Falls: The Under-Recognized Risk of Delirium

Stephanie Rogers, MD, MS, MPH
Division of Geriatrics, Assistant Professor of Medicine
Medical Director Delirium Reduction Campaign
Medical Director ACE unit
Medical Director Hip Fracture Co-management Service
I have nothing to disclose.
Objectives

- Review the definition, prevalence, incidence, risk factors and consequences of delirium
- Recognize the strength of association between delirium and falls
- Discuss diagnosis and treatment of delirium
- Recognize the impact delirium prevention programs have on fall rates
Delirium is:
1. Serious
2. Prevalent & Under-recognized
3. Preventable
4. Associated with Falls

Delirium prevention programs decrease fall rates
1) Delirium is serious
Delirium: DSM V

A. A disturbance in *attention* and *awareness*.
B. The disturbance *develops over a short period of time*, represents a *change from baseline* attention and awareness, and tends to *fluctuate* in severity during the course of a day.
C. An additional *disturbance in cognition* (i.e. memory deficit, disorientation, language, visuospatial ability, or perception).
D. The disturbances in Criteria A and C are *not better explained by* another preexisting, established, or evolving neurocognitive disorder and do not occur in the context of a severely reduced level of arousal, such as coma.
E. There is evidence from the history, physical examination, or laboratory findings that the disturbance is a direct physiological consequence of another medical condition, substance intoxication or withdrawal (i.e. due to a drug of abuse or to a medication), or exposure to a toxin, or is due to multiple etiologies.
1. Acute onset and fluctuating course
   - and -

2. Inattention
   - and either -

3. Disorganized thinking
   - or -

4. Altered level of consciousness
Delirium is serious!

<table>
<thead>
<tr>
<th>Patient Experience</th>
<th>Quality &amp; Safety</th>
<th>Our People</th>
<th>Financial Strength</th>
<th>Strategic Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>↑Patient &amp; caregiver distress</td>
<td>↑Mortality</td>
<td>↑Staff burnout</td>
<td>↑Cost</td>
<td>↑Length of Stay</td>
</tr>
<tr>
<td>↑Institutionalization</td>
<td>↑Hospital-acquired complications</td>
<td></td>
<td>↑Safety attendant use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>↑Restraint use</td>
<td></td>
<td></td>
<td>↑Readmissions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Delirium: A Stress Test for the Brain

Mortality (22 months)  
Episode of Delirium: n=2957  
Controls: n=8645

Institutionalization (14 months)  
Episode of Delirium: n=2579  
Controls:

Dementia (4 years)  
Episode of Delirium: n=241  
Controls:

Readmission (30 day)  
Episode of Delirium: n=241  
Controls:

*Slide courtesy of Vanja Douglas, MD

Hospitalization: A Stress Test for the Brain


*Slide courtesy of Vanja Douglas, MD*
Post-op delirium and long term cognition

Saczynski et al, NEJM 2012
2) Delirium is prevalent & under-recognized
How Often Does Delirium Occur?

- **Medical patients:**
  - Prevalence: 18-35%; Incidence: 11-14%

- **Surgical patients:**
  - Incidence: 11-51%

- **ICU patients**
  - Prevalence + Incidence: 80-85%

- **Nursing home residents**
  - Prevalence: 18%

*Slide courtesy of Vanja Douglas, MD*

50-75% of delirium is missed

- Nurses and providers fail to recognize delirium without formal, routine screening
  - Hypoactive delirium is most often missed

3) Delirium is preventable
30-40% cases are preventable

- Multi-component intervention
  - Cognitive stimulation
  - Sleep promotion
  - Mobilization
  - Adequate nutrition & hydration

Risk Factors (Predisposition)

- Age (>80)
- History of DEMENTIA, stroke, or Parkinson’s disease
- Functional impairment
- Sensory impairment
- Depression
- Alcohol abuse
Iatrogenic Precipitants

- Medications (3 or more)
- Surgery (cardiothoracic, vascular, orthopedic)
- Sleep deprivation
- Restraints/Immobilization
- Urinary catheters
- Frequent procedures (fingersticks, vitals)
- Undertreated pain
# Prevention: Non-pharmacologic

<table>
<thead>
<tr>
<th>Risk factor for delirium</th>
<th>Targeted intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Impairment</td>
<td>Board with names of care team members and day’s schedule</td>
</tr>
<tr>
<td></td>
<td>Frequent reorientation</td>
</tr>
<tr>
<td>Sleep Deprivation</td>
<td>Bedtime routine, avoid naps</td>
</tr>
<tr>
<td></td>
<td>Unit-wide noise-reduction strategies</td>
</tr>
<tr>
<td></td>
<td>Schedule adjustments to allow sleep</td>
</tr>
<tr>
<td>Immobility</td>
<td>Early ambulation, bed exercises</td>
</tr>
<tr>
<td></td>
<td>Minimal use of catheters and restraints</td>
</tr>
<tr>
<td>Vision impairment &lt; 20/70</td>
<td>Use of visual aids</td>
</tr>
<tr>
<td></td>
<td>Adaptive equipment</td>
</tr>
<tr>
<td>Hearing impairment</td>
<td>Portable amplifying devices</td>
</tr>
<tr>
<td></td>
<td>Earwax disimpaction</td>
</tr>
<tr>
<td>Dehydration (BUN/Cr ratio &gt;18)</td>
<td>Oral rehydration</td>
</tr>
</tbody>
</table>
Meta-analysis of Nonpharmacologic Delirium Prevention

Delirium incidence:
- OR 0.47 (0.38-0.58)
- NNT = 14

*Slide courtesy of Vanja Douglas, MD

Hshieh et al, JAMA Int Med 2015
Early Mobilization

Delirium reduction:
• 4 days to 2 days in 104 randomized ICU patients
• 53% to 21% (p=0.003) in before/after study of 57 patients
• 20% to 3% in 140 randomized non-vented ICU patients getting OT BID x5 days


*Slide courtesy of Vanja Douglas, MD*
Sleep Promotion:
Earplugs

• 832 patients in 5 studies

• Placement of earplugs in patients in the ICU in isolation or as part of a sleep bundle is associated with significant reduction in risk of reduction (RR 0.59)

*Slide courtesy of Vanja Douglas, MD

Prevention: Pharmacologic

• Medications studied in randomized trials for prevention of delirium (mostly post-op):
  – Haloperidol (both ICU and non-ICU), risperidone, olanzapine (7 studies)
  – Donepezil, rivastigmine (113 patients)
  – Diazepam
  – Gabapentin
  – Epidural vs. halothane anesthesia
  – Ketamine
  – Melatonin

Treatment

• Treat the underlying cause
• Remove unnecessary medications
• Remove bladder catheters
• Avoid restraints
• Early mobilization
• Treat urinary retention and constipation
• Normalize sleep-wake cycles
• Cognitive stimulation and reorientation
Managing “Agitation”

**Identify the unmet need:**

- Loneliness/depression: one-on-one interaction; group activities
- Boredom: art/music therapy; physical activity
- Discomfort: toileting, hunger, thirst, communication, pain

*Figure 2. Change in (A) Total Agitation, (B) Verbal Agitation, (C) Physical Agitation, (D) Pleasure, and (E) Interest in Control and Intervention Groups of Patients With Dementia at Baseline and During the Treatment Condition.*


*Slide courtesy of Vanja Douglas, MD*
Antipsychotics

Antipsychotic Medication for Prevention and Treatment of Delirium in Hospitalized Adults: A Systematic Review and Meta-Analysis

Karin J. Neufeld, MD, MPH, Jirong Yue, MD, Thomas N. Robinson, MD, MPH, Sharon K. Inouye, MD, MPH, and Dale M. Needham, MD, PhD

OBJECTIVES: To evaluate the effectiveness of antipsychotic medications in preventing and treating delirium.

DESIGN: Systematic review and meta-analysis.

SETTING: PubMed, EMBASE, CINAHL, and ClinicalTrials.gov databases were searched from January 1, 1988, to November 26, 2013.

PARTICIPANTS: Adult surgical and medical inpatients.

INTERVENTION: Antipsychotic administration for delirium prevention or treatment in randomized controlled trials or cohort studies.

MEASUREMENTS: Two authors independently reviewed all citations, extracted relevant data, and assessed studies for potential bias. Heterogeneity was considered as chi-square P < .1 or I² > 50%. Using a random-effects model (I² > 50%) or a fixed-effects model (I² < 50%), odds ratios (ORs) were calculated for dichotomous outcomes (delirium incidence and mortality), and mean or standardized mean difference for continuous outcomes (delirium duration, severity, hospital or ICU LOS, length of stay (LOS)). Sensitivity analyses included postoperative prevention studies only, exclusion of studies with high risk of bias, and typical versus atypical antipsychotics.

RESULTS: Screening of 10,877 eligible records identified 19 studies. In seven studies comparing antipsychotics with placebo or no treatment for delirium prevention after surgery, there was no significant effect on delirium incidence (OR = 0.56, 95% confidence interval (CI) = 0.23–1.34, I² = 93%). Using data reported from all 19 studies, antipsychotic use was not associated with change in delirium duration, severity, hospital or ICU LOS, with high heterogeneity among studies. No association with mortality was detected (OR = 0.90, 95% CI = 0.62–1.29, I² = 63%).

Antipsychotics use is associated with a 1.6x ↑risk of falling

**Meta-analysis of the Impact of 9 Medication Classes on Falls in Elderly Persons**

John C. Woolcott, MA; Kathryn J. Richardson, MSc; Matthew O. Wiens, BSc, Pharm, PharmD; Bhavini Patel, MPharm; Judith Marin, BPharm, PharmD; Karim M. Khan, MD, PhD; Carlo A. Marra, BSc, Pharm, PharmD, PhD

*Arch Intern Med. 2009;169(21):1952-1960*
4. Delirium is associated with Falls
96% of patients with falls had evidence of delirium on chart review.
Delirious pts: 11% fell (10/95)
Non-Delirious pts: 2% fell (5/213)

OR: 4.55

Pendlbury, et al BMJ 2015
Increased falls in patients with delirium (27% vs 11%)
Do delirium prevention programs reduce falls?
Effectiveness of Multicomponent Nonpharmacological Delirium Interventions
A Meta-analysis

Tammy T. Hsieh, MD; Jirong Yue, MD; Esther Oh, MD; Margaret Puelle; Sarah Dowal, MSW, MPH; Thomas Travison, PhD; Sharon K. Inouye, MD, MPH

• 11 studies (4 with falls outcomes)
• 1,038 patients with falls
• 62% lower odds of falling (OR 0.38)
Delirium incidence:
- OR 0.47 (0.38-0.58)
- NNT = 14

Falls:
- OR 0.38 (0.25-0.60)
Delirium prevention programs decrease fall rates
What is HELP?

• Program with a large volunteer pool to improve patient cognitive and physical functioning in the hospital

• Volunteers:
  – Cognitive orientation and stimulation
  – Sleep enhancement strategies
  – Exercise and mobilization
  – Hearing and vision aids
  – Feeding assistance and preventing dehydration
Yale Delirium Prevention Trial

Reduction in:

- Development of delirium (15% vs 10%)
- Total # of days with delirium (161 vs. 105)
- Total # of delirium episodes (90 vs. 62)

Clinical Benefits

• Prevention of:
  – Functional decline (Inouye 2000)
  – Cognitive decline (Inouye 2000)

• Decreased:
  – Nursing home placement (Caplan 2007, JAGS 2005)
  – Falls (Inouye 2009, Caplan 2007)
  – Sitter use (Caplan 2007)
2 sites had ↓ in falls from:
  – 11.4 to 3.8 per 1000 patient-days
  – 4.7 to 1.2 per 1000 patient-days

At 29 hospitals implementing HELP, 95% of staff members reported a reduction in the rate of falls
Implications for Clinical Practice

*Failure to have a delirium program is a missed opportunity for fall prevention

- The Agency for Healthcare Research and Quality (AHRQ) correlates higher delirium rates with lower quality of hospital care
- The Minimum Data Set (MDS) aims to increase delirium awareness and recognition

(Inouye NEJM 2006)
Implications for Clinical Practice

• Screen for delirium risk on admission to target prevention interventions

• Screen every shift for find under-recognized, new onset delirium
Assessing Delirium Risk: The AWOL Tool

<table>
<thead>
<tr>
<th>AWOL Delirium Risk Score</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Age $\geq$ 80 years</td>
</tr>
<tr>
<td>W</td>
<td>Unable to correctly spell “WORLD” backward</td>
</tr>
<tr>
<td>O</td>
<td>Not Oriented to city, state, county, hospital name and floor</td>
</tr>
<tr>
<td>L</td>
<td>Illness severity of moderately ill, severely ill, or moribund (as opposed to not ill or mildly ill)</td>
</tr>
</tbody>
</table>

% Developing Delirium

Not Delirious at Admission (n=359)

Douglas et al, J Hosp Med 2013

*Slide courtesy of Vanja Douglas, MD
**Resource Stewardship with AWOL**

- **No Delirium**
  - <65: 587
  - ≥65: 308
  - AWOL (-): 737
  - AWOL (+): 177

- **Delirium**
  - <65: 78
  - ≥65: 40
  - AWOL (-): 158

- 38 more at risk cases received care pathway
- 150 fewer cases received care pathway unnecessarily

*Slide courtesy of Vanja Douglas, MD*
### Table 2. AUC for delirium risk scores in acute medicine: original internal validations and validations in our cohort

<table>
<thead>
<tr>
<th>Score</th>
<th>Internal validation</th>
<th>External validation in our cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Any</td>
<td>Incident</td>
</tr>
<tr>
<td></td>
<td>Incident</td>
<td></td>
</tr>
<tr>
<td>Inouye et al. [5]</td>
<td>0.66, 0.55–0.77</td>
<td>0.73, 0.66–0.80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.74, 0.68–0.80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.74, 0.66–0.80*</td>
</tr>
<tr>
<td>Martinez et al. [6]</td>
<td>0.85, 0.80–0.88</td>
<td>0.69, 0.62–0.76</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.71, 0.65–0.78</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.71, 0.65–0.78*</td>
</tr>
<tr>
<td>Isfandiyat et al. [7]</td>
<td>0.82, 0.78–0.88</td>
<td>0.76, 0.70–0.83</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.77, 0.71–0.82</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.77, 0.67–0.86*</td>
</tr>
<tr>
<td>Douglas et al. [8]</td>
<td>0.69, 0.54–0.83</td>
<td>0.74, 0.67–0.81</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.75, 0.69–0.81</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.75, 0.63–0.83*</td>
</tr>
</tbody>
</table>

*Slide courtesy of Vanja Douglas, MD*
Assess for cognitive impairment: Mini-Cog

- 3 word recall + clock draw
# Nursing Delirium Screening Scale

<table>
<thead>
<tr>
<th>NuDESC Item</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disorientation</strong>: Verbal or behavioral manifestation of not being oriented to time or place or misperceiving persons in the environment.</td>
<td></td>
</tr>
<tr>
<td><strong>Inappropriate behavior</strong>: Behavior inappropriate to place and/or for the person; e.g., pulling at tubes or dressings, attempting to get out of bed when that is contraindicated, and the like.</td>
<td></td>
</tr>
<tr>
<td><strong>Inappropriate communication</strong>: Communication inappropriate to place and/or for the person; e.g., incoherence, noncommunicativeness, nonsensical or unintelligible speech.</td>
<td></td>
</tr>
<tr>
<td><strong>Illusions/Hallucinations</strong>: Seeing or hearing things that are not there; distortions of visual objects.</td>
<td></td>
</tr>
<tr>
<td><strong>Psychomotor retardation</strong>: Delayed responsiveness, few or no spontaneous actions/words; e.g., when the patient is prodded, reaction is deferred and/or the patient is unarousable.</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong>:</td>
<td></td>
</tr>
</tbody>
</table>

0 – behavior not present during shift  
1 – behavior present at some time during the shift, but mild  
2 – behavior present at some time during the shift, and pronounced

A total score of 2 or greater indicates that the patient screens positive for delirium.
Other types of delirium assessments

- CAM
- CAM-ICU
- 3D-CAM (3 mins)
- FAM-CAM
- Delirium Rating Scale (DRS)
- Delirium Index (DI)
- Memorial Delirium Assessment Scale (MDAS)
Implications for Clinical Practice: high risk or delirious patients

• Review and remove delireogenic medications
• Prevent and treat with evidence-based protocols: hearing and vision assistance, cognitive stimulation, mobilization, sleep protocols
• Treat underlying cause: pain, dehydration, constipation, urinary retention, infection, etc
• Delirium is:
  1. Serious
  2. Prevalent & Under-recognized
  3. Preventable
  4. Associated with Falls

• Delirium prevention programs decrease fall rates
Acknowledgements

Vanja Douglas, MD Neurohospitalist, UCSF

Delirium Reduction Campaign
• UCSF Nursing
• Julie Carpenter
• Jessica Chao
• Teresa Fong
• Ralph Gonzales
• Brian Holt
• Sudha Lama
• Judy Maselli
• Megan Rathfon
• Stephanie Rogers
• Michael Wang
• Jan Yeager

Funding Sources
• UCSF Center for Clinical Innovation

Collaborators
• Clay Angel
• James Bourgeois
• Anne Donovan
• Emily Finlayson
• Andy Josephson
• Jacqueline Leung
• Elizabeth Whitlock
The Vulnerable Brain

*Slide courtesy of Vanja Douglas, MD

Images from Wikimedia Commons