment**
**PWH Randomized Interventional Trial of Geriatric-Orthopedic Liaison on Acute Hip Fracture Elderly Data Entry Sheet 2009**

<table>
<thead>
<tr>
<th>Gum label (with address/telephone no.)</th>
<th>Ward ___ Bed no. ___</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of assessment</td>
<td>5. 1. Interventional arm 2. Conventional arm</td>
</tr>
<tr>
<td>1. NOF (R)/ (L)</td>
<td>2. Trochanteric (R)/ (L)</td>
</tr>
<tr>
<td>3. Others (RY) (L)</td>
<td>4. Hip screw</td>
</tr>
<tr>
<td>7. Type of operation</td>
<td>9. Date of operation</td>
</tr>
<tr>
<td>1. DHS</td>
<td>10. Date of transfer/discharge</td>
</tr>
<tr>
<td>2. Intra-medullary nail (Gamma)</td>
<td>11. Days from admission to day of operation</td>
</tr>
<tr>
<td>3. AO screw</td>
<td>12. Days from operation to transfer/discharge</td>
</tr>
<tr>
<td>4. Hip screw</td>
<td>13. Type of anesthesia 1. GA 2. SA</td>
</tr>
<tr>
<td>6. Open reduction of fracture</td>
<td>6. DM with complication</td>
</tr>
<tr>
<td>8. Conservative</td>
<td>10. Renal disease</td>
</tr>
<tr>
<td></td>
<td>11. Stroke</td>
</tr>
<tr>
<td></td>
<td>12. Dementia</td>
</tr>
<tr>
<td></td>
<td>13. Parkinson's disease</td>
</tr>
<tr>
<td></td>
<td>14. Connective tissue disease</td>
</tr>
<tr>
<td></td>
<td>15. Joint problem of LLs</td>
</tr>
<tr>
<td></td>
<td>16. Carcinoma site</td>
</tr>
<tr>
<td></td>
<td>17. Others</td>
</tr>
<tr>
<td></td>
<td>18. Others</td>
</tr>
</tbody>
</table>

**Premorbid Social and Functional Status**

17. MFAC
19. Modified Barthel index ___/20
20. Norton Score ___/20

**Cognitive status on admission**

22. MMSE ___/30
23. MDAS ___/70
24. CAM 1. Yes 2. No
25. Pre op-medical intervention

1. CVS  
2. Respiratory  
3. Neurological  
4. Endocrine  
5. Cognition  
6. Electrolytes  
7. Renal  
8. GI  
9. Hematological  
10. Drug adjustment  
11. Others

1. BP control  
2. CCF  
3. Arrhythmia  
4. ACS  
5. Heart murmur

26. Risk Factors Identification

1. Gait, postural and neurological problems  
2. Musculoskeletal problems  
3. Medical condition  
4. Neuropsychiatric condition  
5. Impaired senses  
6. Medications  
7. Improper walking device  
8. Environmental hazards  
9. Trip  
10. Others

27. Significant Medical Complication

1. Delirium  
2. Retention of urine  
3. Fluid overload/CHF  
4. Pneumonia  
5. Stroke  
6. Sepsis  
7. MI  
8. Arrhythmias  
9. Pressure ulcer  
10. Renal failure  
11. Others

Delirium screening (post op day 1):
28. "Did you undergo surgery?"  
29. "When?"  
30. MDAS  
31. CAM

1. Correct  
2. Incorrect  
30  
1. Yes  
2. No

Upon discharge from PWH

32. Total length of stay at PWH

33. Total no of non-geriatric medical consultations (routine+ urgent)

34. Deceased 1. Yes 2. No

35. Functional status upon discharge

1. MFAQ

2. Use of aids  
3. Modified Barthel index

36. Next care setting

1. TPH  
2. Home/ usual living place  
3. Medical unit (take over)

37. Geriatric ambulatory support

1. CNS

2. CGAT

3. GDH

4. Arrange medical /geriatric clinic follow up
Geriatric Clinical Assessment

1) Greet patient (mental state, cognition, mood)
2) Raise your arms (stroke, parkinsonism, local injury)
3) Neurovascular examination (CVS and fluid status, AF, carotid bruit, reflexes)
4) Respiration (SaO2, chest, CXR)
5) Abdomen (bladder, bladder scan, bowel, foley’s)
6) Legs (edema, ? DVT)
Greeting the Patient
Raise your arms
Touch your fingers
Touch your nose
Palpate for distended bladder
Look for edema
7) Review of medications and side-effects (dologesic, senokot, metformin and B12 deficiency)
8) Vital signs (bp, pulse, fever, Sao2)
9) Some patients post-op, attempt to walk (gait, pain, walking aid)
British Geriatric Society’s Framework Document on Orthogeriatric Service (2004):
“Presence of specialised medical staff in the acute orthopedic ward is of great benefit”

British Orthopedic Association (2004):
“Immediate involvement of orthogeriatricicians from admission to discharge is to be advocated as the way forward”
Conjoint Orthogeriatric Programme

1) Evidence-based clinical pathway
   Qual Saf Health Care 2006; 15: 375-379
   www.qshc.com/supplemental

2) Comprehensive geriatric intervention
   a) M. Vidan et al, JAGS 2005; 53: 1476-1482
      RCT n=155/164
      RCT n= 68/69

3) Hospitalist model
   P Michael et al
   retrospective case control n= 230/236

4) Comanagement
   RCT n= 251/254
Expected benefits of acute orthogeriatric care
(Curr Anae & Critical Care 2005, 16:2-10)

Superior medical care
Optimal scheduling of fracture surgery
Better communication with patients and their relatives
Better communication within the multidisciplinary team
Initiation of research, education and audit
Reduction in adverse events
Earlier initiation of rehabilitation and more effective use of discharge resources
Guidelines

Royal college of Physicians
SIGN

• Surgery within 24 hours if medical condition permits
• Delayed surgery increases mortality and morbidity and adverse effect on rehabilitation
• Medically unfit patients should not be rushed to theatre before medical optimization
3 Categories of Patients

Hip Fracture

Good Premorbid
- Fast Track
  - Uncomplicated
    - Peri-operative and Short rehab

Poor Premorbid
- Unstable peri-operative Medical status
  - Effective optimisation
    - Surgery ASAP and slow rehab

Unfit for surgery
- 1. Poor premorbid function
- 2. Medical complications:
  - Stroke
  - Myocardial event
  - Severe sepsis
- Supportive / Palliation
Medical Comorbidities in 100 patients admitted to the orthogeriatric ward for hip fracture

Period: Oct to Dec, 2006
Consecutive admissions
Gender/Age: Female n=70 mean age 84.0 yrs (+/- 6.0)
           Male    n=30 mean age 79.4 yrs (+/-6.7)

<table>
<thead>
<tr>
<th>Type of fracture / Gender</th>
<th>NOF</th>
<th>Trochanteric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (age)</td>
<td>59 (84.1 yrs)</td>
<td>4 (83.0 yrs)</td>
</tr>
<tr>
<td>Male (age)</td>
<td>19 (79.2 yrs)</td>
<td>8 (79.8 yrs)</td>
</tr>
<tr>
<td>Total</td>
<td>78</td>
<td>12</td>
</tr>
</tbody>
</table>

Surgical: 89 (Mode of Anaesthesia
Conservative: 11

GA (10)
SA (79)
Medical Comorbidities of patients undergoing operation n=89

<table>
<thead>
<tr>
<th></th>
<th>Premorbid n(%)</th>
<th>Pre-operative Optimisation n(%)</th>
<th>Post-operation Optimisation n(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CVS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension / BP IHD / ACS</td>
<td>Overall (70.8%)</td>
<td>Overall (7.9%)</td>
<td>Overall (34.8%)</td>
</tr>
<tr>
<td></td>
<td>4.7 (52.8%)</td>
<td>6 (6.7%)</td>
<td>20 (22.5%)</td>
</tr>
<tr>
<td></td>
<td>5 (5.6)</td>
<td>0 (1.1)</td>
<td>1 (1.1)</td>
</tr>
<tr>
<td></td>
<td>6 (6)</td>
<td>1 (1.1)</td>
<td>10 (11.2)</td>
</tr>
<tr>
<td>CHF</td>
<td>5 (5.6)</td>
<td>1 (2.2)</td>
<td></td>
</tr>
<tr>
<td><strong>Respiratory</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COAD</td>
<td>Overall (11.2%)</td>
<td>Overall (6.7%)</td>
<td>Overall (12.4%)</td>
</tr>
<tr>
<td>Restrict lung dis (Pul. Fibrosis)</td>
<td>7 (7.9)</td>
<td>4 (4.5)</td>
<td>3 (3.4)</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>3 (3.4)</td>
<td>2 (2.2)</td>
<td>8 (9.0)</td>
</tr>
<tr>
<td><strong>Neurological</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Old CVA</td>
<td>Overall (41.6%)</td>
<td>Overall (4.5%)</td>
<td>Overall (24.7%)</td>
</tr>
<tr>
<td>Parkinsonism</td>
<td>10 (11.2)</td>
<td>0 (4.5%)</td>
<td>4 (4.5%)</td>
</tr>
<tr>
<td>Dementia/Delirium</td>
<td>6 (6)</td>
<td>0 (4.5)</td>
<td>18 (20.2)</td>
</tr>
<tr>
<td>Psychiatric illness</td>
<td>17 (19.1)</td>
<td>4 (4.5)</td>
<td></td>
</tr>
<tr>
<td>(Schizophrenia, depression)</td>
<td>4 (4.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Premorbid n(%)</td>
<td>Pre-operative Optimisation n(%)</td>
<td>Post-operation Optimisation n(%)</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------</td>
<td>---------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td><strong>Metabolic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DM</td>
<td>Overall (46 %)</td>
<td>Overall (12.4%)</td>
<td>Overall (27%)</td>
</tr>
<tr>
<td></td>
<td>26 (29.2)</td>
<td>2 (2.2)</td>
<td>16 (18)</td>
</tr>
<tr>
<td>Hyperlipidaemia</td>
<td>4 }</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyperuricaemia</td>
<td>8 } (16.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thyroid</td>
<td>3 }</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrolyte</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Renal / urological</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRF (not on RRT)</td>
<td>Overall (11.2%)</td>
<td>Overall (3.4%)</td>
<td>Overall (11.2)</td>
</tr>
<tr>
<td>BPH (±Foley’s)</td>
<td>7 } (11.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retention of urine</td>
<td>3 }</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(RV&gt;150cc)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GI</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peptic disease</td>
<td>8 (9.0%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Medical Comorbidity of partial ageing operation n=89

<table>
<thead>
<tr>
<th></th>
<th>Premorhid n(%)</th>
<th>Pre-operative Optimisation n(%)</th>
<th>Post-operation Optimisation n(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haematological</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic Anaemia</td>
<td>3 (3.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(MDS/ACD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malignancy</td>
<td>3 (3.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fever</td>
<td></td>
<td></td>
<td>19 (21.3%)</td>
</tr>
<tr>
<td>DVT / PE</td>
<td></td>
<td></td>
<td>1 (1.1%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(PE)</td>
</tr>
<tr>
<td>Total no</td>
<td>175</td>
<td>31</td>
<td>118</td>
</tr>
<tr>
<td>Mean no/patient</td>
<td>2.0</td>
<td>0.35</td>
<td>1.3</td>
</tr>
</tbody>
</table>
Fever

- AROU (RV<150cc)
- Chest infection
- Joint inflammation (gout, pseudogout)
- Thromboembolism
- Drug hypersensitivity
- Reaction to operation
SOB and Desaturation

- Fluid overload: 3rd space → vascular compartment, vascular stiffness coupled with diastolic dysfunction
- AECOPD
- Pneumonia and chest infection
- Sepsis
- Pulmonary embolism (high index of suspicion)
Edema in the flanks
Anaemia

• Transfuse to Hb > 10 gm for cardiac function, mental function and mobility
• Gamma nail
Glycaemic control
( South M J 2006; 99(6): 580-589)

• Stress of surgery and anaesthesia
• Associated with longer LOS, healthcare utilisation, peri-operative mortality
• Aggressive glycemic control reduces morbidity and mortality
• Target blood glucose: 4.4-10 mmol/L
Acute Upper GI Haemorrhage

(Ali Pharm Ther 2007; 25: 297-308)

- Prospective study
- N=822 ; age > 60yrs
- Hip fracture
- 3.9%
- Associated with poor outcome
- AGIH occur 11.1 days post admission
- Associated with ↑ LOS (28.7 vs 15 days)
Risk factors

- History of peptic ulcer
- Current smoker
- Blood group O
- Post-op aspirin and/or clopidrogrel/ COX-2 inhibitors/NSAID

Prophylactic PPU, NTT 7.9
Avoid NSAIDs (eg volteran SR)
Delirium
## Cognitive Impairment

<table>
<thead>
<tr>
<th>Dementia</th>
<th>No Dementia</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Delirium</td>
<td>No Delirium</td>
</tr>
<tr>
<td>Delirium (Pre- &amp; Post-op)</td>
<td>Delirium (Pre- &amp; Post-op)</td>
</tr>
<tr>
<td>POCD</td>
<td>POCD</td>
</tr>
</tbody>
</table>
## Delirium associated with orthopedic surgery: Meta-analysis

<table>
<thead>
<tr>
<th>Studies</th>
<th>Prevalence of preoperative delirium</th>
<th>Proportion of delirium cases with preoperative onset</th>
<th>Proportion persisting postoperatively</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brauer et al, 2000</td>
<td>4.4%</td>
<td>46% (25/54)</td>
<td>Not stated</td>
</tr>
<tr>
<td>Kagansky et al, 2004</td>
<td>5.9%</td>
<td>50% (6/12)</td>
<td>83% (5/6)</td>
</tr>
<tr>
<td>Morrison et al, 2003</td>
<td>8.1%</td>
<td>39% (46/117)</td>
<td>Not stated</td>
</tr>
<tr>
<td>Formiga et al, 2003</td>
<td>12.7%</td>
<td>34% (13/38)</td>
<td>Not stated</td>
</tr>
<tr>
<td>Edlund et al, 1999</td>
<td>19%</td>
<td>68% (10/15)</td>
<td>100% (10/10)</td>
</tr>
<tr>
<td>Edlund et al, 2001</td>
<td>29.7%</td>
<td>61% (30/49)</td>
<td>97% (29/30)</td>
</tr>
<tr>
<td>Gustafson et al, 1988</td>
<td>33%</td>
<td>54% (37/68)</td>
<td>100% (37/37)</td>
</tr>
<tr>
<td>Johansson et al, 2002</td>
<td>35.6%</td>
<td>92% (26/28)</td>
<td>46% (12/26)</td>
</tr>
</tbody>
</table>

**Incidence of Delirium: 35%** *(Bitsch 2004)*

International Psychogeriatrics 2007 19(2), 197-214
Conclusion

- Risk of delirium in hip fracture higher than elective surgery
- Most studies miss out Hypoactive Delirium
- Post-operative delirium has multiple etiologies, some exerting influence in the pre-operative period
Objective:
Determine the incidence and risk factors of post-operative delirium in geriatric patients with acute hip fracture and establish its relationship with clinical outcomes.

Methodology and Participants:
A 10-month cohort study was conducted on geriatric patients admitted for acute hip fracture to a tertiary teaching hospital. Patients aged 60 or above were recruited into the study. Those, who were admitted for old hip fracture, verbally non-communicable and treated conservatively, were excluded. The demographic data, clinical features, occurrence of delirium and possible risk factors were recorded. The diagnosis of delirium was made on a clinical basis. Outcomes, including length of hospitalization, post-operative complications and in-patient mortality were studied. These patients were followed up for six months after discharge for 1-month and 6-month mortality.
### Predictors of post-operative delirium

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Delirium (n = 36)</th>
<th>No delirium (n = 214)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age +/- SD</td>
<td>85.3 +/- 7.0</td>
<td>81.9 +/- 8.6</td>
<td>0.025</td>
</tr>
<tr>
<td>Gender (male)</td>
<td>10 (27.8%)</td>
<td>47 (22.0%)</td>
<td>0.442</td>
</tr>
<tr>
<td>Number of comorbidities</td>
<td>1.81 +/- 1.22</td>
<td>1.84 +/- 1.22</td>
<td>0.871</td>
</tr>
<tr>
<td>Number of regular medications</td>
<td>3.75 +/- 3.07</td>
<td>3.41 +/- 2.57</td>
<td>0.478</td>
</tr>
<tr>
<td>History of dementia</td>
<td>8 (22.2%)</td>
<td>30 (14.0%)</td>
<td>0.205</td>
</tr>
<tr>
<td><strong>Dementia requiring pre-operative optimization</strong></td>
<td>5 (13.9%)</td>
<td>5 (2.3%)</td>
<td><strong>0.007</strong></td>
</tr>
<tr>
<td>General anesthesia</td>
<td>5 (13.9%)</td>
<td>36 (16.8%)</td>
<td>0.528</td>
</tr>
<tr>
<td>Post-operative urinary retention</td>
<td>5 (13.9%)</td>
<td>21 (9.8%)</td>
<td>0.553</td>
</tr>
</tbody>
</table>
## Post-operative complications

<table>
<thead>
<tr>
<th></th>
<th>Delirium (n = 36)</th>
<th>No delirium (n = 214)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td>13 (36.1%)</td>
<td>68 (31.8%)</td>
<td>0.607</td>
</tr>
<tr>
<td>Respiratory</td>
<td>7 (19.5%)</td>
<td>18 (8.4%)</td>
<td>0.065</td>
</tr>
<tr>
<td>Neurological</td>
<td>3 (8.3%)</td>
<td>8 (3.73%)</td>
<td>0.200</td>
</tr>
<tr>
<td>Endocrine</td>
<td>4 (11.1%)</td>
<td>21 (9.81%)</td>
<td>0.767</td>
</tr>
<tr>
<td>Electrolyte disturbance</td>
<td>2 (5.6%)</td>
<td>27 (12.6%)</td>
<td>0.274</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>2 (5.6%)</td>
<td>19 (8.9%)</td>
<td>0.747</td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>0 (0%)</td>
<td>3 (1.40%)</td>
<td>1.000</td>
</tr>
<tr>
<td>Renal impairment</td>
<td>1 (2.78%)</td>
<td>10 (4.67%)</td>
<td>1.000</td>
</tr>
<tr>
<td>Urinary</td>
<td>10 (27.8%)</td>
<td>41 (19.2%)</td>
<td>0.0235</td>
</tr>
<tr>
<td>Haematological</td>
<td>10 (27.8%)</td>
<td>66 (30.8%)</td>
<td>0.721</td>
</tr>
<tr>
<td>Poor pain control</td>
<td>2 (5.56%)</td>
<td>4 (1.87%)</td>
<td>0.208</td>
</tr>
<tr>
<td><strong>Infection</strong></td>
<td>9 (25%)</td>
<td>27 (12.6%)</td>
<td><strong>0.050</strong></td>
</tr>
</tbody>
</table>
Conclusion:

- **Post-operative delirium** is common in elderly patients undergoing hip surgery, especially those with **advancing age** and requiring pre-operative optimization of **pre-existing dementia**.

- **Post-operative infection**, mostly pneumonia and urinary tract infection, is related to post-operative delirium. However, their causal relationship cannot be established in this study.

- **Post-operative delirium did not affect the clinical outcomes**, which may be related to the pre-operative and post-operative intervention by the medical geriatric team. Randomized controlled trials are warranted to study the effects of geriatric intervention on clinical outcomes.
POD and Outcome

Clin Ortho and Rel Res 2004(422): 195-200

1) ↑ morbidity and mortality at 1 yr
2) ↑ LOS and suffering and cost
3) Less likely to recover pre-fracture functional level
4) Functional decline at 1 yr
Risk factors for POD are different from Pre-op delirium
(JAGS 2001(49): 1335-1340)

<table>
<thead>
<tr>
<th>Pre-op</th>
<th>Post-op</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Preexisting dementia</td>
<td>• Severe peri-operative bp decrease</td>
</tr>
<tr>
<td>• Drugs(anticholinergic/neuroleptics, analgesics)</td>
<td>• Post-op anaemia, hypoxaemia</td>
</tr>
<tr>
<td>• Constipation</td>
<td>• Post-op infections</td>
</tr>
<tr>
<td>• Pain</td>
<td>• Better potential for rehab and return home</td>
</tr>
<tr>
<td>• Neurovascular</td>
<td></td>
</tr>
<tr>
<td>• Poorer rehab potential</td>
<td></td>
</tr>
</tbody>
</table>
Neurotransmitter pathogenetic hypothesis

- General anaesthesia
- Cytokines
- Stressful inflammatory events
- Central nicotinic acetylcholine receptor inhibition by drugs during anaesthesia
- mAChRs and anticholinergic agents
Other mechanisms

- ↓ oxidative metabolism
- ↑ cortisol
- Inadequate post-operative analgesia
Interventions to reduce Delirium

Nurse led interdisciplinary programme
(JAGS 2001; 49: 523-532)

• Education of nursing staff
• Systematic cognitive screening
• Geriatric liaison
• Scheduled pain protocol
• Reduced duration and severity of delirium
Proactive geriatric consultation
(JAGS 2001; 49:516-522)

- O2
- Fluids
- Pain
- ↓ medications
- Bladder/bowel
- Nutrition intake
• Early mobilization and rehabilitation
• Prevent, early detection and treatment of major post-op complications (myocardial, respiratory, pulmonary emboli, UTI)
• Environmental stimuli
Tools

• MMSE
• CAM
• MDAS

Clinical Recognition
# Confusion Assessment Method Instrument (CAM)

<table>
<thead>
<tr>
<th>Acute Onset</th>
<th>Yes</th>
<th>No</th>
<th>Uncertain</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there evidence of an acute change in mental status from the patient's baseline?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inattention</th>
<th>2A Did the patient have difficulty focusing attention (e.g., being easily distractible or having difficulty keeping track of what was being said)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not present at any time during interview</td>
<td>Present at some time during interview, but in mild form</td>
</tr>
<tr>
<td>Uncertain</td>
<td>Present at some time during interview, in marked form</td>
</tr>
</tbody>
</table>

| 2B (If present or abnormal) Did this behavior fluctuate during the interview (i.e. tend to come and go or increase and decrease in severity)? |

<table>
<thead>
<tr>
<th>2C (If present or abnormal) Please describe this behavior</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Disorganized Thinking</th>
<th>3 Was the patient's thinking disorganized or incoherent, such as rambling or irrelevant conversation, unclear or illogical flow of ideas, or unpredictable switching from subject to subject?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Altered Level of Consciousness</th>
<th>4 Overall, how would you rate this patient's level of consciousness?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alert (normal)</td>
<td>Vigilant (hyperalert, overly sensitive to environmental stimuli, startled very easily)</td>
</tr>
<tr>
<td>Lethargic (drowsy, easily aroused)</td>
<td>Stupor (difficult to arouse)</td>
</tr>
<tr>
<td>Coma (unrousable)</td>
<td>Uncertain</td>
</tr>
</tbody>
</table>

| Disorientation | 5 Was the patient disoriented at any time during the interview, such as thinking that he or she was somewhere other than the hospital, using the wrong bed, or misjudging the time of day? |

| Memory Impairment | 6 Did the patient demonstrate any memory problems during the interview, such as inability to remember events in the hospital or difficulty remembering instructions? |

| Perceptual Disturbances | 7 Did the patient have any evidence of perceptual disturbances, such as hallucination, illusions, or misinterpretations (e.g., thinking something was moving when it was not)? |

| Psychomotor Agitation | 8A At any time during the interview, did the patient have an unusually increased level of motor activity, such as restlessness, picking up bedclothes, tapping fingers, or making frequent sudden changes in position? |

| 8B At any time during the interview, did the patient have an unusually increased level of motor activity, such as sluggishness, staring into space, staying in one position for a long time, or moving very slowly? |

| Altered Sleep-Wake Cycle | 9 Did the patient have evidence of disturbance of the sleep-wake cycle, such as excessive daytime sleepiness with insomnia at night? |

| Scoring | To have a positive CAM result, the patient must display Presence of acute onset and fluctuating disorientation (1) AND Inattention (2) AND EITHER disorganized thinking (3) OR altered level of consciousness (4) |

Delirium: Y / N

Occupational Therapist ____________________________ Date ____________________________
## Memorial Delirium Assessment Scale (MDAS)

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>None (0)</th>
<th>Mild (1)</th>
<th>Moderate (2)</th>
<th>Severe (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reduced Level of Consciousness (Awareness)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Disorientation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Short-Term Memory Impairment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Impaired Digit Span</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Reduced Ability to Maintain &amp; Shift Attention</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Disorganized Thinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Perceptual Disturbance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Delusions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Decreased or Increased Psychomotor Activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(a) hypoactive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) hyperactive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(c) both</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Sleep-Wake Cycle Disturbance (Disorder of Arousal)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total** /30

**Remarks:**

---

**Occupational Therapist:** ___________________________  **Date:** ____________

MDAS/Feb06
CT Scanning Room

RADIATION
CONTROLLED AREA
NO UNAUTHORISED ENTRY
DO NOT ENTER WHEN RED LIGHT IS ON
Post Operative Period

( G Bellelli et al JAGS 2005; 53(8): 1443-1444)

1 year

- N=106
- Discharged 12 months
- Home(initial): 81 17 1 hospitalisation
  4 >2 hospitalisations
  21 → OAH
- OAH(initial): 11
Predictors of Rehospitalisation or OAH

- Low BI before fracture
- Lower functional recovery at discharge
- Delirium on admission to rehabilitation
- Low albumin
- Living alone
The Humanity Riddle

Fig. 1

2013
Thankyou