

# Falls: The Under-Recognized Risk of Delirium

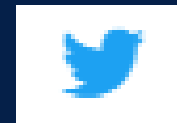
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University of California  
San Francisco

*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.

# CAM Diagnostic Algorithm

1.Acute onset and fluctuating course

*-and-*

2.Inattention

*-and either-*

3.Disorganized thinking

*-or-*

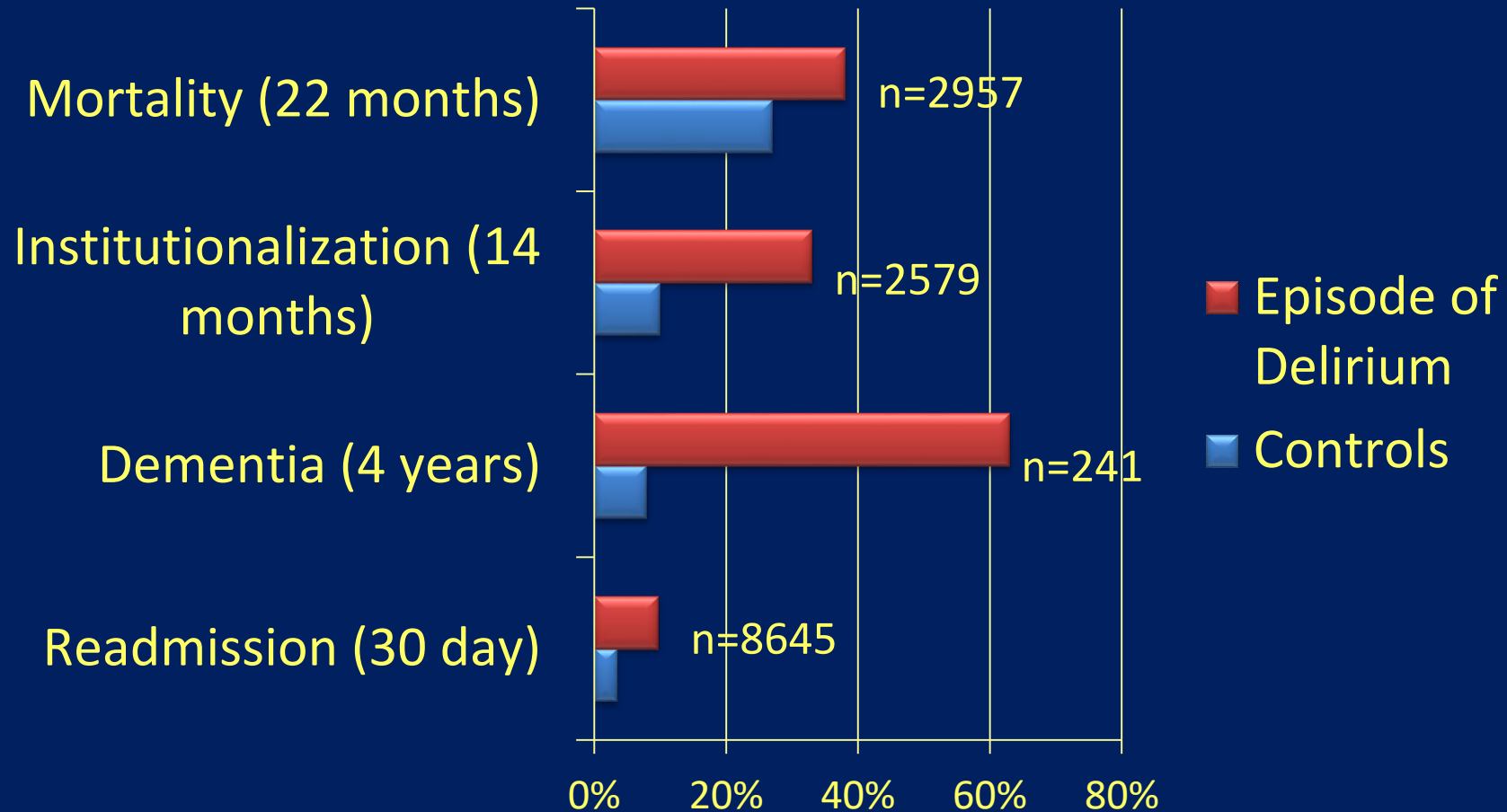
4.Altered level of consciousness



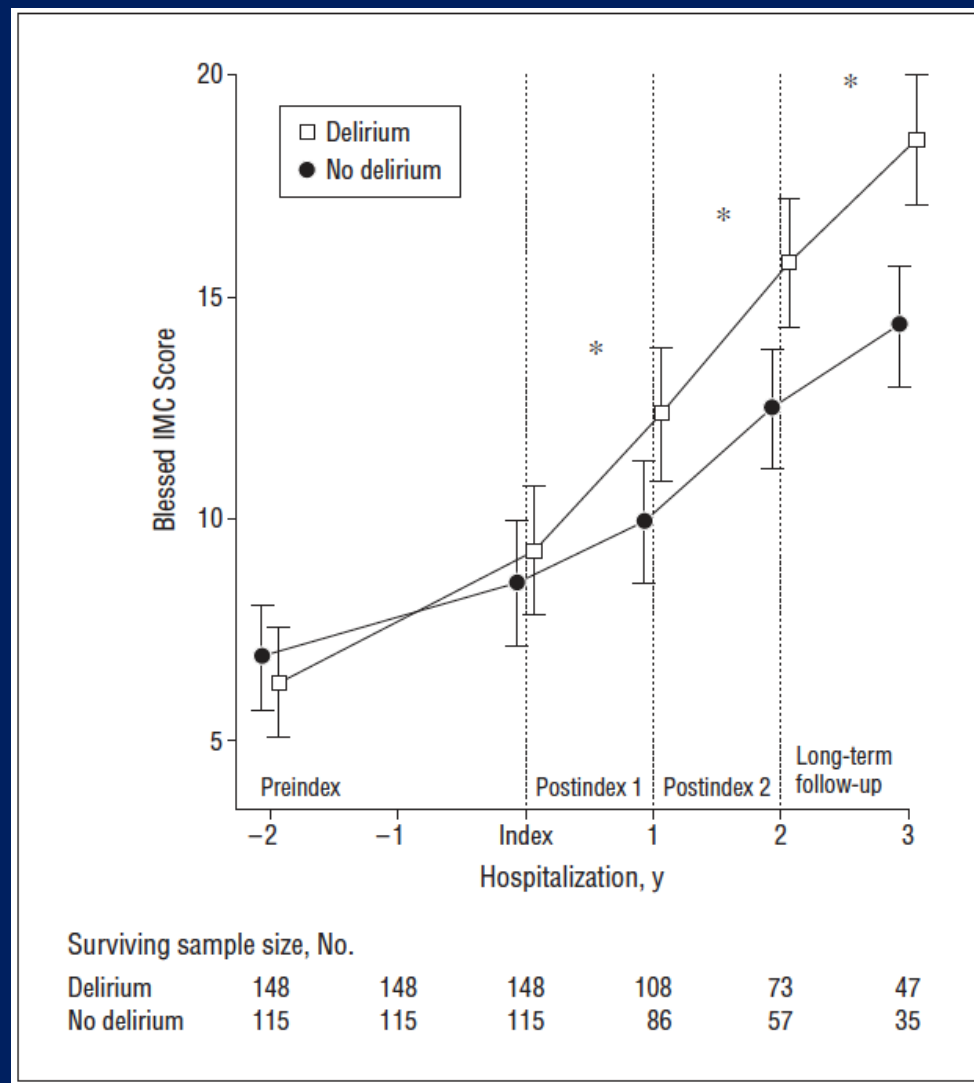
# Delirium is serious!

Patient Experience	Quality & Safety	Our People	Financial Strength	Strategic Growth
↑Patient & caregiver distress	↑Mortality	↑Staff burnout	↑Cost	↑Length of Stay
↑Institutionalization	↑Hospital-acquired complications		↑Safety attendant use	↑Readmissions
	↑Restraint use			
	↑Dementia			

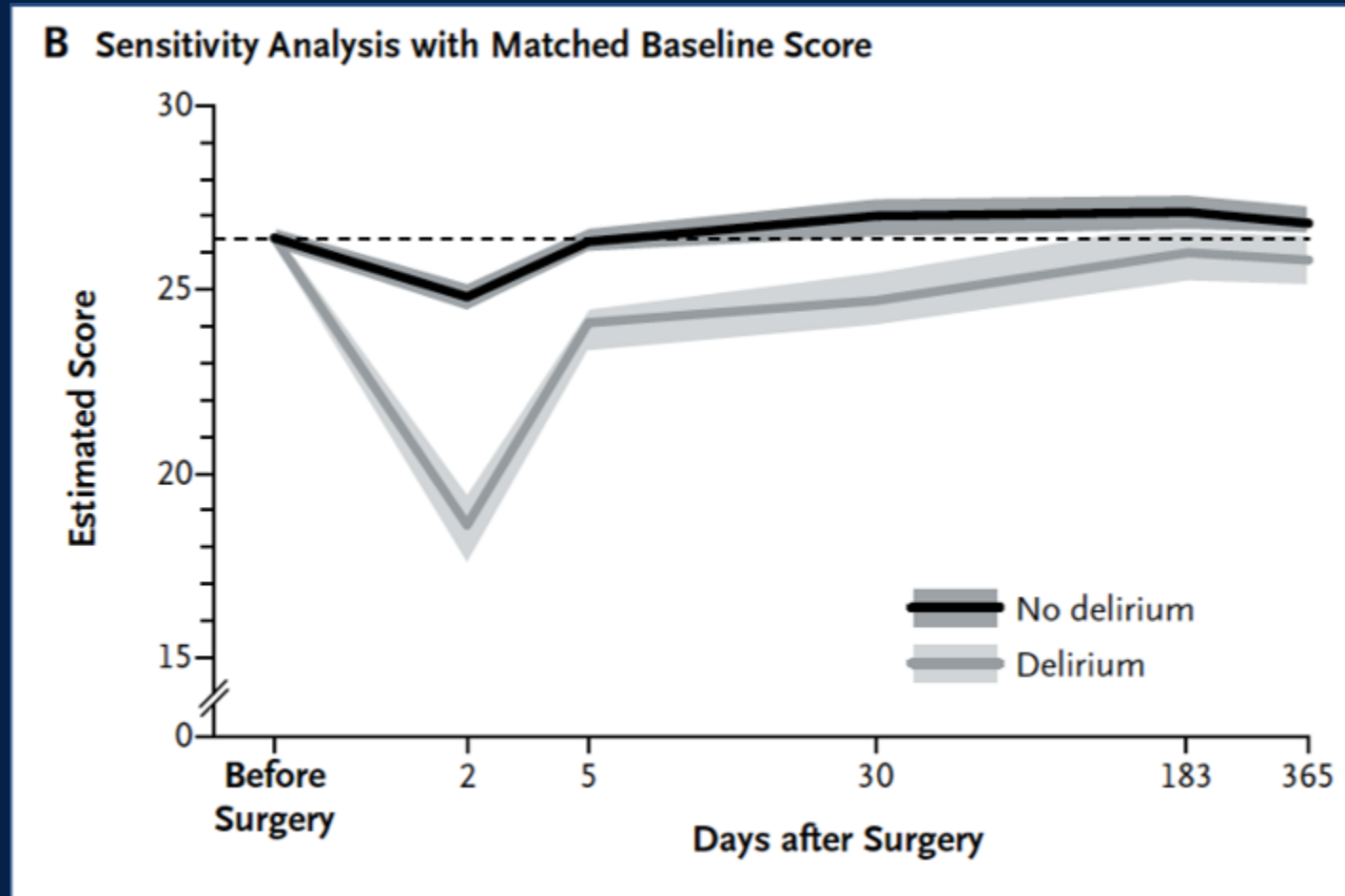
# Delirium: A Stress Test for the Brain



# Hospitalization: A Stress Test for the Brain



# Post-op delirium and long term cognition



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%

# 50-75% of delirium is missed

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

Gustafson et al, *J Am Geriatr Soc* 1991



3) Delirium is preventable

# 30-40% cases are preventable

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

(Inouye et al, *Lancet* 2013)

# Risk Factors (Predisposition)

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

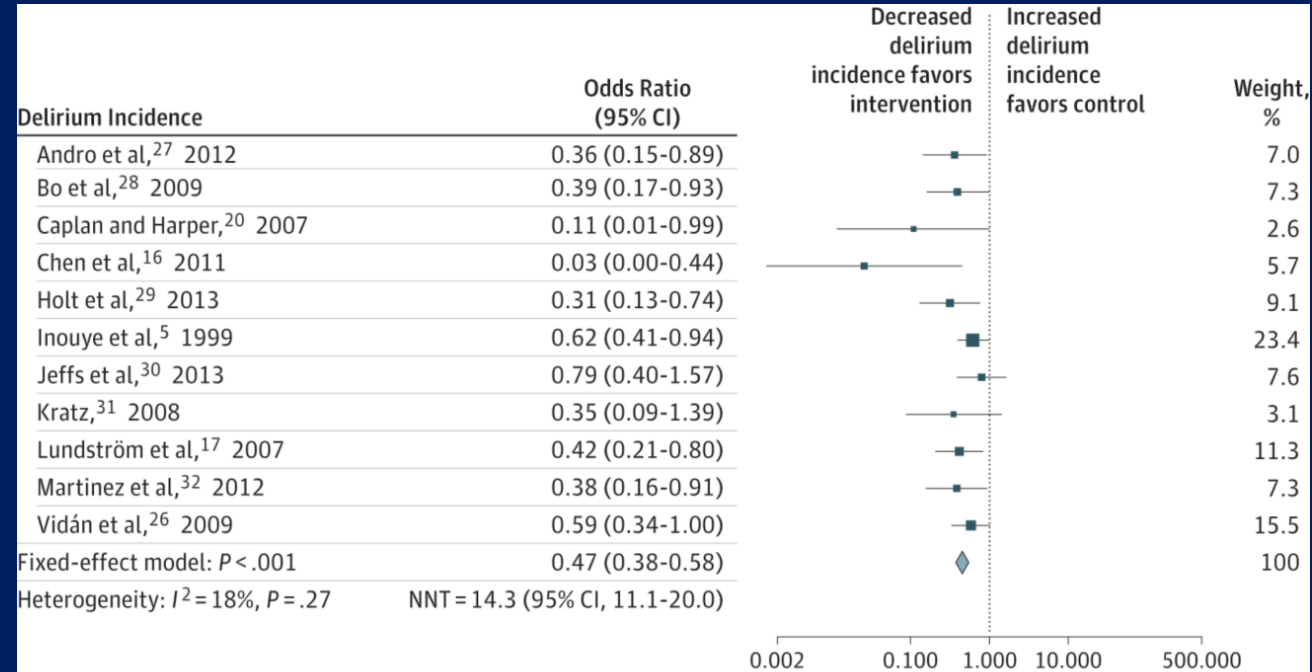
# Iatrogenic Precipitants

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

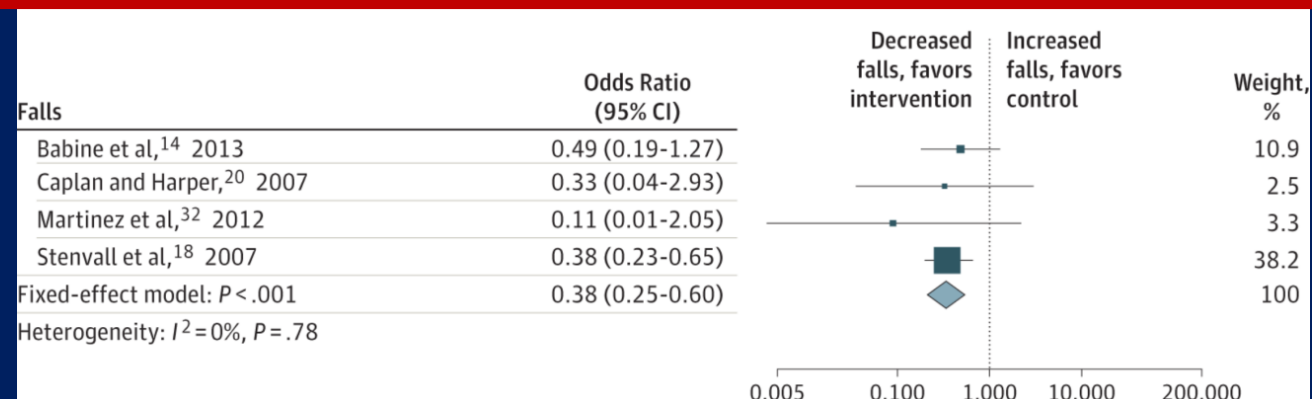
# Prevention: Non-pharmacologic

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

# Meta-analysis of Nonpharmacologic Delirium Prevention



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



# 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





# 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)



# 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

Siddiqi et al, *Cochrane Database Syst Rev* 2007; Page et al, *Lancet Respir Med* 2013; Friedman et al, *Am J Psychiatry* 2014; Neufeld et al, *JAGS* 2016

# Treatment

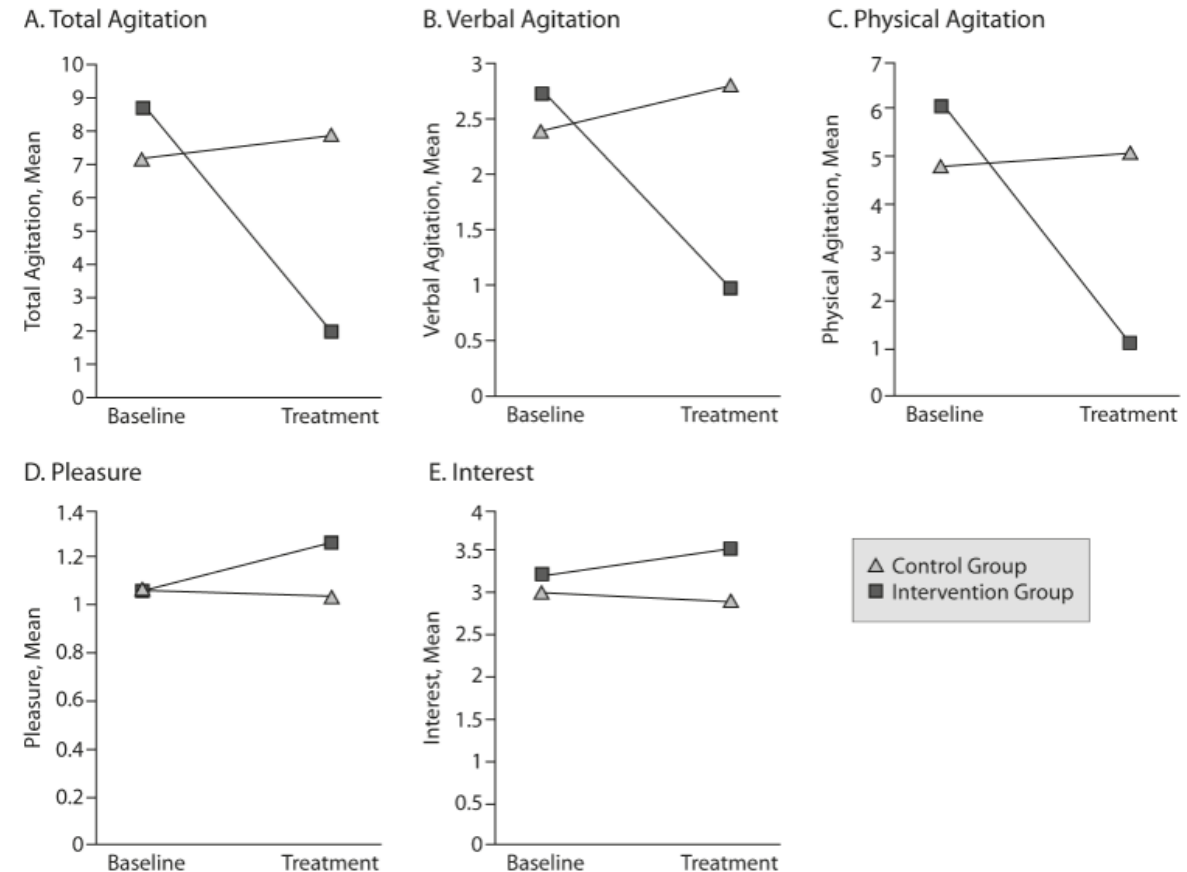
- Treat the underlying cause
- Remove unnecessary medications
- Remove bladder catheters
- Avoid restraints
- Early mobilization
- Treat urinary retention and constipation
- Normalize sleep-wake cycles
- Cognitive stimulation and reorientation

# 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,<sup>a</sup> (B) Verbal Agitation,<sup>a</sup> (C) Physical Agitation,<sup>a</sup> (D) Pleasure,<sup>b</sup> and (E) Interest<sup>b</sup> in Control and Intervention Groups of Patients With Dementia at Baseline and During the Treatment Condition



<sup>a</sup>Assessed with the Agitation Behavior Mapping Instrument. <sup>b</sup>Assessed with Lawton's Modified Behavior Stream.

# Antipsychotics

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

Karin J. Neufeld, MD, MPH,<sup>\*a</sup> Jirong Yue, MD,<sup>\$a</sup> Thomas N. Robinson, MD, MPH,<sup>||</sup>  
Sharon K. Inouye, MD, MPH,<sup>\*†‡b</sup> and Dale M. Needham, MD, PhD<sup>†‡b</sup>

**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  $I^2 > 50\%$ . Using a random-effects model ( $I^2 > 50\%$ ) or a fixed-effects model ( $I^2 < 50\%$ ), 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 and intensive care unit (ICU) length of stay (LOS)). Sensitivity analyses included postoperative prevention studies only, exclusion of studies

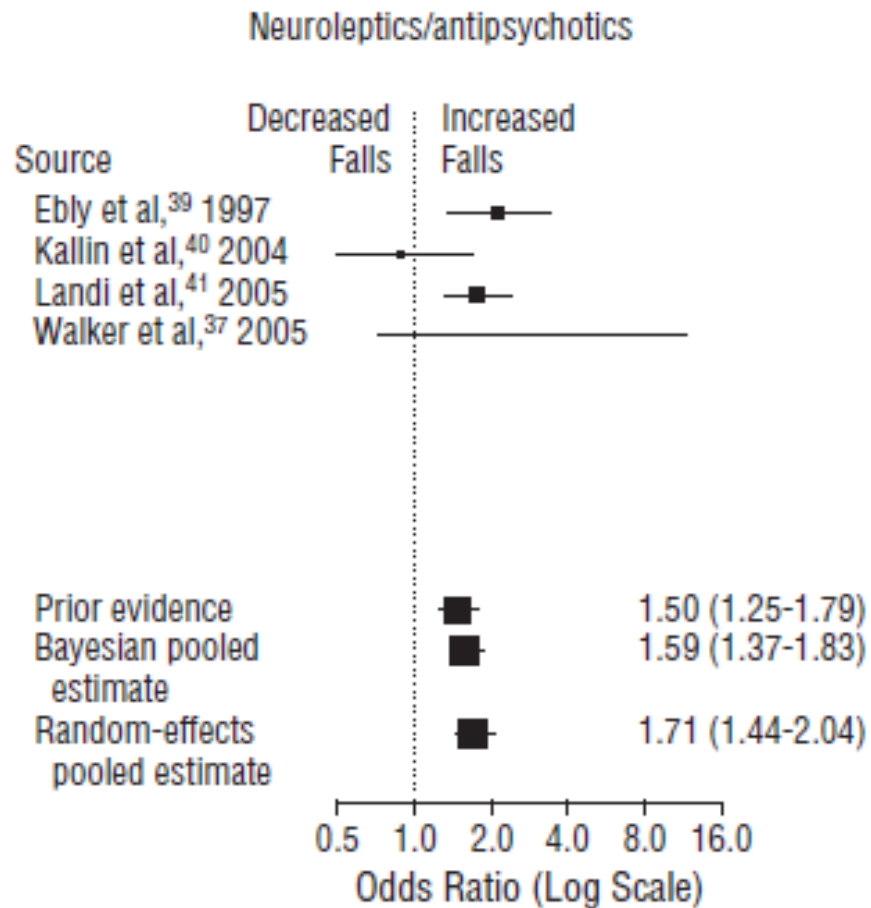
with high risk of bias, and typical versus atypical antipsychotics.

**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,  $I^2 = 93\%$ ). Using data reported from all 19 studies, antipsychotic use was not associated with change in delirium duration, severity, or hospital or ICU LOS, with high heterogeneity among studies. No association with mortality was detected (OR = 0.90, 95% CI = 0.62–1.29,  $I^2 = 0\%$ ).

**CONCLUSION:** Current evidence does not support the use of antipsychotics for prevention or treatment of delirium. Additional methodologically rigorous studies using standardized outcome measures are needed. *J Am Geriatr Soc* 64:705–714, 2016.

**Key words:** delirium; pharmacological prevention; pharmacological treatment; adult

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



## REVIEW ARTICLE

### 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




## Falls in the General Hospital: Association With Delirium, Advanced Age, and Specific Surgical Procedures

Barbara E. Lakatos PMHCNS-BC, APN , Virginia Capasso Ph.D., APN-BC, Monique T. Mitchell PMHCNS-BC, APN, Susan M. Kilroy M.S., R.N., Mary Lussier-Cushing PMHCNS-BC, APN, Laura Sumner M.Ed., M.B.A., M.S.N., Jennifer Repper-Delisi PMHCNS-BC, APN, Erin P. Kelleher M.S., R.N., Leslie A. Delisle B.S.N., R.N., Constance Cruz PMHCNS-BC, APN, Theodore A. Stern M.D.

96% of patients with falls had evidence of delirium  
on chart review

Psychosomatics

Volume 50, Issue 3, May–June 2009, Pages 218-226

Observational, longitudinal study of delirium in consecutive unselected acute medical admissions: age-specific rates and associated factors, mortality and re-admission 

ST Pendlebury<sup>1, 2, 3</sup>, NG Lovett<sup>2, 3</sup>, SC Smith<sup>2</sup>, N Dutta<sup>2</sup>, C Bendon<sup>2</sup>, A Lloyd-Lavery<sup>2</sup>, Z Mehta<sup>3</sup>, PM Rothwell<sup>3</sup>

Author affiliations +

Delirious pts: 11% fell (10/95)

Non-Delirious pts: 2% fell (5/213)

OR: 4.55

Pendlebury, et al BMJ 2015

# Predictors of falls and hospitalization outcomes in elderly patients admitted to an acute geriatric unit



Laura Corsinovi  , Mario Bo, Nicoletta Ricauda Aimonino, Renata Marinello, Federico Gariglio, Cristina Marchetto, Laura Gastaldi, Laura Fissore, Mauro Zanolchi, Mario Molaschi

Table 4. Variables independently predictive of falls according to a multivariate analysis by means of logistic regression model

	$\beta$	$\pm$ S.E.M.	RR	CI 95%	<i>p</i>
Age	0.048	0.018	1.050	1.013–1.087	<0.01
Balance impairment (Tinetti scale)					
	–0.090	0.030	0.914	0.861–0.970	<0.01
Delirium	1.274	0.603	3.577	1.096–11.672	<0.05
Endocrino-metabolic disease					
	1.777	0.638	5.913	1.693–20.644	<0.01
Polypharmacy	0.204	0.045	1.226	1.122–1.340	<0.001

Increased falls in  
patients with  
delirium (27% vs  
11%)

Archives of Gerontology and Geriatrics

Volume 49, Issue 1, July–August 2009, Pages 142–145

Do delirium prevention programs reduce falls?

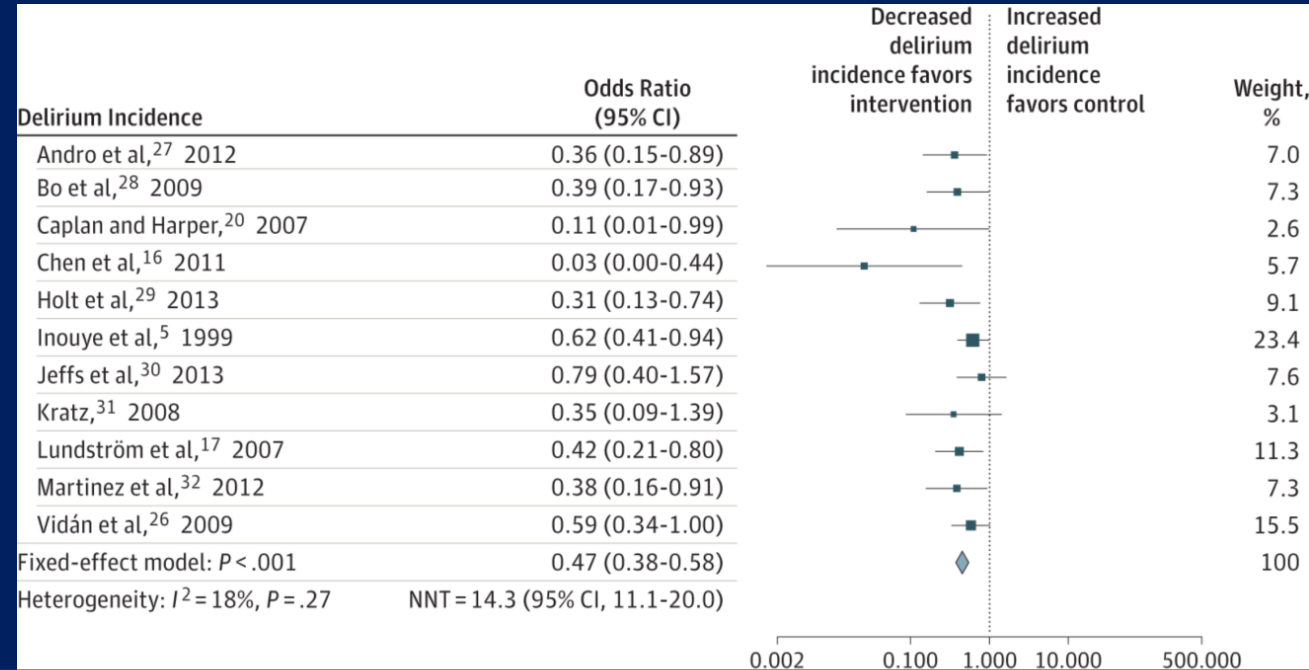
# Effectiveness of Multicomponent Nonpharmacological Delirium Interventions

## A Meta-analysis

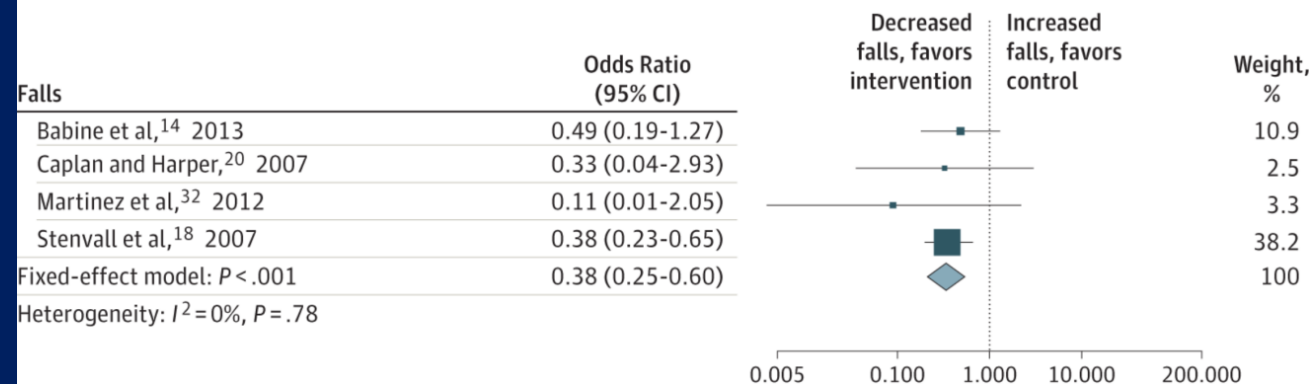
Tammy T. Hsieh, MD; Jirong Yue, MD; Esther Oh, MD; Margaret Puelle; Sarah Dowal, MSW, MPH;  
Thomas Trivison, PhD; Sharon K. Inouye, MD, MPH

- 11 studies (4 with falls outcomes)
- 1,038 patients with falls
- 62% lower odds of falling (OR 0.38)

# Meta-analysis of Nonpharmacologic Delirium Prevention



- 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



Hospital Elder Life Program



HELP

# 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)

Inouye S et al. A Multicomponent Intervention to Prevent Delirium in Hospitalized Older Patients. NEJM  
1999;340:669-76.



# Clinical Benefits

- Prevention of:
  - Delirium (Zaubler 2013, Rubin 2011, Chen 2011, Caplan 2007, Rubin 2006, Inouye 1999)
  - Functional decline (Inouye 2000)
  - Cognitive decline (Inouye 2000)
- Decreased:
  - Length of hospital stay (Rubin 2011, Caplan 2007, Rubin 2006)
  - Nursing home placement (Caplan 2007, JAGS 2005)
  - Falls (Inouye 2009, Caplan 2007)
  - Sitter use (Caplan 2007)



# Medicare Nonpayment, Hospital Falls, and Unintended Consequences

Sharon K. Inouye, M.D., M.P.H., Cynthia J. Brown, M.D., and Mary E. Tinetti, M.D.

N Engl J Med 2009; 360:2390-2393 | June 4, 2009 | DOI: 10.1056/NEJMp0900963



- 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

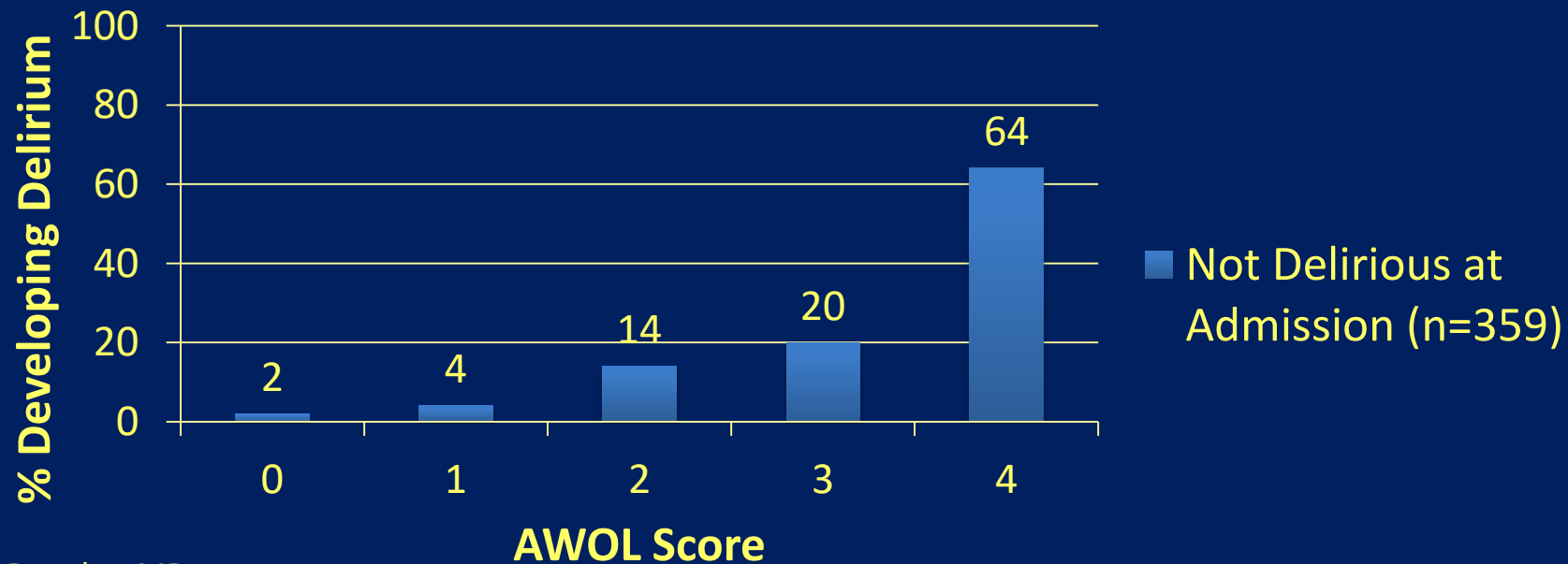
(Inouye NEJM 2006)

# 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

AWOL Delirium Risk Score		
<b>A</b>	Age $\geq$ 80 years	1 point
<b>W</b>	Unable to correctly spell “ <b>WORLD</b> ” backward	1 point
<b>O</b>	Not <b>O</b> riented to city, state, county, hospital name and floor	1 point
<b>L</b>	<b>I</b> llness severity of moderately ill, severely ill, or moribund (as opposed to not ill or mildly ill)	1 point

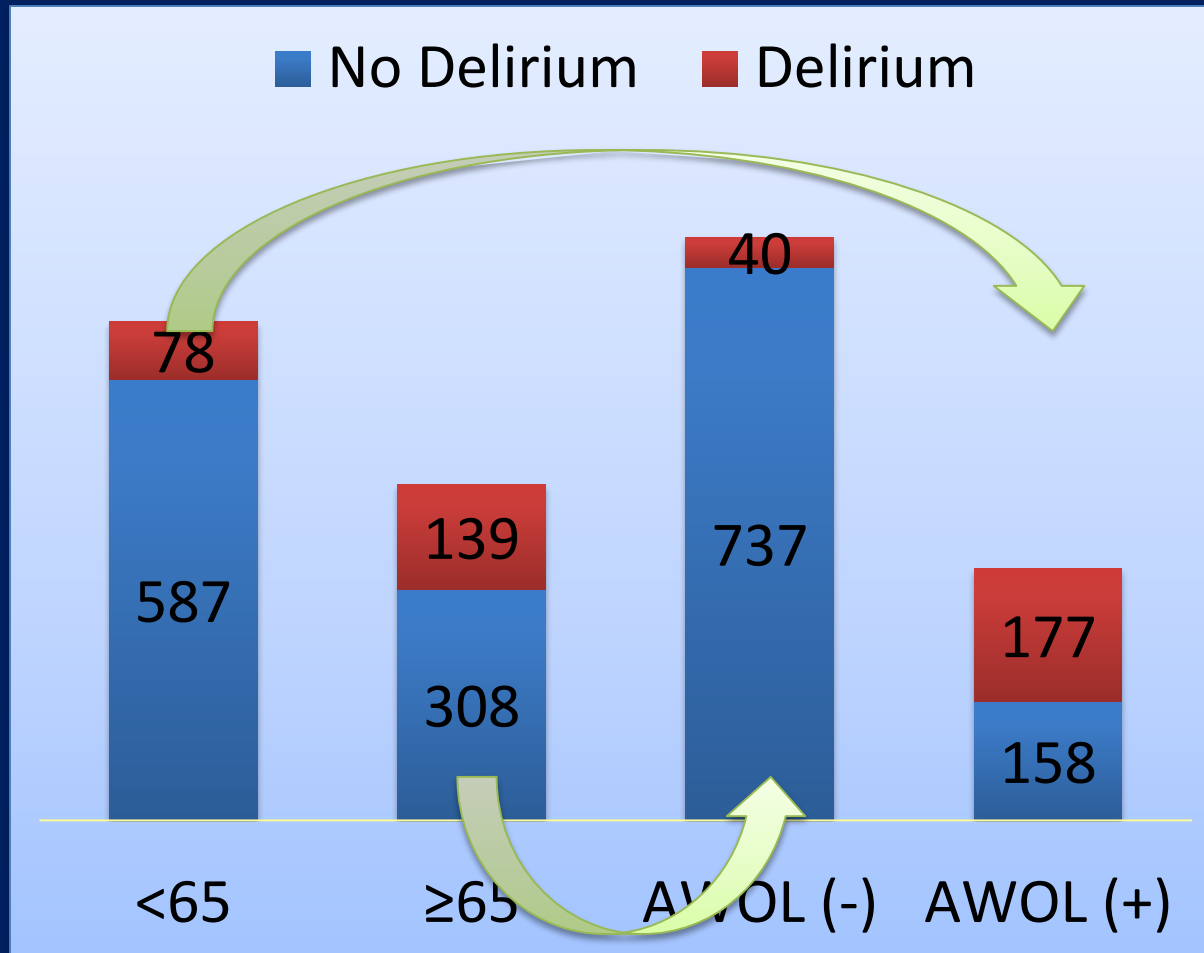


\*Slide courtesy of Vanja Douglas, MD

Douglas et al, J Hosp Med 2013



# Resource Stewardship with AWOL



38 more at  
risk cases  
received care  
pathway

150 fewer  
cases  
received care  
pathway  
unnecessarily

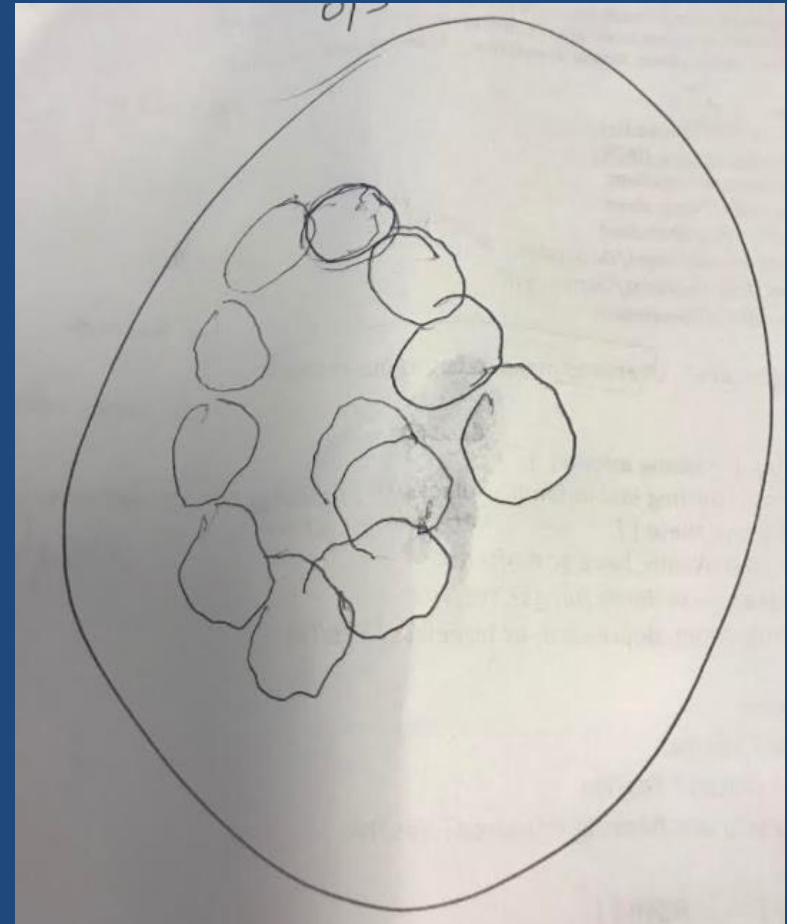
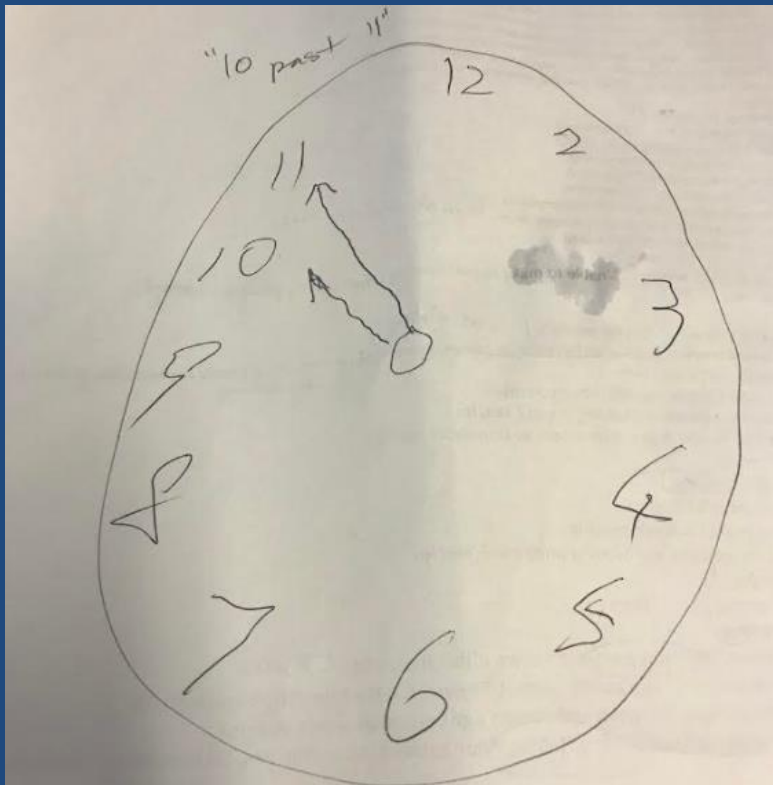
# Comparison & External Validation

**Table 2.** AUC for delirium risk scores in acute medicine: original internal validations and validations in our cohort

AUC, 95% CI, delirium					
Score	Internal validation		External validation in our cohort		
	Any	Incident	Any	Incident	Prevalent
Inouye <i>et al.</i> [5]		0.66, 0.55–0.77	0.73, 0.66–0.80 <i>n</i> = 205 0.74, 0.68–0.80 <sup>a</sup> <i>n</i> = 290	0.73, 0.62–0.84 <i>n</i> = 225	0.70, 0.62–0.72 <i>n</i> = 205 0.73, 0.66–0.80 <sup>a</sup> <i>n</i> = 290
Martinez <i>et al.</i> [6]	0.85, 0.80–0.88		0.69, 0.62–0.76 <i>n</i> = 207 0.71, 0.65–0.78 <sup>a</sup> <i>n</i> = 294	0.78, 0.68–0.88 <i>n</i> = 225	0.62, 0.53–0.70 <i>n</i> = 207 0.67, 0.60–0.74 <sup>a</sup> <i>n</i> = 294
Isfandiatty <i>et al.</i> [7]		0.82, 0.78–0.88	0.76, 0.70–0.83 <i>n</i> = 205 0.77, 0.71–0.82 <sup>a</sup> <i>n</i> = 292	0.83, 0.74–0.91 <i>n</i> = 150 0.77, 0.67–0.86 <sup>a</sup> <i>n</i> = 239	0.69, 0.61–0.77 <i>n</i> = 205 0.73, 0.60–0.80 <i>n</i> = 292
Douglas <i>et al.</i> [8]		0.69, 0.54–0.83	0.74, 0.67–0.81 <i>n</i> = 206 0.75, 0.69–0.81 <sup>a</sup> <i>n</i> = 305	0.78, 0.68–0.88 <i>n</i> = 150 0.73, 0.63–0.83 <sup>a</sup> <i>n</i> = 239	0.68, 0.60–0.76 <i>n</i> = 206 0.73, 0.66–0.80 <sup>a</sup> <i>n</i> = 305

# Assess for cognitive impairment: Mini- Cog

- 3 word recall + clock draw



# Nursing Delirium Screening Scale

NuDESC Item	Score
<b><u>Disorientation</u></b> : Verbal or behavioral manifestation of not being oriented to time or place or misperceiving persons in the environment.	
<b><u>Inappropriate behavior</u></b> : 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.	
<b><u>Inappropriate communication</u></b> : Communication inappropriate to place and/or for the person; e.g., incoherence, noncommunicativeness, nonsensical or unintelligible speech.	
<b><u>Illusions/Hallucinations</u></b> : Seeing or hearing things that are not there; distortions of visual objects.	
<b><u>Psychomotor retardation</u></b> : Delayed responsiveness, few or no spontaneous actions/words; e.g., when the patient is prodded, reaction is deferred and/or the patient is unarousable.	
<b>Total:</b>	

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

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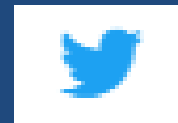
- UCSF Center for Clinical Innovation

## Collaborators

- Clay Angel
- James Bourgeois
- Anne Donovan
- Emily Finlayson
- Andy Josephson
- Jacqueline Leung
- Elizabeth Whitlock



# Questions?



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# The Vulnerable Brain

