Preoperative Care of the Very Elderly

Christopher Patterson
McMaster University
Hamilton Health Sciences
Objectives

• Redefine “very elderly”
• List reasons for preoperative care
• Outline postoperative conditions which are common in elderly
• Present strategies to avoid delirium, deconditioning & malnutrition in the postoperative period

No conflicts of interest
Are they “very elderly?”
Age and operative complications

No evidence that age is an independent risk factor for postoperative complications in the absence of comorbid conditions.
So, is one of them “frail?”
What is Frailty?

- A syndrome: a state of vulnerability to adverse health outcomes
- Cluster of features (unintentional weight loss 10lbs; self reported exhaustion; weakness-grip strength; slow walking speed; low physical activity)
- Muscle loss (sarcopenia), loss of homeostasis, inflammation etc.
- Adaptability, environmental factors, social resources important in impact of frailty
We are really talking about preoperative care of the *frail elderly*...
## Edmonton Frail Scale score and postoperative complications

<table>
<thead>
<tr>
<th></th>
<th>&lt;4</th>
<th>&gt; or = 4</th>
<th>&gt;7</th>
</tr>
</thead>
<tbody>
<tr>
<td>All complications %</td>
<td>10</td>
<td>35</td>
<td>56</td>
</tr>
<tr>
<td>OR any complication</td>
<td>0.27 (0.27, 0.80)</td>
<td>5.02 (1.55, 9.07)</td>
<td></td>
</tr>
<tr>
<td>OR delirium</td>
<td>0.61 (0.18, 2.12)</td>
<td>2.43 (0.65, 9.07)</td>
<td></td>
</tr>
<tr>
<td>OR cardiac</td>
<td>0.42 (0.11, 1.62)</td>
<td>3.75 (1.04, 13.51)</td>
<td></td>
</tr>
<tr>
<td>OR pulmonary</td>
<td>0.34 (0.09, 2.32)</td>
<td>6.61 (1.51, 28.29)</td>
<td></td>
</tr>
</tbody>
</table>

Dasgupta M et al. Arch Gerontol Geriatr 2009; 48: 78
Reasons for Preoperative Care

- Optimize medical condition for surgery
- Estimate and convey medical risk to surgeon and patient
- Recognize and treat medical conditions that may influence surgical risk
- Reduce postoperative medical complications
Common medical complications of surgery

- Cardiac
- Pulmonary
- Infections
- Thromboembolic
- Renal
Common medical complications of surgery

- Cardiac
- Pulmonary
- Infections
- Thromboembolic
- Renal

*And in the frail elderly…*

- Delirium
- Deconditioning
- Malnutrition
Difficulties estimating cardiac risk in elderly

- Symptoms may be unreliable (memory, cardiac neuropathy, atypical presentations)
- Prevalence of CAD very high (> 30% 80+)
- Diastolic dysfunction extremely common
- Arrhythmias (especially AF very common)
- HF may be readily precipitated by ↑ rate or Atrial Fibrillation
Postoperative Delirium
Delirium: epidemiology

Prevalence over age 65 years

- At hospital admission: 14-24%
- During hospitalization: 6-56%
- In ICU: 70-87%
- Postoperative: 15-53%
- End of life up to: 83%
Precipitants of delirium

- Surgery (especially AAA, hip, cardiac…)
- 3 or more additional medications
- Physical restraint
- Bladder catheters
- Malnutrition
- Any iatrogenic event

Inouye & Charpentier JAMA 1996;275:852,
Marcantonio et al JAMA 1994;271:134
Delirium is usually multifactorial
Delirium is usually multifactorial
Recognizing Delirium

- Onset: typically over hours or days
- Fluctuation: typically waxes and wanes over 24 hour period, lucid intervals
- Sleep wake cycle interruption
- Hallucinations or illusions
- Previous cognitive impairments
- Previous episodes of delirium
- Medication review
- Special senses
Delirium: helpful motor signs

- Restlessness, agitation
- “Picking”
- Myoclonus (often multifocal)
- Asterixis (coarse flapping tremor)
Mental status in Delirium

- Level of consciousness
- Drowsy, inattentive, distractible
- Measuring attention
  - Digit Span
  - Serial 7’s
  - Months Backwards
  - Counting Backwards
- Orientation
- Thought disorder: hallucinations, delusions
- Formal testing MMSE, MoCA
Delirium: Confusion Assessment Method (CAM)

1. Acute onset, fluctuating course  
   PLUS

2. Inattention  
   AND

3. Disorganized thinking  
   OR

4. Decreased level of consciousness

Inouye S et al Ann Intern Med 1990; 113:941
Confusion Assessment Method

Sensitivity for delirium  94% (91-97)
Specificity  89% (85-94)
Interobserver agreement  0.81 - 1.0
Positive LR  5.4 (3.5 - 8.4)
Negative LR  0.6 (0.5 - 0.7)

Wei L et al J AGS 2008; 56:2358
Delirium: prognosis

- Increased mortality in hospital 22-76%
- Hypoactive type has higher mortality
- Prolonged length of hospital stay
- One year mortality 35-40%
- Even after recovery from delirium, annual incidence of dementia is 20%

Cole M & McCusker J. Int Psychogeriatr 2009; 21(4): 613
Recovery from Delirium

Figure 1. Proportion of older hospital inpatients who recover from delirium at each time point.

Cole M & McCusker J. Int Psychogeriatr 2009; 21(4): 613
## RF for Postoperative Delirium

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Effect size (lower)</th>
<th>Effect size (upper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive impairment</td>
<td>0.27</td>
<td>0.29</td>
</tr>
<tr>
<td>Depression</td>
<td>-0.23</td>
<td>0.56</td>
</tr>
<tr>
<td>Psychotropic drugs</td>
<td>0.19</td>
<td>0.26</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>0.15</td>
<td>0.19</td>
</tr>
<tr>
<td>Institutionalized</td>
<td>0.08</td>
<td>0.11</td>
</tr>
<tr>
<td>Poor function</td>
<td>0.35</td>
<td>0.45</td>
</tr>
</tbody>
</table>

Dasgupta & Dumbrell JAGS 2006; 54: 578
RF for postoperative Delirium after AAA surgery

- Incidence 33%
- Lower education
- Preoperative depression
- Greater number of psychoactive medications
- Number of pack years of smoking
- Mental status

RF for postoperative Delirium after hip surgery (25% acute)

1 point each for

- MMSE <24
- Vision worse than 20/70
- APACHE II score >16
- Urea/creatinine > 0.1 (1:10)

<table>
<thead>
<tr>
<th>Score</th>
<th>Incidence of Delirium %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3.8</td>
</tr>
<tr>
<td>1-2</td>
<td>11.1</td>
</tr>
<tr>
<td>3-4</td>
<td>37.1</td>
</tr>
</tbody>
</table>

Kalisvaart K et al JAGS 2006; 54: 822
## Prediction of Delirium after Cardiac Surgery

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Criteria</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMSE</td>
<td>&lt;23</td>
<td>2</td>
</tr>
<tr>
<td>MMSE</td>
<td>23-27</td>
<td>1</td>
</tr>
<tr>
<td>GDS (15)</td>
<td>&gt;4</td>
<td>1</td>
</tr>
<tr>
<td>Stroke or TIA</td>
<td>In history</td>
<td>1</td>
</tr>
<tr>
<td>Abnormal serum albumen</td>
<td>&lt;35 or &gt;45</td>
<td>1</td>
</tr>
</tbody>
</table>

Rudolph J et al Circulation 2009; 119: 229
## Prediction of Delirium after Cardiac Surgery

<table>
<thead>
<tr>
<th>Risk score</th>
<th>Incidence of delirium %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>1</td>
<td>43</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
</tr>
<tr>
<td>&gt; or = 3</td>
<td>87</td>
</tr>
</tbody>
</table>

Rudolph J et al Circulation 2009; 119: 229
Type of anesthesia and risk of Postoperative Delirium (POD)

• Systematic evidence review and meta analysis
• Only RCTs Jadad score >3
• GA vs. regional anesthesia
• 18 RCTs
• 2708 patients
• *NO DIFFERENCE IN INCIDENCE OF POD*

Delirium: Management

• Address immediate safety
• Investigate causes e.g. drugs, infections…
• Specific treatment of causes
• General measures . avoid restraints
  . family members
  . fluids, nutrition
  . low stimulation
• Sedative medications
• Follow up
Some anticholinergic drugs

- Dimenhydrinate
- Diphenhydramine
- Oxazepam
- Ampicillin
- Clindamycin
- Gentamycin
- Olanzapine
- Tolteridine
Drugs with anticholinergic properties

<table>
<thead>
<tr>
<th>Drug</th>
<th>ng/ml of atropine equivalents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Codeine</td>
<td>0.11</td>
</tr>
<tr>
<td>Digoxin</td>
<td>0.25</td>
</tr>
<tr>
<td>Furosemide</td>
<td>0.22</td>
</tr>
<tr>
<td>Nifedipine</td>
<td>0.22</td>
</tr>
<tr>
<td>Prednisolone</td>
<td>0.55</td>
</tr>
<tr>
<td>Ranitidine</td>
<td>0.22</td>
</tr>
<tr>
<td>Theophylline</td>
<td>0.44</td>
</tr>
<tr>
<td>Warfarin</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Causes of Delirium: A Checklist

D: Drugs  anticholinergics, ETOH
E: Endocrine  BS, Na Ca, Mg, cortisol, etc.
M: Metabolic  organ failure, hypoxia, etc.
E: Epilepsy or seizures  post ictal, status
N: Neoplasm  especially SIADH, CNS
T: Trauma  concussion, surgery
I: Infection  any
A: “Apoplexy”  any vascular event MI, PE, CVA
# Sedative medications for delirium

<table>
<thead>
<tr>
<th>Drug class</th>
<th>Dose</th>
<th>ADR</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antipsychotic <strong>haloperidol</strong></td>
<td>0.5-1mg bid; q4h prn</td>
<td>EPS, QT↑</td>
<td>Usually agent of choice</td>
</tr>
<tr>
<td>Atypical neuroleptics e.g. <strong>risperidone</strong></td>
<td>0.5mg bid</td>
<td>EPS, QT↑</td>
<td>Increased risk stroke and mortality</td>
</tr>
<tr>
<td>Benzodiazepine <strong>lorazepam</strong></td>
<td>0.5-1mg q4h prn</td>
<td>Paradoxical agitation, oversedation</td>
<td>Can prolong delirium; best for ETOH, PD</td>
</tr>
<tr>
<td>Antidepressant <strong>trazodone</strong></td>
<td>25-150 mg HS</td>
<td>Oversedation</td>
<td>Uncontrolled studies</td>
</tr>
</tbody>
</table>
Preventing Delirium

- Preoperative strategies
- Medical optimization
- Anesthesia ? Regional vs. GA
- Specific medications e.g. gabapentin, haloperidol
- Specific in hospital programs (e.g. HELP)
Gabapentin

• Systematic review
• Single dose 1200 mg preoperatively
• Pain (100 mm VAS) WMD
  -16.55 mm @ 6 h
  -10.87 mm @ 24h
• Opioid dose -27.9 mg
• Increased risk of sedation OR 3.86 (2.5, 5.94)
• Reduced risk of vomiting OR 0.58 (0.39, 0.86)

Ho K-Y et al Pain 2006; 126: 91
Reduction of Postoperative Delirium with gabapentin

- 21 patients undergoing spinal surgery
- Gabapentin 900mg preoperative and for first 3 postoperative days vs. usual analgesic regime
- 5/12 (42%) of usual care developed postoperative delirium
- 0/9 gabapentin group developed postoperative delirium
- \( P=0.045 \)
- NB: gabapentin is renally excreted

Leung J et al Neurology 2006; 67: 1251
Reduction of Postoperative Delirium with haloperidol

RCT 430 hip surgery patients mean age 70
Haloperidol 0.5m tid preoperatively and up to 3 days postoperatively

<table>
<thead>
<tr>
<th></th>
<th>Haldol</th>
<th>Usual care</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidence</td>
<td>15.1%</td>
<td>16.5%</td>
<td>NS</td>
</tr>
<tr>
<td>Duration</td>
<td>5.4 days</td>
<td>11.8 days</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Mean LOS</td>
<td>17.1 (11.1)</td>
<td>22.6(16.7)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Kalisvaart K et al JAGS 2005; 53: 1658
Deconditioning

www.greenwichnursing.com
DECONDITIONING: a simple definition

The adverse physiological consequences of too much rest
Bed rest and loss of muscle strength

Muscle strength, maximal voluntary contraction (MVC) is lost at 2-5% per day!

Harper & Lyles. JAGS 1988; 36: 1047
Muller EA. Arch Phys Med Rehab 1970; 51: 449
Loss of muscle strength

23% loss in one week i.e. 3% per day

Muller EA. Arch Phys Med Rehab 1970;51:449
Change in muscle mass with bedrest 28 days: effect of cortisolemia

Ferrando AA et al Curr Opin Clin Metab Care 206; 9:410
Plasma volume and bed rest

Effects of bedrest on cardiovascular system

- Reduction in plasma volume
- Reduced stroke volume and cardiac output
- Orthostatic hypotension
- Results in falls, syncope

Killewich L. J Am Coll Surg 2006; 203: 5
DECONDITIONING

- Muscle weakness
- Circulatory changes
- Many other consequences including negative calcium balance, catabolic state, pressure effects on skin, insulin resistance, inflammatory responses etc.
- Changes occur soon after rest begins
Muscle and age
Aging and loss of muscle mass/strength (sarcopenia)

- Muscle strength declines by 15% per decade in 6th and 7th decade
- Declines by 30% per decade thereafter

Killewich, L. J Am Coll Surg 2006; 203: 5
Muscle mass and age

DECONDITIONING

Results in:
• Decreased ability to perform activities of daily living (including incontinence)
• Increased risk of falls, fear of falling and fractures
• Potential skin breakdown
• Eventually contractures
How surgery and the postoperative state contribute to deconditioning

Surgery:
• Catabolic state
• Decrease in cardiac work
• Decrease in pulmonary function
• Immunosupression
• Immobilization

Postoperative state:
• Pain, fatigue, rest, nutrition

Killewich L. J Am Coll Surg 2006; 203: 5
Deconditioning in hospital: Epidemiology

- 35-50% of older adult patients experience functional decline during hospitalization
- Common reason for delaying hospital discharge in Geriatric patients
- Only half of those who declined regained their function 3 months after discharge

Covinsky K et al. JAGS 2003; 51: 451
Hanson K et al. JAGS 1999; 47: 360
DECONDITIONING caused by bed rest in hospital

- 16-33% of older adults on complete bedrest at some point in hospitalization
- Deconditioning begins as early as 3 days post admission

Brown C et al. JAGS 2004; 52: 1263
Inouye S et al. JAGS 1993; 41: 1353
Deconditioning in hospital: Consequences

• Prolongs hospital stay
• Increases risk of hospital acquired complications (injuries, infections)
• May result in (inappropriate) discharge to alternative accommodations
DECONDITIONING
Treatment

• Resistance training increases muscle strength and volume by 1% per day
  Remember that it is lost at 2-5% per day

• More importantly, resistance training increases spontaneous activity
DECONDITIONING Prevention

• Maintain mobility before and after surgery
• Resistance exercise
• Adequate nutrition including vitamin D
• Adequate fluid and electrolyte intake (especially sodium)
• Avoid tethers wherever possible (including i. v. lines, catheters, restraints)
“Prehabilitation” on waiting list.

249 patients waiting for elective CABG
RCT twice weekly supervised exercise; education & reinforcement; monthly nurse initiated calls vs. usual care: duration 10 weeks

- Total LOS 6 vs. 7 days (p=0.002)
- Postop days in hospital 5 vs. 6 (p=0.001)
- Improved Quality of Life

“Prehabilitation” on waiting list.

Nutrition
Malnutrition in hospitalized elderly

152 patients over age 65 (20% over 80y)
Admitted to Ottawa General Hospital

<table>
<thead>
<tr>
<th>Result</th>
<th>No. (and %) of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed assessment</td>
<td></td>
</tr>
<tr>
<td>Well nourished</td>
<td>62 (40.8)</td>
</tr>
<tr>
<td>Moderate risk</td>
<td>67 (44.1)</td>
</tr>
<tr>
<td>Malnourished</td>
<td>23 (15.1)</td>
</tr>
</tbody>
</table>

Azad N et al. CMAJ 1999; 161: 511
Malnutrition and surgery

Malnutrition (however measured e.g. global subjective, nutritional risk index, mini nutritional assessment etc.) increases risk of:

• Postoperative mortality
• All postoperative complications
• Postoperative infections
• Prolonged hospital stay
Serum albumin and surgical mortality (N=54,000)

Figure 1. Thirty-day mortality rate by preoperative serum albumin level for all operations and 3 subspecialties.

Serum albumin and surgical morbidity


Figure 2. Thirty-day morbidity rate by preoperative serum albumin level for all operations and 3 subspecialties.
Nutrition and outcome in hip fracture patients (N=377)

<table>
<thead>
<tr>
<th></th>
<th>Serum albumin g/L</th>
<th>TLC /mm³</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>&gt; 35</td>
<td>&gt;1500</td>
</tr>
<tr>
<td>B</td>
<td>&gt; 35</td>
<td>&lt;1500</td>
</tr>
<tr>
<td>C</td>
<td>&lt; 35</td>
<td>&gt;1500</td>
</tr>
<tr>
<td>D</td>
<td>&lt; 35</td>
<td>&lt;1500</td>
</tr>
</tbody>
</table>

O’Daly B et al. Clin Nutr 2010; 29: 89
Muscle function and postoperative recovery

Requires adequate:
  • Caloric intake
  • Protein intake
  • Vitamin status, especially Vitamin D
Vitamin D deficiency

< 50 nmol/L 25(OH) D
• Acute geriatric patients (France) 80%
• Hip fracture patients (Australia) 80%

<80 nmol/L 25(OH) D
• Hip fracture patients (Australia) 97%
• Similar in Hamilton

Sutra del Galy et al. JAGS 2009; 57(9): 1721
Hip fractures: good evidence for …

- Preventing bedsores
- Delay of surgery no more than 24 hours
- Regional vs. general anesthetic
- DVT prophylaxis
- Antibiotic prophylaxis
- Epidural analgesia postop
- Nutritional assessment
- Protein supplements

Early oral feeding postoperatively

RCT 143 gynecological oncology patients
Early oral feeding vs. usual care associated with:

• Postop complications 17 vs. 39% (p=0.003)
• Infectious complications 3 vs. 14% (p=0.017)
• LOS 4.7 vs. 5.8 days (p=0.006)

So far…

- Frailty rather than age that predicts adverse outcomes
- Difficulties estimating some clinical risks (e.g. cardiac symptoms)
- Delirium is a common and serious postoperative complication
- Deconditioning is also common and serious
- Malnutrition is common and associated with many adverse outcomes
So, if frailty is so important, can we easily measure it?
An easy way to estimate frailty

Box 1: The CSHA Clinical Frailty Scale

1. *Very fit* — robust, active, energetic, well motivated and fit; these people commonly exercise regularly and are in the most fit group for their age
2. *Well* — without active disease, but less fit than people in category 1
3. *Well, with treated comorbid disease* — disease symptoms are well controlled compared with those in category 4
4. *Apparently vulnerable* — although not frankly dependent, these people commonly complain of being “slowed up” or have disease symptoms
5. *Mildly frail* — with limited dependence on others for instrumental activities of daily living
6. *Moderately frail* — help is needed with both instrumental and non-instrumental activities of daily living
7. *Severely frail* — completely dependent on others for the activities of daily living, or terminally ill

Note: CSHA = Canadian Study of Health and Aging.
An easy way to estimate frailty

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Note: CSHA = Canadian Study of Health and Aging

Rockwood et al. CMAJ 2005;173:489
Take home messages…

• Frailty vs. age is main risk factor for postoperative complications, and is relatively easily measured
• Prevent delirium by: medication review especially anticholinergics, optimize medical condition, type of anesthetic, possibly gabapentin or haloperidol
• Prevent deconditioning by early mobilization, resistance exercise and “prehabilitation” (for elective surgery)
• Prevent malnutrition: protein calorie supplements, Vitamin D etc.
This presentation may be viewed at:

http://www.fhs.mcmaster.ca/medicine/geriatric/