Delirium

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Disclosures

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- **Other influential affiliations:** None

Objectives

1. Understand efficacious interventions to prevent delirium;

2. Use efficacious interventions to manage delirium;

3. Learn approaches to aid the wider groups we work with to change their understanding of delirium.

Delirium

Delirium

According to the DSM-5* classification, to be diagnosed with delirium a patient must display all of the following:

Disturbance in attention

Ask patient to name the months of the year backwards

Disturbance in awareness

Ask patient their age, date of birth, place and current year

+ An additional disturbance

Such as defecit in:

Memory Visuospatial ability

Language Perception

Acute change

Develops over a short period of time

Sudden change from baseline

Fluctuates during the course of a day

May require information from other staff, carers, or case notes

No better explanation

These disturbances are not better explained by a pre-existing, established or evolving neurocognitive disorder or coma state

Evidence of cause

Evidence that disturbance is a consequence of one or more of:

Another medical condition Substance intoxication Substance withdrawal Exposure to a toxin

Hyperactive delirium

Predominantly restless and agitated

Increased motor activity

Loss of control of activity

Restlessness

Wandering

Mixed motor type

Evidence of both subtypes in the previous 24 hours

⟷

Hypoactive delirium

Predominantly drowsy and inactive

Decreased activity

Decreased action speed

Decreased speed of speech

Decreased amount of speech

Reduced awareness of surroundings

Listlessness

Withdrawal

⚠ Commonly mistaken for depression or dementia

Adverse consequences

All types of delirim

Reduced functional ability

Onset of dementia

Increased mortality

Admission to long term care

Distress

Increased length of stay

Hospital acquired complications

Pressure sores

Incontinence

Falls

Hypoactive delirium

+ Greater mortality

Less reversibility

+ Greater length of stay

Worse quality of life

+ Greater frequency of falls

What's new with Epidemiology?

48.9% of people with dementia will be delirious during hospitalization

Han, Q. Y. C., Rodrigues, N. G., Klainin-Yobas, P., Haugan, G. & Wu, X. V. Prevalence, risk factors, and impact of delirium on hospitalized older adults with dementia: a systematic review and meta-analysis. *J. Am. Med. Dir. Assoc.* **23**, 23–32 (2022).

Delirium in those >65 years old is associated with dementia at 12 months OR 8.8 (95% CI 1.9-41.4)

Richardson, S. J. et al. Recurrent delirium over12 months predicts dementia: results of the delirium and cognitive impact in dementia (DECIDE) study. *Age Ageing* **50**, 914–920 (2021).

1/2 to 1/5 of those with dementia in hospital will develop delirium.

3-4x higher risk than general population.

Inouye, S. K., Westendorp, R. G. & Saczynski, J. S. Delirium in elderly people. *Lancet* **383**, 911–922 (2014).

Use of multicomponent non-drug prevention (e.g. HELP) may prevent 6 patients per 1000 from Dementias over the 2.4 years post admission.

Rathmell CS, Akeju O, Inouye SK, Westover MB. Estimating the number of cases of dementia that might be prevented by preventing delirium. Br J Anaesth. 2023 Jun;130(6):e477-e478.

With widespread use could prevent 33,000 cases of dementia per year.

Rathmell CS, Akeju O, Inouye SK, Westover MB. Estimating the number of cases of dementia that might be prevented by preventing delirium. Br J Anaesth. 2023 Jun;130(6):e477-e478.

What's new in biomarkers?
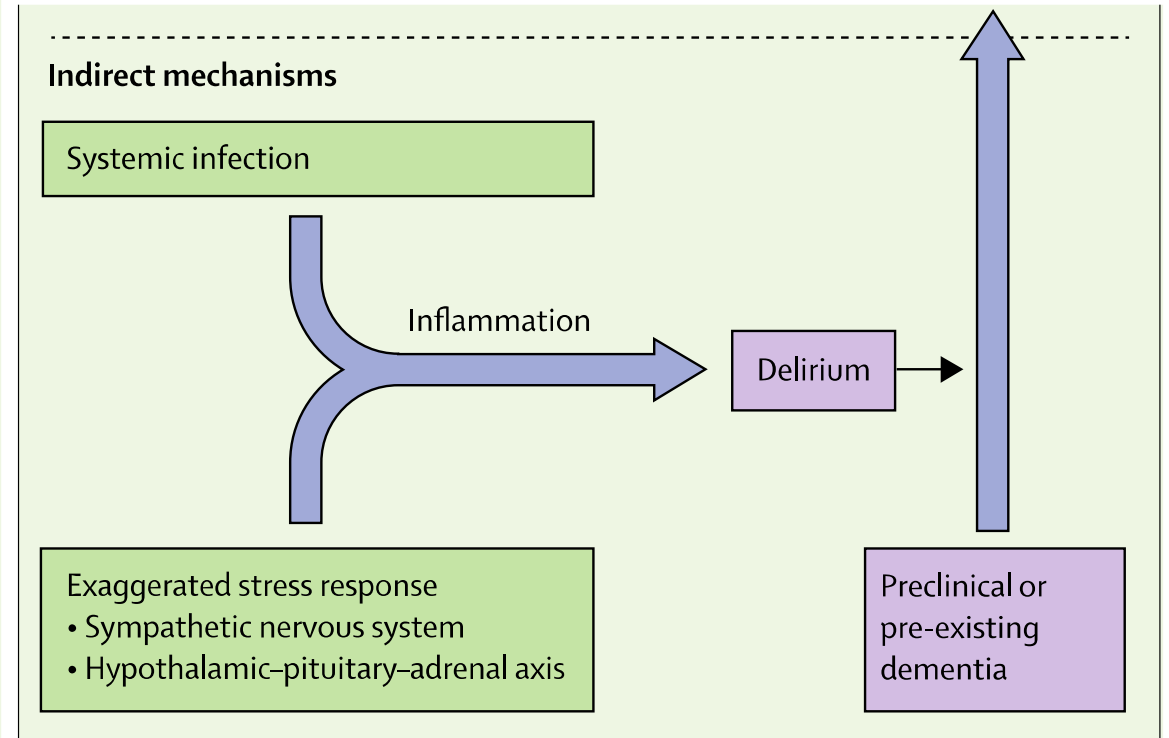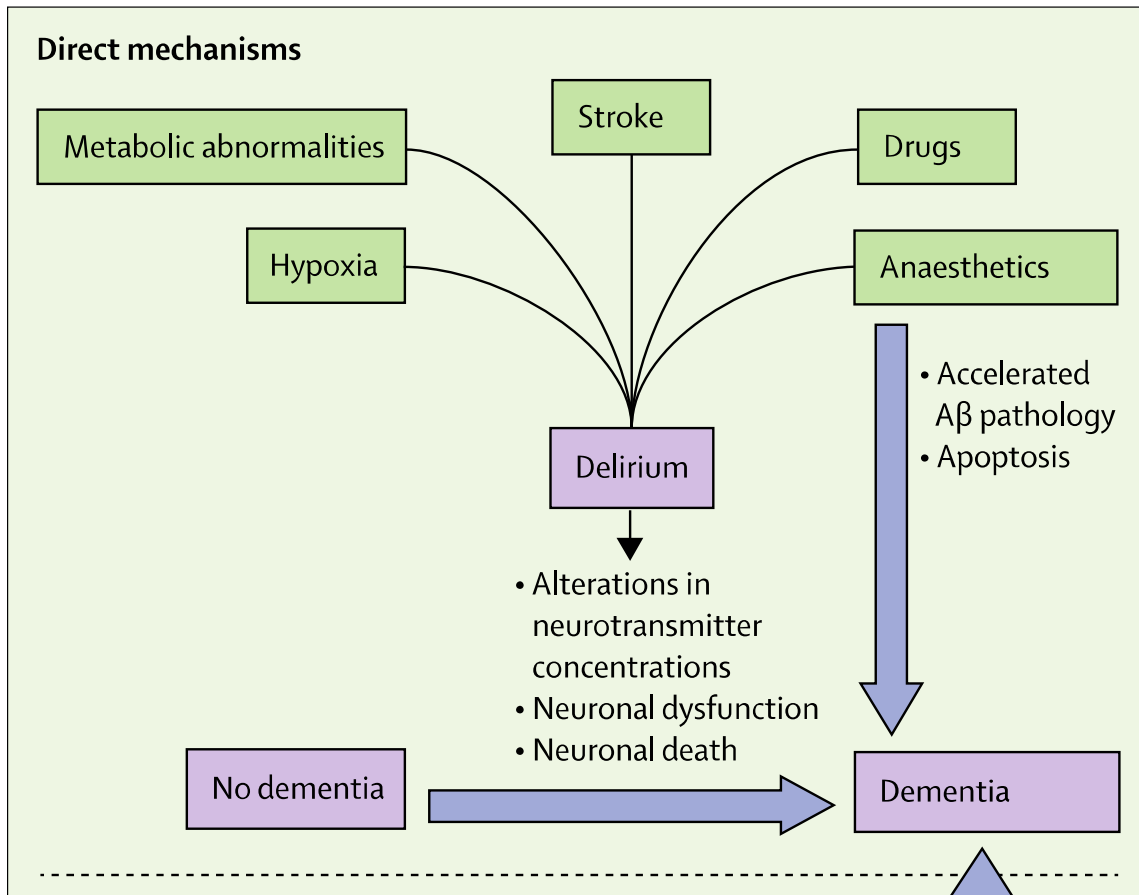
Figure: A hypothetical model for the pathophysiological relation between delirium and dementia

Disturbances in neurotransmitter pathways
Activation of pro-inflammatory cytokines resulting in the breakdown of the blood brain barrier
Disruption of the hypothalamic-pituitary-axis in reaction to acute stress
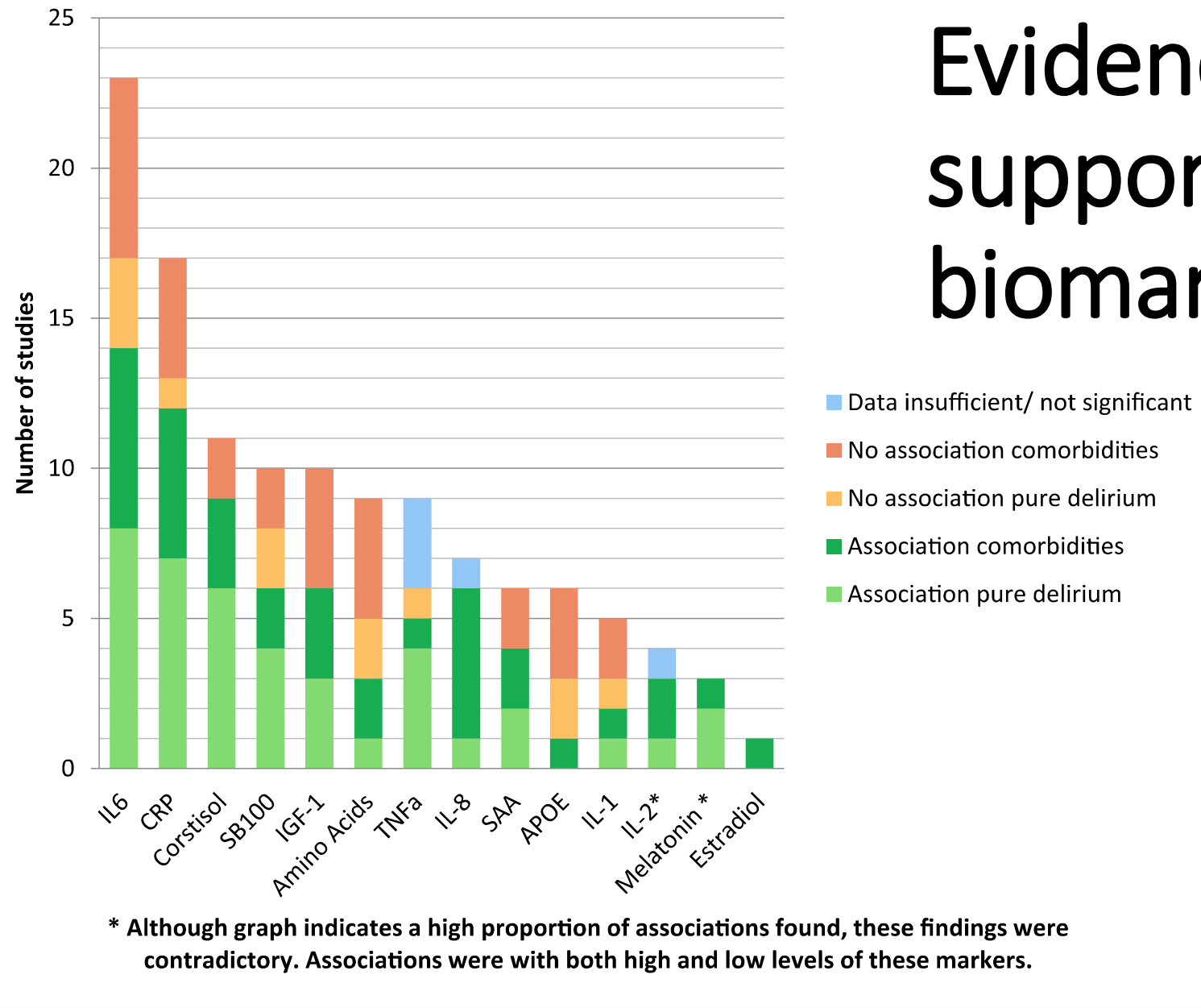
Fig. 2. Graphic summary of studies showing an association, lack of association, or insufficient data.

CRP, TNF-α, and IL-6 are consistent biomarkers

Lozano-Vicario L, García-Hermoso A, Cedeno-Veloz BA, Fernández-Irigoyen J, Santamaría E, Romero-Ortuno R, Zambom-Ferraresi F, Sáez de Asteasu ML, Muñoz-Vázquez ÁJ, Izquierdo M, Martínez-Velilla N. Biomarkers of delirium risk in older adults: a systematic review and meta-analysis. Front Aging Neurosci. 2023 May 12;15:1174644.

	Odds Ratio with 95% CI	Weight (%)
Study		
IL-6		
Cerejeira et al. 2012	0.84 [0.40, 1.76]	7.86
Chen et al. 2019	1.61 [1.00, 2.57]	10.47
Peng et al. 2019	1.81 [1.06, 3.11]	9.75
Shen et al. 2016	5.24 [2.56, 10.70]	8.04
Heterogeneity: $\tau^2 = 0.31$, $I^2 = 76.75\%$, $H^2 = 4.30$	1.88 [1.01, 3.51]	
Test of $\theta_i = \theta_j$: Q(3) = 12.90, p = 0.00		
TNF-alpha		
Cinar et al. 2014	1.22 [0.36, 4.12]	4.54
Peng et al. 2019	1.92 [1.12, 3.30]	9.75
Heterogeneity: $\tau^2 = 0.00$, $I^2 = 0.00\%$, $H^2 = 1.00$	1.78 [1.09, 2.92]	
Test of $\theta_i = \theta_j$: Q(1) = 0.45, p = 0.50		
C-Reactive Protein		
Cerejeira et al. 2012	0.94 [0.45, 1.95]	7.86
Cinar et al. 2014	0.45 [0.13, 1.53]	4.47
Dillon et al. 2016	2.02 [1.12, 3.65]	9.23
Dillon et al. 2016	1.60 [0.87, 2.92]	9.11
Dillon et al. 2016	2.05 [1.34, 3.14]	10.90
Shen et al. 2016	5.73 [2.80, 11.74]	8.01
Heterogeneity: $\tau^2 = 0.29$, $I^2 = 72.92\%$, $H^2 = 3.69$	1.75 [1.04, 2.93]	
Test of $\theta_i = \theta_j$: Q(5) = 18.47, p = 0.00		
Overall	1.80 [1.31, 2.47]	
Heterogeneity: $\tau^2 = 0.19$, $I^2 = 65.50\%$, $H^2 = 2.90$		
Test of $\theta_i = \theta_j$: Q(11) = 31.88, p = 0.00		
Test of group differences: $Q_b(2) = 0.03$, p = 0.98		

1/4   1/2   1   2   4   8

Random-effects DerSimonian–Laird model
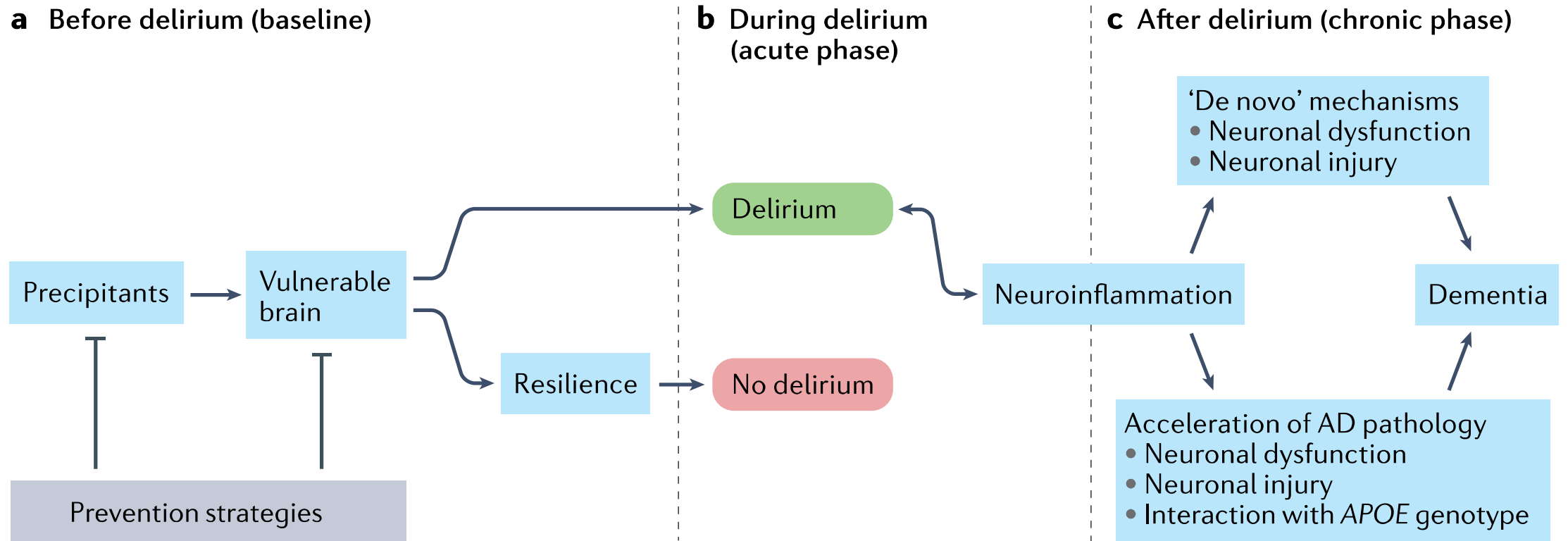
OR 1.8 (95% 1.31, 2.47)

Fig. 1 | **A hypothetical model for the inter-relationship between delirium and dementia and potential opportunities for prevention. a,b** | In the setting of precipitating factors, such as hypoxia, metabolic abnormalities, medications, infection or surgery, and in the presence of an existing vulnerability, such as Alzheimer disease (AD) or other neurodegenerative pathology, cerebrovascular disease, or injury, delirium (green) can occur. Alternatively, owing to the presence of resilience factors, such as cognitive reserve, or the implementation of prevention strategies (grey) to minimize one or more modifiable delirium risk factors, delirium does not occur (red). **c** | The development of delirium and subsequent neuroinflammation might then result in the acceleration of underlying neurodegenerative pathology. Alternatively, in individuals without underlying neurodegenerative pathology, delirium might be associated with neuronal injury, with 'de novo' mechanisms leading to dementia.

What's new with risk factors?

33 predisposing and 112 precipitating factors (n= 315 studies; 101144 patients)

Ormseth CH, LaHue SC, Oldham MA, Josephson SA, Whitaker E, Douglas VC. Predisposing and Precipitating Factors Associated With Delirium: A Systematic Review. *JAMA Netw Open.*2023;6(1):e2249950

Table 2. The 33 Predisposing Factors Associated With Delirium

Predisposing factor	No.		
	Studies	Total participants	Participants with delirium
Advanced age	112	50 418	9147
Cognitive impairment[a] or dementia	130	42 124	9617
Functional impairment (physical, vision, hearing, or frailty)	48	17 206	3679
Cardiovascular disease[b]	18	11 895	1422
Cumulative comorbidities[c]	26	10 528	2035
Central nervous system disorder[d]	24	9246	1861
Alcohol use	12	8100	1462
Male sex	15	4696	1112
Depression	19	4362	926
Lower educational attainment	8	3657	648
Malnutrition or undernutrition	9	2921	614
Diabetes	6	2775	1905
Tobacco use	7	2605	467
Anemia	5	2538	292
Psychiatric disorder or trait[e]	7	2138	326
Female sex	4	2134	636
Multiple medications	6	1287	323
Psychoactive medication	3	1074	177

Malignant neoplasm	2	846	188
Pain (chronic)	2	774	146
Pulmonary disease (OSA or COPD)	4	685	163
Poor sleep quality	4	655	154
Chronic kidney disease	1	560	63
Non-English language	1	532	241
Narcotic analgesic	1	500	57
White race	1	309	239
Low vitamin D	1	240	60
Anticholinergic	1	74	29
Biomarkers and genetics			
Biomarkers of neurodegeneration[f]	7	1114	237
SNVs in *DRD2* and *SLC6A3* gene	1	720	126
APOE4	2	169	76
AG haplotype of *GRIN3A* gene	1	102	41
COMT Val^{127} or Val^{127} genotype	1	89	17

Table 3. The 112 Precipitating Factors Associated With Delirium

Precipitating factor	No. Studies	Total participants	Participants with delirium
Surgical factor			
Type of surgery[a]	23	15 864	2133
Intraoperative blood loss or transfusion	12	11 171	1250
Intraoperative hemodynamics	5	6684	442
Duration of operation	16	6172	1521
Postoperative complication, atrial fibrillation, or shock	6	3117	410
Prolonged time to operation	7	2457	816
Anesthesia type and depth[b]	4	772	179
No. of surgeries	3	610	125
Intraoperative fluids	2	295	138

Systemic illness or organ dysfunction

Neurological injury	14	11 130	1917
Anemia	12	9965	856
Organ dysfunction or high illness severity[c]	25	7697	1863
Infection	13	7587	1994
Mechanical ventilation	14	7281	1468
Kidney injury	14	7047	1545
Pain	14	6259	1349
Hypoxemia	12	5085	2103
Leukocytosis	7	3307	641
Fever or hypothermia	8	3181	999
Stroke[d]	8	2653	519
Respiratory disease[e]	6	2164	593
Liver dysfunction	6	2118	477
Hypotension	4	1557	347
Tachypnea	2	851	170
Stress, anxiety, or depression	2	754	86
High thyroid-stimulating hormone level	1	568	82
Dehydration	1	566	566
Urinary retention	1	314	86
Thrombocytopenia	2	240	126
Cardiac arrest or cardiogenic shock	1	212	12
Unsafe swallow (on admission)	1	82	23
Hyperoxia[f]	1	65	19

Metabolic abnormality

Glucose level	3	6704	403
Albumin level	10	6260	1120
Electrolyte imbalance	3	2333	251
Metabolic acidosis	2	1618	247
Metabolic disturbance or disorder	3	1457	868
Sodium level	3	1065	193
Calcium level	1	818	90
Hyperamylasemia	1	818	90
Potassium level	2	365	72
Fluid level	2	270	52
Magnesium level	1	90	49

(continued)

Table 3. The 112 Precipitating Factors Associated With Delirium (continued)

Precipitating factor	No. Studies	Total participants	Participants with delirium
Pharmacology			
Benzodiazepine	11	5145	1078
Opioid	14	4.215	774
Sedative or analgesic	10	3295	1551
Neuroleptic	5	3032	688
Anticholinergic	4	2225	756
Multiple medications	4	1077	149
Patient-controlled analgesia	1	915	104
Statin discontinuation	1	763	588
Mannitol	1	618	131
Psychoactive drug	2	419	138
Steroid	2	391	125
Nicotine withdrawal	1	293	210
Acetylcholinesterase inhibitor	1	251	125
Nonsteroidal anti-inflammatory drug	1	80	36

Iatrogenic and environmental factor			
Urinary catheter	10	3812	1214
Physical restraint	11	2841	805
Longer length of stay	9	2724	461
ICU admission	4	1564	264
Neurosurgical drainage tube	1	800	157
Sleep disturbance	5	749	271
Fall	2	743	383
Bed or ward change	2	710	108
Immobilization	1	612	68
Gastric tube	1	320	92
Administration of therapy during night hours	1	203	35
Any iatrogenic event	1	196	35
Trauma[g]	5	1282	269

Biomarker			
High CRP level	13	4321	1163
High IL-6 level	7	1229	654
High neopterin level	5	672	274
High NT-proBNP level	1	635	73
High IL-8 level	3	604	435
High S100B level	3	575	541
High cortisol level	4	527	208
Low ubiquitin C-terminal hydrolase level	1	427	327
Low cerebral oxygen saturation	3	395	98
High micro-RNA-210 level	1	370	63
Low IGF-1 level	3	326	71
High TNF-a level	1	321	321
High IL-10 level	1	321	321
Higher CSF p-tau level	1	214	57
Change in exosomal a-synuclein	1	202	17
High procalcitonin level	1	149	30
Endothelial dysfunction	1	147	103
High CSF sTREM2 level	1	146	65
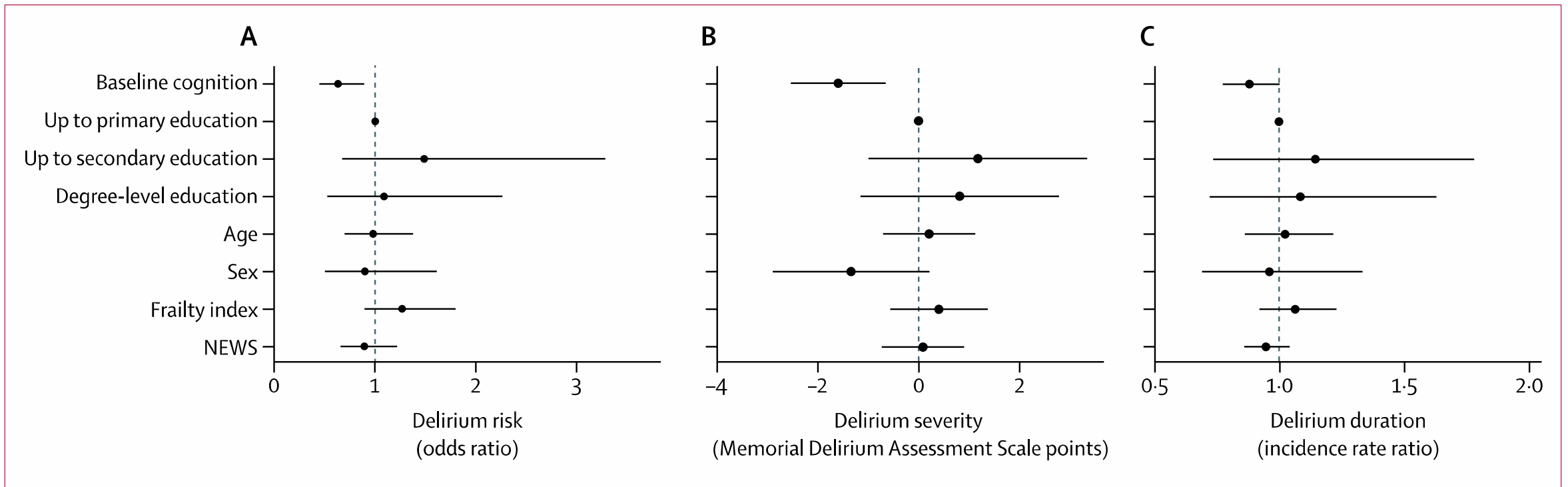
Figure 2: Delirium risk, severity, and duration when adjusted

NEWS=National Early Warning Score.

Higher baseline cognition is associated less likelihood of delirium, shorter and less severe delirium
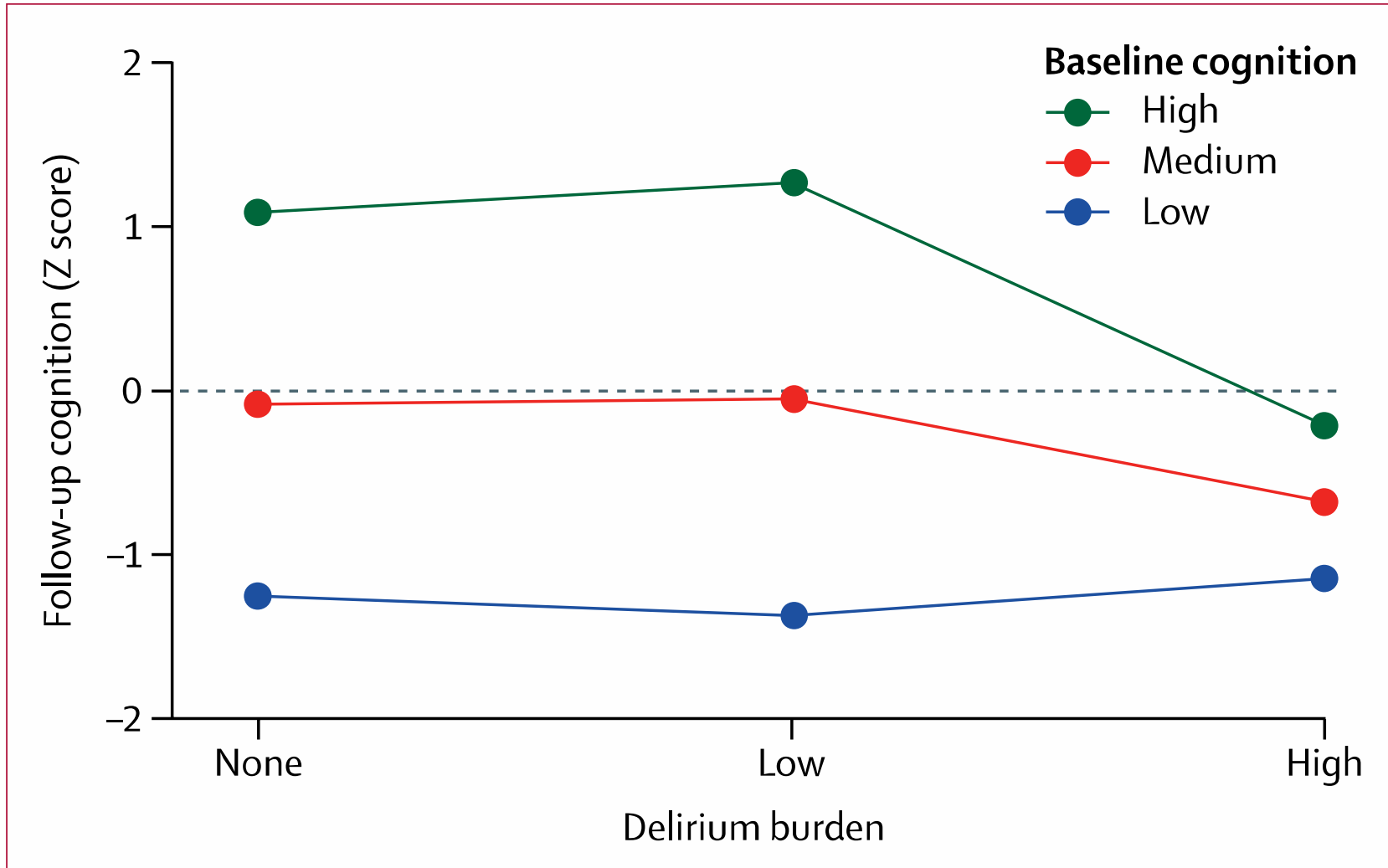
Figure 3: Association between delirium burden and follow-up cognition by baseline cognition
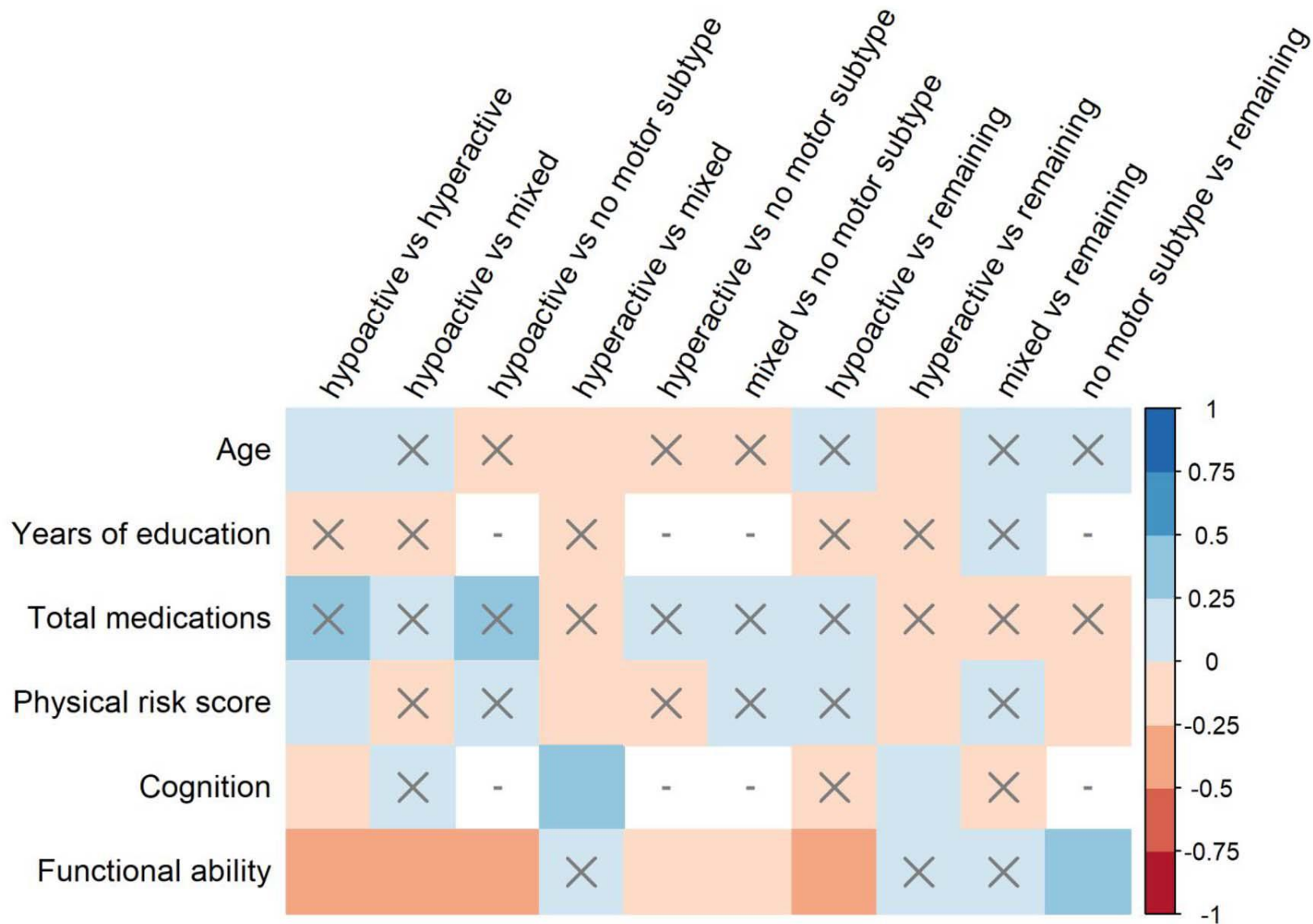
Figure 1. Effect sizes (Hedges' g) for random-effects meta-analyses conducted on differences between motor subtypes of delirium on continuous predisposing factors. Positive Hedges' g indicates higher scores on factor in Group A compared with Group B. X = non-significant result ($P > 0.05$), − = analysis unable to be conducted (insufficient data).

Figure 2. Effect sizes (odds ratio) for random-effects meta-analyses conducted on differences between motor subtypes of delirium on categorical predisposing factors. OR > 1 indicates greater likelihood of the factor being present in Group A compared with Group B. X = non-significant result ($P > 0.05$), — = analysis unable to be conducted (insufficient data).
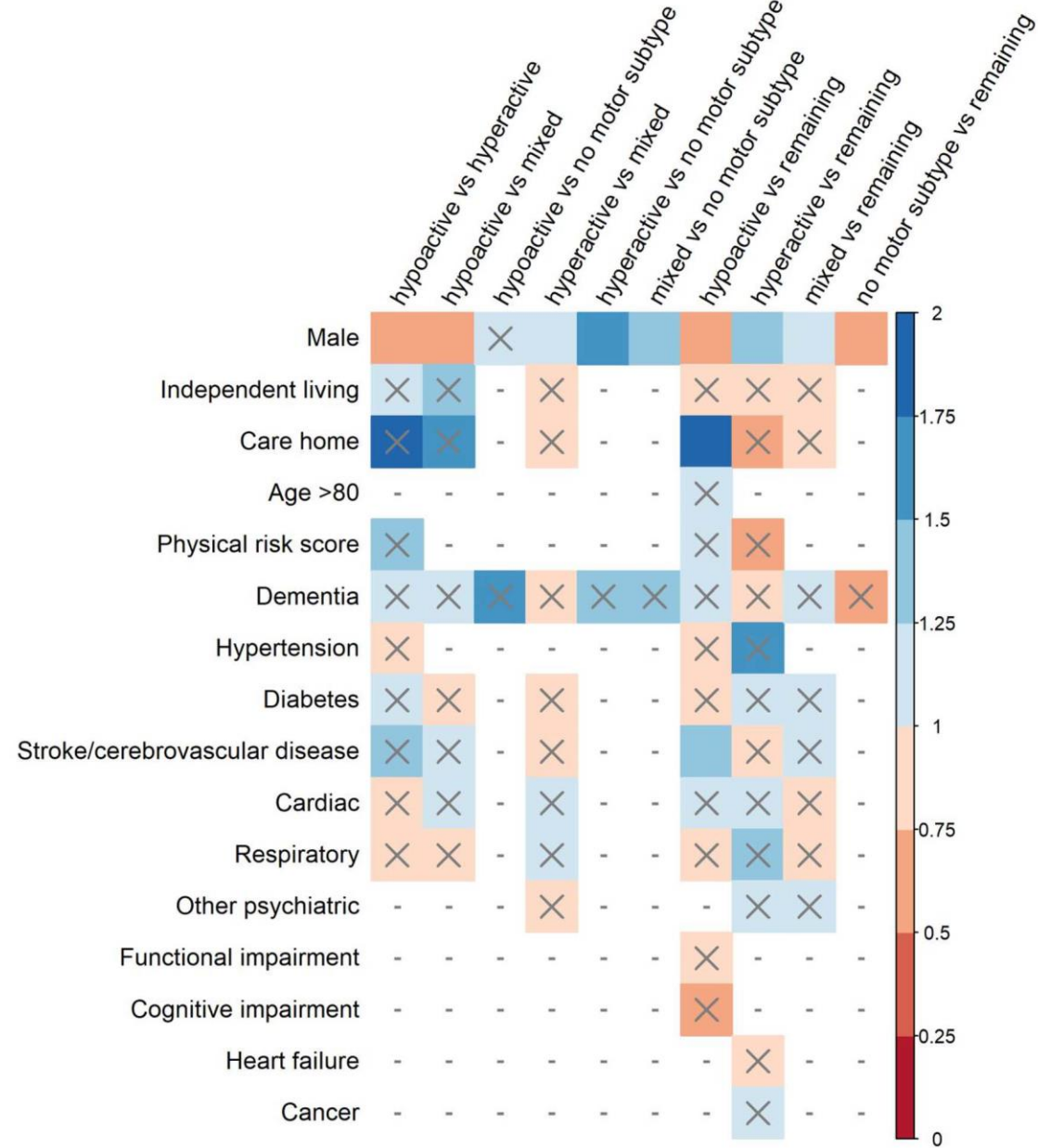
Hypoactive = older, women, lower cognition, lower functional sores

Hyperactive = men, from care facilities, higher # medications, worse functional performance and history of CVA

https://doi.org/10.1093/ageing/afac200

Anticholinergic drug burden associated with incident delirium.

OR 1.12-1.83 HR 1.52-2.05

What's new in Detection?

FIGURE 1. Establishing acute change from baseline. This is applicable to many settings, i.e., * in acute hospital, prior to admission, in long-term care, prior to surgery, etc. CAM: Confusion Assessment Method; FAM-CAM: Family-CAM; IQCODE: Informant Questionnaire on Cognitive Decline in the Elderly.

Table 2. Characteristics of Delirium Screening Tools (Last 6 Years)[a]

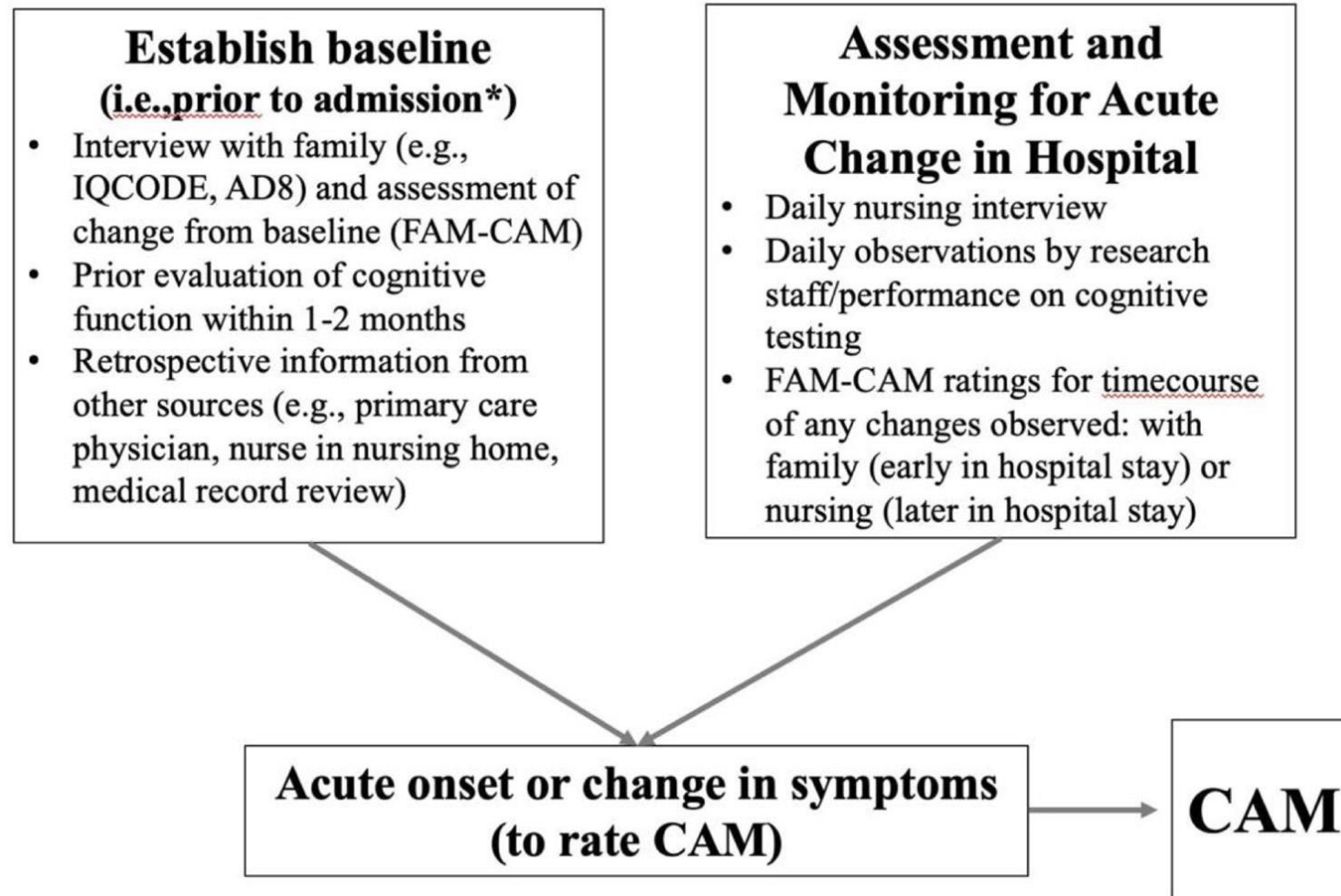| Screening Tool	Setting	No. (% Male)	Age, Mean (SD), y	Assessment Time	Scoring	Sensitivity (Cognitively Impaired), %	Specificity (Cognitively Impaired), %	Interrater Reliability (95% CI)	Description (No. of Questions/items)
3D-CAM[28]	Hospital	201 (39)	84 (5.4)	3 min (median)	Possible delirium if (1) acute onset or fluctuation AND (2) inattention AND EITHER (3) disorganized thinking OR (4) altered level of consciousness	95 (96)	94 (86)	95%	Screening tool derived from the CAM (long form, 4 PQ, 4 OR; short form, 1 PQ, 1 CQ, 2 OR)
CAM-S[29,d]	Hospital	1219 (41)	77 [f]	Long form, 10-15 min; Short form, IR	Maximum score = 19 (long form), 7 (short form)	NA [f]	NA	Long form, ICC = 0.66; Short form, ICC = 0.72	Delirium assessment (10 PQ, 10 OR)
4AT[30,g]	Hospital	234 (36)	84 (5.9)	<2 min	Maximum score = 12; possible delirium when score ≥4	90 (94)	84 (91)	NR	Screening tool for delirium and cognitive impairment (5 PQ, 2 OR)
DelApp[31]	Hospital	156 (85 delirium group, 87 dementia group, 75 control group)		<5 min	Maximum score = 10; median, 6 (IQR, 4-7) in delirium group, 10 (IQR, 10-10) in control group	(88)	(90)	κ = 0.65-0.76 (0.65-1.0)	Software for objective measurement of attention (≥1 PQ, 1 PQ)
FAM-CAM[32]	Home [i]	52 (33)[j]	76.4 (8.5)	NR	Possible delirium if (1) acute change in mental status AND (2) inattention AND EITHER (3) disorganized thinking OR (4) altered level of consciousness	82 (90)	91 (69)	κ = 0.85 (1.11)	Caregiver-based questionnaire (10 CQ)
I-AGeD[33]	Hospital	88 (27)[k]	82 (6.4)	NR	Maximum score = 10; possible delirium when score >4	77.4 [d]	63.2	NR	Screening tool for caregivers (10 CQ)
Inter-RAI[34,m]	Hospital	239 (49)	NR	NR	Possible delirium if (1) acute onset or fluctuation AND (2) inattention AND EITHER (3) disorganized thinking OR (4) altered level of consciousness	98	93	NR	Screening tool for acute care (4 OR)
MOTYB + signs of confusion[35]	Long-term care	265 (51.1)	83 (27)	and (2) mental function varies over the course of the day	Possible delirium if the patient failed MOTYB and (2) mental function varies over the course of the day	93.8 (97.5)	94.7 (72.4)	NR	Screening tool for acute care (2 PQ, 6 OR)
RADAR[36]	Hospital	193 (40)	80.8 (7.8)	7 (caregivers)	Possible delirium if it has ≥1 positive answer to second question or ≥1 was changed (subjective or objective)	73 (71.4)	67 (42.9)	κ = 0.34-0.79	Tool for nursing staff (3 OR)
SQeeC[37]	Hospital	100 (40)	87	30 (6 to 3)	Possible delirium if it had ≥1 incorrect answer to first question or provided wrong answer to second question	83 (83)	91 (89)	NR	Tool to evaluate level of consciousness (2 PQ)
Sour Seven[38]	Hospital	80 (36)	83 (8.9)	1-2 min (nurses), 2-5 min (caregivers)	Maximum score = 18; possible delirium when score ≥4	89.5	90	64.3%-92.8%	Tool for informal caregivers and untrained nurse (7 OR)

Table 2. Summary estimates of sensitivity and specificity

Application of 4AT	No. of studies (observations)	Sensitivity (95% CI)	Specificity (95% CI)
All studies	17 (3702)	0.88 (0.80–0.93)	0.88 (0.82–0.92)
Sensitivity analysis (low risk of bias)	9 (2252)	0.87 (0.84–0.90)	0.88 (0.81–0.93)
Sensitivity analysis (excluding retrospective studies)	13 (3018)	0.87 (0.78–0.92)	0.87 (0.79–0.92)
Subgroup analysis (excluding stroke)	14 (3440)	0.86 (0.77–0.92)	0.89 (0.83–0.93)
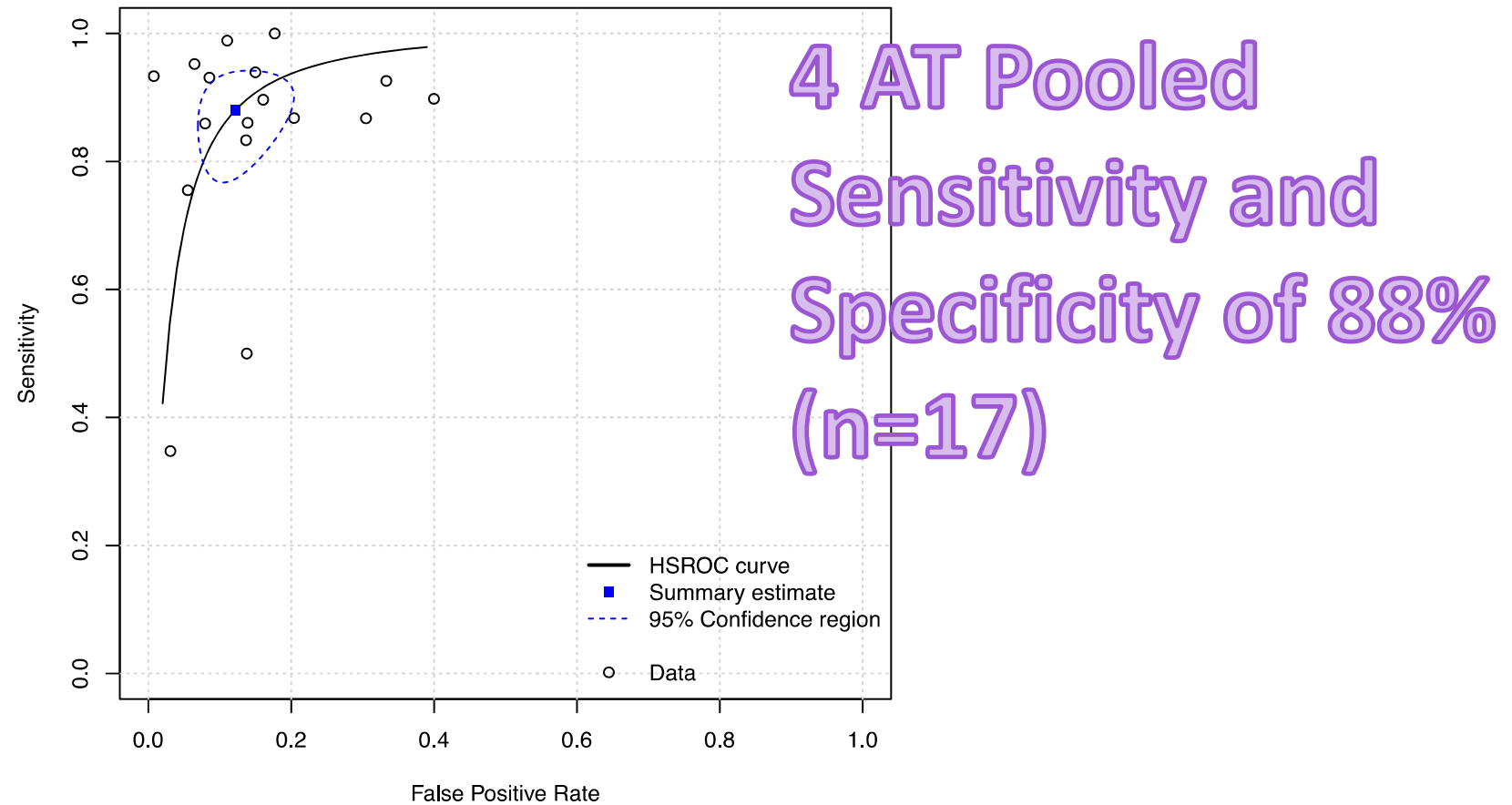
Figure 3. Hierarchical Summary Receiver Operating Characteristic (HSROC) curve of the 4AT for identifying individuals with delirium.

3D - CAM

Feature 1: Acute Change / Fluctuating Course
Any one of the following present?*
†Testing: Self report of confusion OR disorientation OR hallucinations
Observed fluctuations in: consciousness OR attention OR speech

†It is recommended that all testing items be administered for Features 1, 2, &3.

Skip patterns have not been validated.

Yes ↓

Feature 2: Inattention
Any one of the following present?
†Testing abnormal: Digit span 3 backwards OR 4 backwards OR days of week backwards OR months of year backwards
Observed: trouble keeping track of interview OR inappropriately distracted

Yes

Feature 3: Disorganized Thinking
Any one of the following present?
†Testing abnormal: Orientation to year, day of week, type of place
Observed: Flow of ideas unclear/illogical, Conversation rambling, off target, or abnormally sparse

Yes ↓

Delirium Present

Feature 4: Altered Level of Consciousness
Any one of the following present?
Observed: Patient is sleepy, stuporous, comatose, and/or hypervigilant

Yes ↓

*Feature 1 Supplementary Question: To be asked only if Feature 2 is present, and either Feature 3 or 4 is present, but Feature 1 is uncertain: Contact a family member, friend, or health care provider who knows the patient well and ask: "Is there evidence of an acute (sudden) change in mental status (memory or thinking) from the patient's baseline?"

Yes → Delirium Present

3D CAM
Sensitivity 92%, Specificity 95%.

Ma R, Zhao J, Li C, Qin Y, Yan J, Wang Y, Yu Z, Zhang Y, Zhao Y, Huang B, Sun S, Ning X. Diagnostic accuracy of the 3-minute diagnostic interview for confusion assessment method-defined delirium in delirium detection: a systematic review and meta-analysis. Age Ageing. 2023 May 1;52(5):afad074.

3D CAM
Positive LR 18.2, Negative LR 0.09

Ma R, Zhao J, Li C, Qin Y, Yan J, Wang Y, Yu Z, Zhang Y, Zhao Y, Huang B, Sun S, Ning X. Diagnostic accuracy of the 3-minute diagnostic interview for confusion assessment method-defined delirium in delirium detection: a systematic review and meta-analysis. Age Ageing. 2023 May 1;52(5):afad074.

Diagnosing Delirium in those with Dementia

CAM	EEG
• **Specificity 96-100%** • **Sensitivity 77%** • **+LR = 19** • **-LR = 0.24** • 3D- CAM • 96% Sensitive; 86% Specific	• Specificity 91% • Sensitivity 67% • +LR = 7 • -LR = 0.36

(Morandi JAGs 2012)

What's new in Non-Drug Prevention & Treatment?

117 trials in clinicaltrials.gov

Many in surgery, ICU

Examining ramelteon, music, multicomponent, nursing interventions, VR, anti-psychotics, early detection, biomarkers, nutritional support, novel pain strategies post op, dexmedetomidine, altered anesthesia protocols....
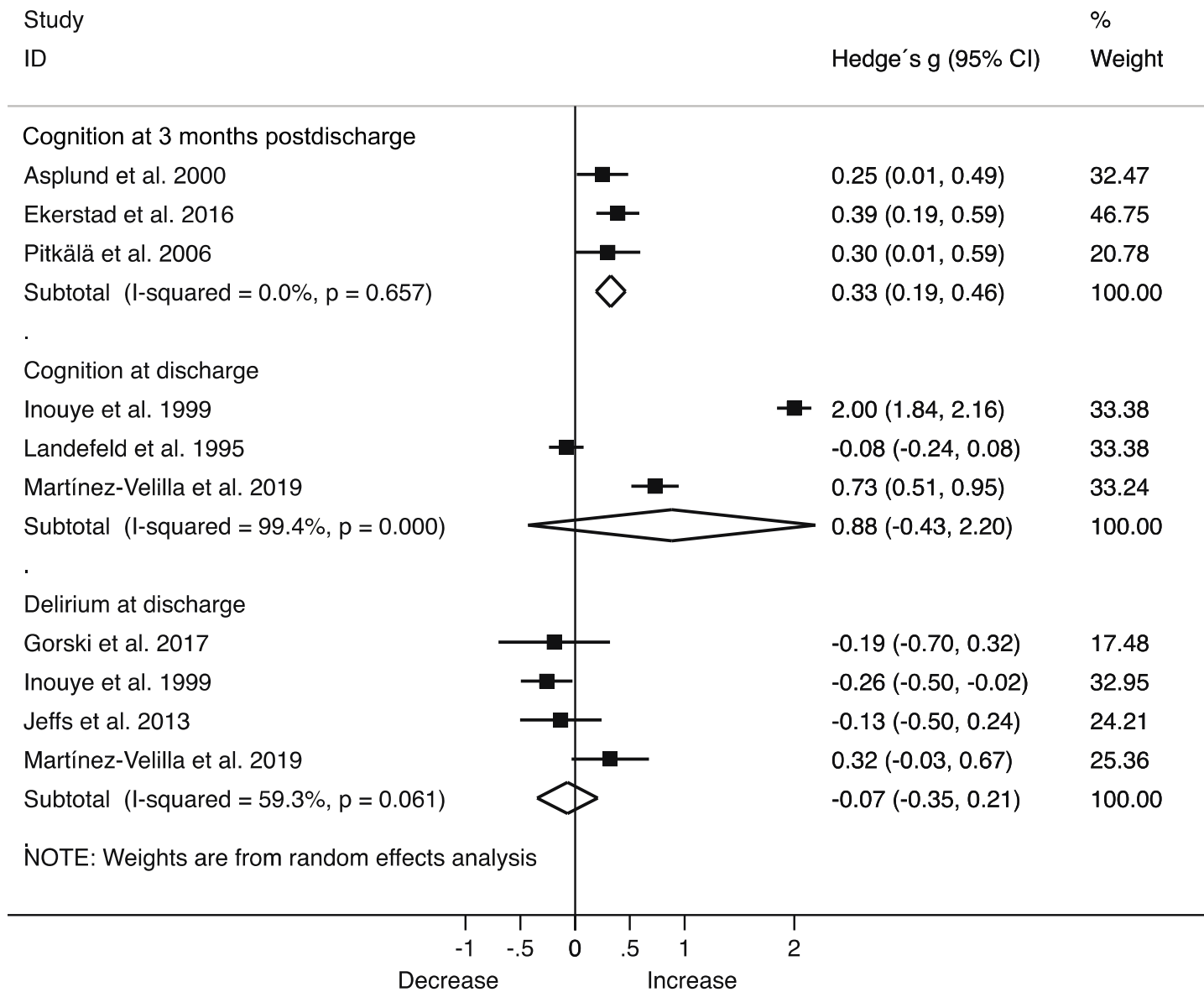
Fig. 2. Forest plot showing the effect sizes (Hedge's g) of in-hospital physical exercise and early rehabilitation interventions on the incidence of delirium and cognitive function at discharge and post-discharge.

Table 4. Multicomponent Nonpharmacologic Approaches to Delirium Prevention

Approach	Description
Orientation and therapeutic activities	Provide lighting, signs, calendars, clocks Reorient the patient to time, place, person, your role Introduce cognitively stimulating activities (eg, reminiscing) Facilitate regular visits from family, friends
Fluid repletion	Encourage patients to drink; consider parenteral fluids if necessary Seek advice regarding fluid balance in patients with comorbidities (heart failure, renal disease)
Early mobilization	Encourage early postoperative mobilization, regular ambulation Keep walking aids (canes, walkers) nearby at all times Encourage all patients to engage in active, range-of-motion exercises
Feeding assistance	Follow general nutrition guidelines and seek advice from dietician as needed Ensure proper fit of dentures
Vision and hearing	Resolve reversible cause of the impairment Ensure working hearing and visual aids are available and used by patients who need them
Sleep enhancement	Avoid medical or nursing procedures during sleep if possible Schedule medications to avoid disturbing sleep Reduce noise at night
Infection prevention	Look for and treat infections Avoid unnecessary catheterization Implement infection-control procedures
Pain management	Assess for pain, especially in patients with communication difficulties Begin and monitor pain management in patients with known or suspected pain
Hypoxia protocol	Assess for hypoxia and oxygen saturation
Psychoactive medication protocol	Review medication list for both types and number of medications

Multidisciplinary, multicomponent non-pharmacologic interventions, HELP or ABCDEF bundle reduce incidence and duration of delirium.

Individualized care + education + reorientation + early mobilization.

RR 0.53 (95% CI 0.41-0.69)

HELP reduced incident delirium by 53%, falls by 62%

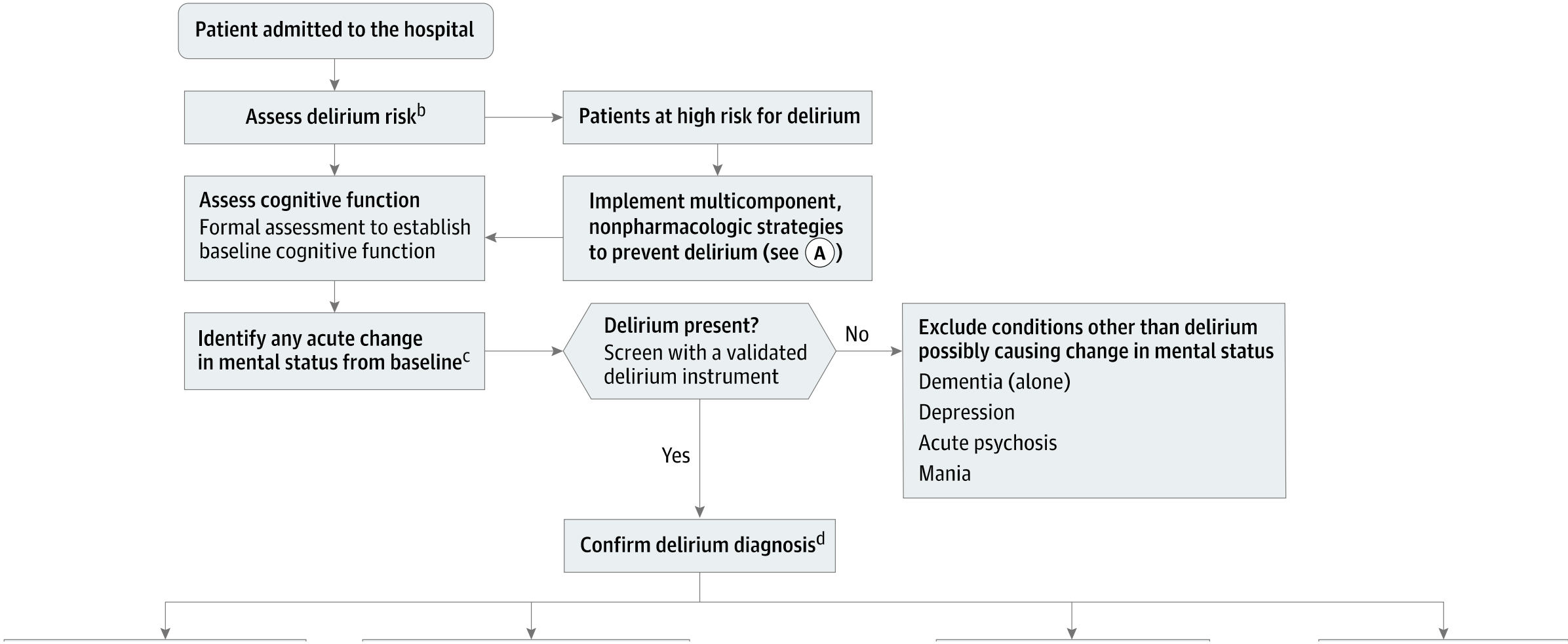OR 0.47 (95% CI 0.38, 0.58); OR 0.38 (95% CI 0.25, 0.6)

NNT 7

Delirium Prevention

Holroyd-Leduc JM, Khandwala F, Sink KM. How can delirium best be prevented and managed in older patients in hospital? CMAJ. 2010 Mar 23;182(5):465-70.

Figure. Suggested Algorithm for Delirium Evaluation and Treatment[a]

```
┌─────────────────────────────────┐
│ Patient admitted to the hospital │
└─────────────────────────────────┘
                 │
                 ▼
┌─────────────────────────────┐      ┌──────────────────────────────────┐
│ Assess delirium risk[b]      │─────▶│ Patients at high risk for delirium │
└─────────────────────────────┘      └──────────────────────────────────┘
                 │                                     │
                 ▼                                     ▼
┌─────────────────────────────┐      ┌──────────────────────────────────┐
│ Assess cognitive function    │◀─────│ Implement multicomponent,         │
│ Formal assessment to establish│      │ nonpharmacologic strategies       │
│ baseline cognitive function  │      │ to prevent delirium (see (A))     │
└─────────────────────────────┘      └──────────────────────────────────┘
                 │
                 ▼
┌─────────────────────────────┐      ╱──────────────────╲      ┌────────────────────────────────────────┐
│ Identify any acute change    │─────▶│ Delirium present?  │──No─▶│ Exclude conditions other than delirium │
│ in mental status from        │      │ Screen with a      │      │ possibly causing change in mental status│
│ baseline[c]                  │      │ validated          │      │ Dementia (alone)                        │
└─────────────────────────────┘      │ delirium instrument│      │ Depression                              │
                                     ╲──────────────────╱      │ Acute psychosis                         │
                                              │                 │ Mania                                   │
                                             Yes                └────────────────────────────────────────┘
                                              ▼
                                   ┌─────────────────────────┐
                                   │ Confirm delirium        │
                                   │ diagnosis[d]            │
                                   └─────────────────────────┘
                                              │
               ┌──────────────┬──────────────┼──────────────┬──────────────┐
               ▼              ▼              ▼              ▼
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Identify and treat underlying causes and contributing factors

Perform clinical evaluation

History (including alcohol and drug use)

Physical examination

Vital signs

Search for occult infections, metabolic abnormalities

Review medications

Minimize Beers criteria medications[e]

Use less harmful alternatives

Administer lowest effective doses

Potential contributing factor identified?

Yes → **Evaluate and treat as appropriate**

No → **Perform additional clinical evaluation**

Laboratory tests: CBC, urinalysis, toxicology screen, liver function, thyroid function, B_{12}

Other tests: arterial blood gas, chest radiograph, EKG, EEG

Neuroimaging: head CT, brain MRI

Lumbar puncture

Prevent complications

Protect airway; prevent aspiration

Maintain normal volume status

Provide nutritional support

Provide skin care

Prevent pressure sores

Mobilize to prevent deep venous thrombosis, pulmonary embolism, urinary tract infection

Manage delirium symptoms

(A) **Nonpharmacologic strategies[f]**

Early mobility; avoid restraints and tethers (Foley catheters)

Family involvement, orientation, and cognitive stimulation

Ensure patient has eyeglasses and hearing aids or other assistive devices as needed

Encourage adequate hydration and nutrition

Maintain sleep-wake cycle

Uninterrupted sleep time; low-level lighting at night

Sleep protocols involving massage, soothing music, herbal tea, warm milk

(B) **Pharmacologic strategies**

Management of severe agitation[g]

Start with a low dose of 1 of the drugs listed below; maintain effective dose for about 2 d before tapering

Seroquel, oral (12.5-25 mg twice daily)

Olanzapine, oral (2.5-5 mg twice daily)

Risperidone, oral (0.5-1 mg twice daily)

Haloperidol, oral or intravenous (0.25-0.5 mg, may repeat every 20-30 min, not to exceed 3-5 mg in 24 h). Due to risk of torsades de pointes, intravenous haloperidol should be administered in monitored settings only.

Management of sleep-wake cycle

Melatonin, oral (3-5 mg at bedtime)

Ramelteon, oral (8 mg at bedtime)

Measure delirium severity for changes over time

Table 3. American Geriatrics Society Clinical Practice Guidelines for the Prevention and Treatment of Postoperative Delirium[a]

Recommendation	Description
Strong: Benefits Clearly Outweigh Risks or Vice Versa	
Multicomponent nonpharmacologic interventions (for prevention)	Delivered by interdisciplinary team for at-risk older adults Includes mobility and walking, avoiding physical restraints, orienting to surroundings, sleep hygiene, adequate oxygen, fluids, and nutrition
Educational programs	Ongoing, provided for health care professionals
Medical evaluation	Identify and manage underlying organic contributors to delirium
Pain management	Should be optimized, preferably with nonopioid medications
Medications to avoid	Any medications associated with precipitating delirium (eg, high-dose opioids, benzodiazepines, antihistamines, dihydropyridines) Cholinesterase inhibitors should not be newly prescribed to prevent or treat postoperative delirium Benzodiazepines should not be used as first-line treatment of delirium-associated agitation Benzodiazepines and antipsychotics should be avoided for treatment of hypoactive delirium
Weak: Evidence in Favor of These Interventions, But Level of Evidence or Potential Risks Limit Strength of Recommendation	
Multicomponent nonpharmacologic interventions (for treatment)	Delivered by interdisciplinary team when older adults are diagnosed with postoperative delirium to improve clinical outcomes
Pain management	Injection of regional anesthetic at the time of surgery and postoperatively to improve pain control with the goal of preventing delirium
Antipsychotics	The use of antipsychotics (haloperidol, risperidone, olanzapine, quetiapine, or ziprasidone) at the lowest effective dose for shortest possible duration may be considered to treat delirious patients who are severely agitated, distressed, or threatening substantial harm to self, others, or both

[a] Adapted from American Geriatrics Society Expert Panel on Postoperative Delirium in Older Adults best practice statement[56] and abstracted clinical practice guideline.[23] Full guideline available at http://www.geriatricscareonline.org.

What's new in Pharmacologic Management?

Treatment
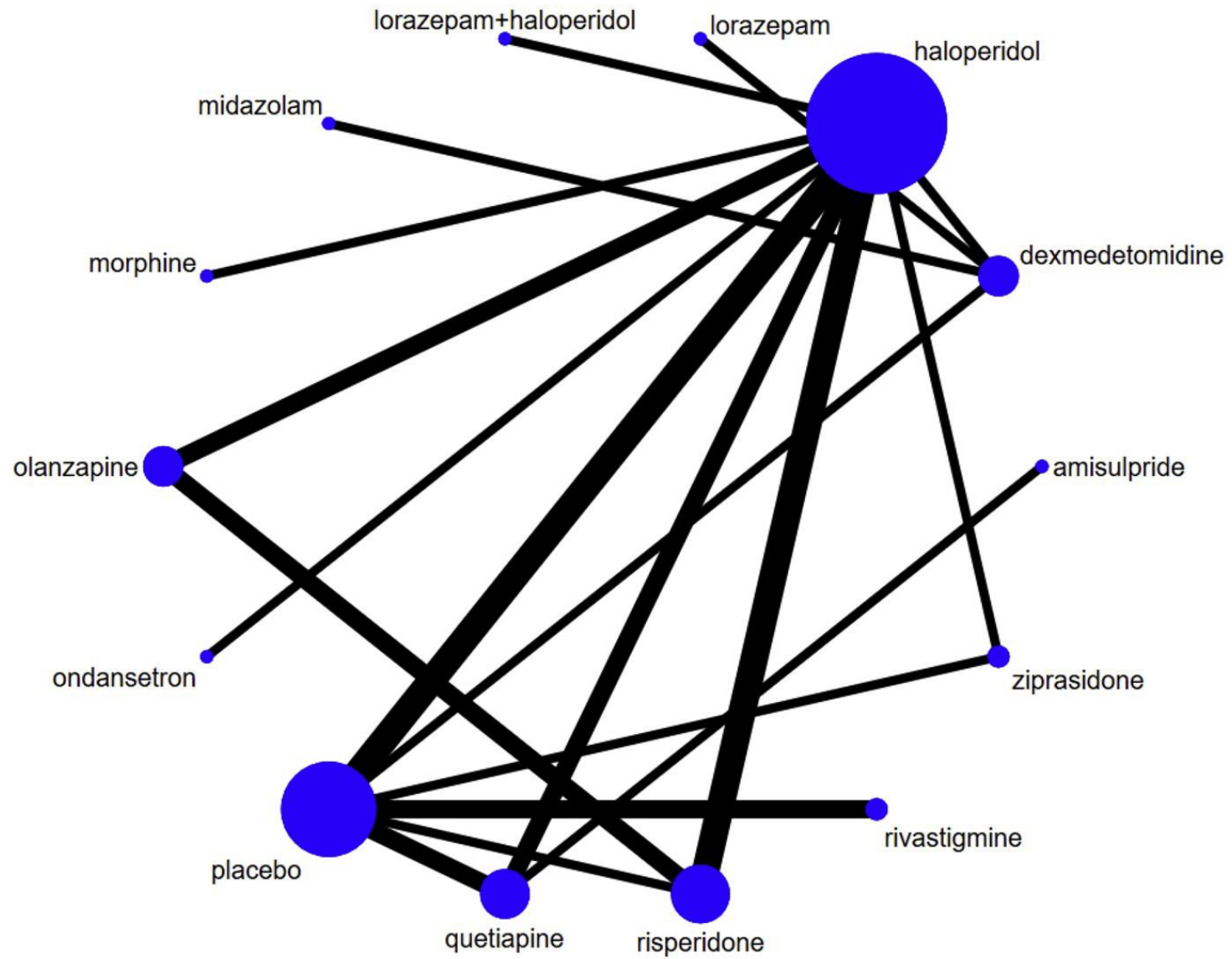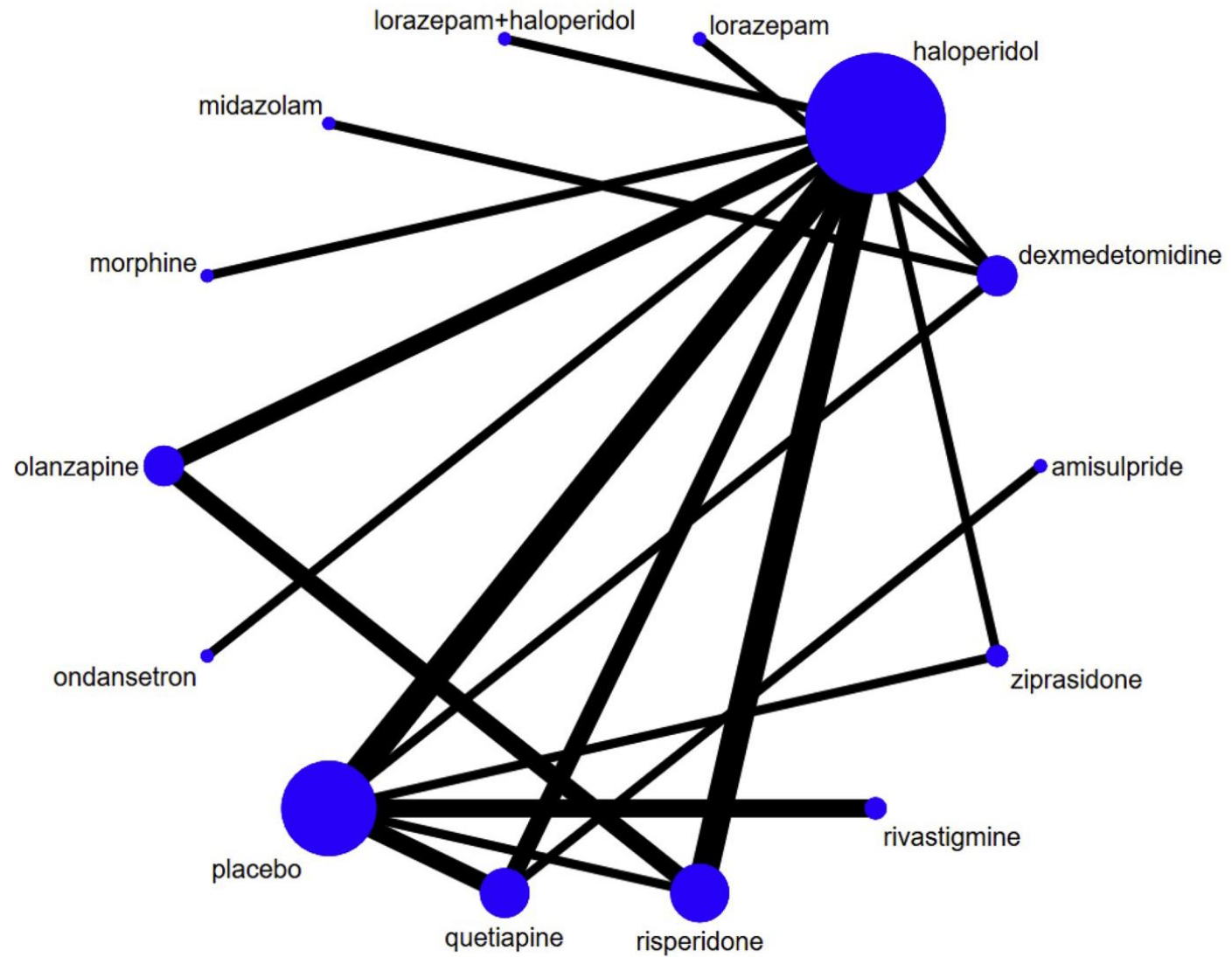
Treatment for ICU patients

Contrast to placebo	Random effect model	OR	
midazolam		0.28	[0.06; 1.29]
rivastigmine		0.87	[0.38; 1.96]
placebo		1.00	
haloperidol		1.01	[0.72; 1.44]
ondansetron		1.25	[0.48; 3.27]
ziprasidone		1.23	[0.82; 1.84]
lorazepam		2.03	[0.52; 7.84]
dexmedetomidine		2.66	[1.05; 6.77]
morphine		3.88	[1.18; 12.80]
quetiapine		8.00	[1.41; 45.41]

"None of the agents showed benefit in non-ICU patients"
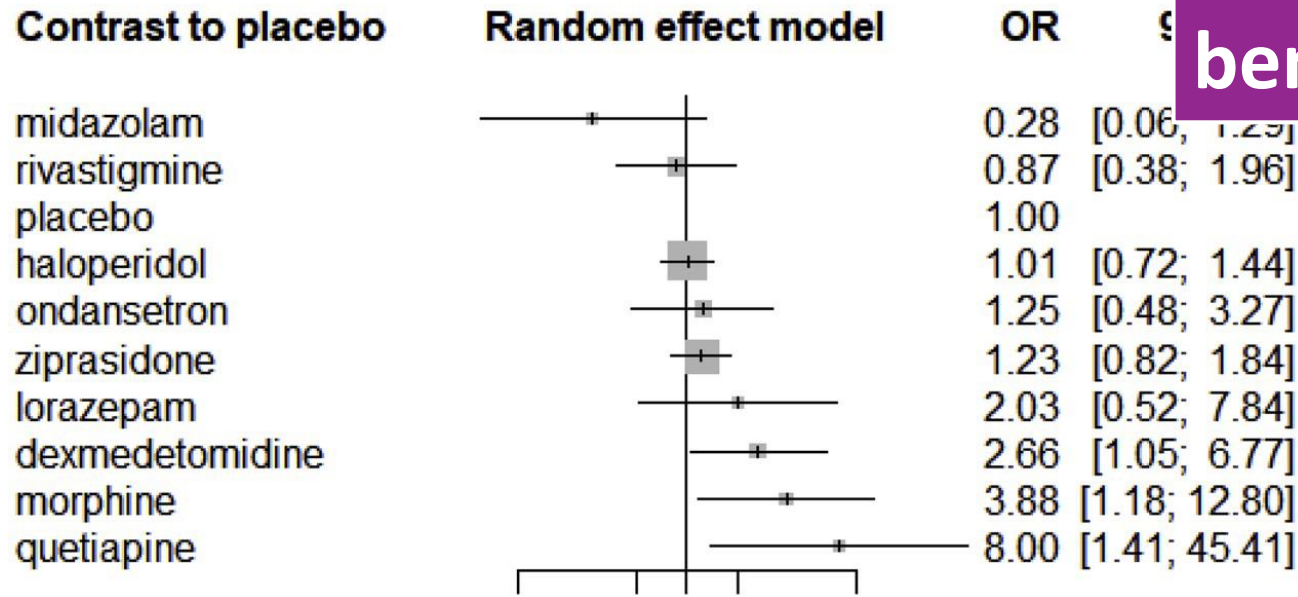
Prevention for ICU surgical patients

Contrast to placebo	Random effect model	OR	95%-
sevoflurane		2.90	[0.75; 11.2
midazolam		2.03	[0.75; 5.4
desflurane		1.90	[0.58; 6.2
propofol		1.69	[0.82; 3.4
remifentanil		1.36	[0.41; 4.5
tryptophan		1.15	[0.55; 2.3
rivastigmine		1.11	[0.42; 2.9
placebo		1.00	
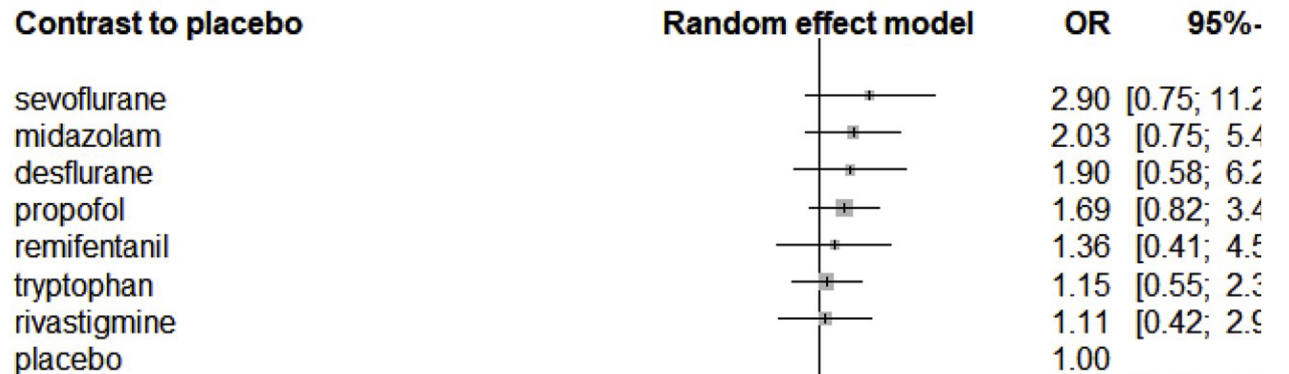
Antipsychotics for treatment of delirium in hospitalised non-ICU patients (Review)

Burry L, Mehta S, Perreault MM, Luxenbe

"There were no reported data to determine whether antipsychotics altered the duration of delirium, length of hospital stay, discharge disposition, or health-related quality of life as studies did not report on these outcomes."

Restraints

Black patients in the ED are more likely to be restrained; RR, 1.31; 95% CI, 1.19-1.43

Eswaran V, Molina MF, Hwong AR, Dillon DG, Alvarez L, Allen IE, Wang RC. Racial Disparities in Emergency Department Physical Restraint Use: A Systematic Review and Meta-Analysis. JAMA Intern Med. 2023 Sep 25:e234832.

In inpatients with delirium, non-English preferred language persons 2.6x ↑ physically restrained, and 1.5x ↑ chemical restraint

Reppas-Rindlisbacher C, Shin S, Purohit U, Verma A, Razak F, Rochon P, Sheehan K, Rawal S. Association between non-English language and use of physical and chemical restraints among medical inpatients with delirium. J Am Geriatr Soc. 2022 Dec;70(12):3640-3643.

TABLE 2 Relative risk of study outcomes by preferred language

	No (%) of patients			Relative risk (95% CI)	
	Overall	English-preferred language	Non-English preferred language	Unadjusted relative risk	Adjusted relative risk[a]
n	213	145	68	213	213
Physical restraint use	36 (16.9)	17 (11.7)	19 (27.9)	2.38 (1.32–4.35)	2.61 (1.40–4.85)
Antipsychotic medication	66 (31.0)	38 (26.2)	28 (41.2)	1.57 (1.05–2.32)	1.50 (1.03–2.19)
Sedative hypnotic medication	54 (25.4)	35 (24.1)	19 (27.9)	1.16 (0.70–1.84)	1.20 (0.71–1.95)

But what are the barriers?

Reduced Alertness
Communication Barriers
Pre-existing Cognitive Disorders
Unstructured Delirium Assessments
Prioritizing Patient's Wellness & Comfort

2018 — Mean: 74%

The task force was established to improve delirium diagnosis and management by:

Recruiting a multidisciplinary working group.

Retrospectively collecting data on ICD-10 delirium-related codes reported for hospitalizations.

2019 — Mean: 76%

The delirium protocol was created by:

Defining risk criteria

Designing of care pathways and prevention measures

Reassessing institutional data related to delirium diagnosis.

2020 — Mean: 76%

The Delirium Task Force commenced phase 1 by:

Conceptualizing and recording an educational video aimed at family and caregivers

Conducting online training to sensitize multidisciplinary teams on the importance of delirium and its under recognition

Providing online training to ward nurses on delirium screening using the CAM

2021 — Mean: 91%

The Delirium Task force moved into phase 2 by:

Implementing delirium screening using the CAM for high-risk patients in the nurses' daily activities and checklist

Building and implementing a structured decision support system in the electronic health record to manage screened delirium cases

Conducting simulation-based education on delirium screening for nurses

2022 — Mean: 99%

The Delirium Task force advanced to phase 3 by:

Launching a chatbot for educating family and caregivers on delirium

Implementing an electronic health record alert for physicians when CAM-positive, displaying the option to adopt the delirium decision support plan and Power Plan (medical orders under a single title).

Conducting online refresher training for nurses

Frequency of high-risk admissions screened for delirium (%)

COVID-19 pandemic

https://doi.org/10.1016/j.gerinurse.2023.08.019
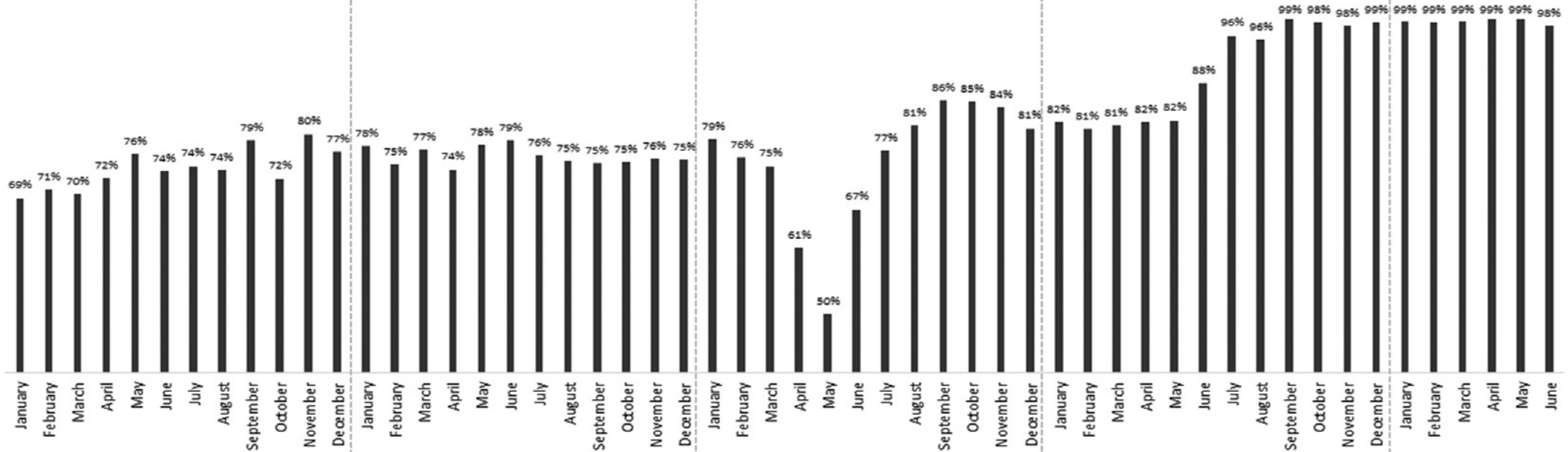
Table 1
Frequencies of delirium screening based on CAM results reported in the electronic health records from 2018 to 2022.

	% (95% CI)				
	2018	2019	2020	2021	2022
Frequency of admissions that were screened for delirium (%)[a]	74.0 (73.0−75.1)	76.2 (75.2−77.1)	75.6 (74.5−76.6)	90.8 (90.1−91.4)	98.7 (98.4−99.1)
Frequency of delirium screening in wards (%)[a]	72.4 (71.3−73.5)	75.6 (74.5−76.6)	74.0 (72.9−75.1)	88.4 (87.6−89.2)	97.8 (97.3−98.2)
Frequency of delirium screening in critical care units (%)[a]	47.5 (45.9−49.1)	49.3 (47.8−50.9)	54.5 (52.7−56.2)	73.6 (72.2−75.0)	76.5 (74.5−78.4)
Frequency of positive screened admissions (%)[b]	9.9 (9.1−10.7)	8.7 (7.9−9.4)	10.5 (9,6−11.3)	11.5 (10.8−12.3)	8.4 (7.5−9.2)
Frequency of positive screening in wards (%)[b]	9.4 (8.7−10.1)	8.1 (7.5−8.8)	10.5 (9.7−11.2)	21.6 (20.7−22.5)	13.0 (12.0−14.1)
Frequency of positive screening in critical care units (%)[b]	21 (20.0−21.9)	16.9 (16.1−17.8)	16.9 (16.0−17.8)	19.7 (18.8−20.6)	14.9 (13.8−16.0)
Frequency of screened admissions that had at least one CAM reported daily (%)[c]	22.3 (21.2−23.4)	16.2 (15.2−17.1)	14.9 (13.9−16.0)	29.1 (28.0−30.2)	43.7 (42.1−45.2)

Admission screening achieved.
Daily screening was not optimal.
Those with admission codes for delirium, only 32% had a positive screen.

Table 1 Major Themes Surrounding Inpatient Delirium Care –
Nursing Perspectives

Theme	Major Barriers or Action Items Identified
1. Delirium Screening Challenges and Perceptions	● Determining acute change from baseline ● Screening tool education and training ● Subjectivity with delirium assessment ● Inaction with positive screens
2. Organizational Culture Towards Delirium	● Dismissive attitudes ● Lack of delirium management knowledge ● Delirium as a priority with hospital leadership ● Hospital environment – sleep interruptions ● Lack of standardized approach to delirium
3. Competing Clinical Priorities	● Contemporaneous clinical demands ● Charting fatigue
4. Desired Improvements	● Decision support systems (e.g., pager alerts) ● Delirium prevention and management order sets ● Multidisciplinary collaboration ● Standardized, recurrent delirium education

Virtual HELP Adherence

- Delirium protocol (96%)
- Nursing medication review (96%)
- Vision (89%) & Hearing (87%)
- Orientation (88%)

- Hydration (64%)
- Mobilization (55%)
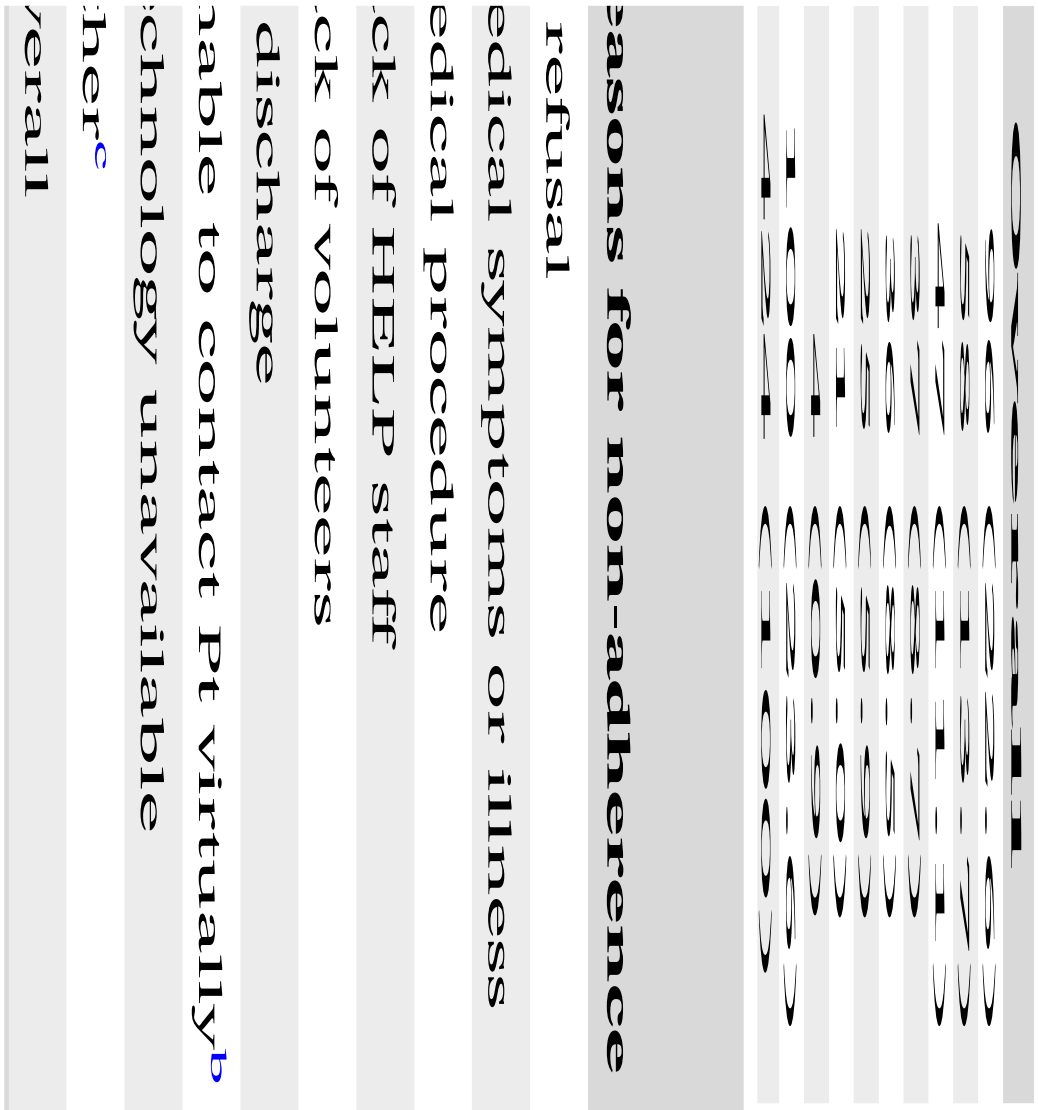
Barriers to the optimal use of pharmacological strategies

- *Fears associated to the administration or use of opioids from staff and patients*
- *Uniqueness of pain and safety issue*
- *Standardized protocol not adapted to the elderly*

- *« There are patients who want to stop using medication rather quickly […] this means that they accumulate a lot of pain. »*
- *« With the elderly, we're reluctant from the start. »*
- *« we have standard follow-ups like for knees and hips »*
- *« because with the elderly, as soon as the operation is over, we have to lower the dose prescribed in the standard protocols »*

Practice improvement considerations related to pharmacological strategies

- *Patient-professional and professional-professional communication regarding patient pain*

- *Regular administration of non-opioid analgesics such as acetaminophen*
- *Frequent adjustment of medication according to the user's clinical condition*

- *« reiterating to the nurses that there was no inter-dose today […] before we increase the doses, we'll introduce our regular PRNs, or before physio »*
- *« it's important to mention that in terms of analgesics […] Tylenol should be given regularly. »*
- *«Nothing is ever exactly the same, for each patient you have to stop and really take time. […] readjusting two or three times a day, or even saying: well, the regular ones aren't working »*

Non-pharmacological strategies

- *Different types of strategies and interventions*

- *« to try some pain-relieving positions; to try ice or heat.»*
- *« deep relaxation strategies, massage […] Deep Cold […] ice […] Positioning in bed with pillows»*
- *« breathing, when you see that someone is tensing up »*

Barriers to the implementation of non-pharmacological strategies

- *Lack of resources (e.g., lack of time, work overload)*

- *Forgetting, lack of knowledge of available strategies and culture*

- *Accessibility*

- *« the T.E.N.S. tool […] at a certain point, none were working […] and then, the problem is that we don't have time, to set up and stay there to make sure it's working.*
- *« Ice, you know, is not available on the floor.»*
- *« unfortunately the nurses have a lot of things to think about, so they forget it […] nurses won't necessarily think about it »*
- *« at one point, we had no more T.E.N.S. […] (Another) What's that? […] (Another) I've never seen that before. »*
- *« the framework is so strict […] it's not integrated»*
- *« electrotherapy, you know, T.EN.S. are very, very, very rare, we have very few of them»*

Barriers to optimal mobilization and pain relief for mobilization

- *Work organization (lack of time, work overload, insufficient personnel, access to equipment and/or rehabilitation personnel)*
- *Fears of the patient and his family*

- *« I don't have half an hour to give »*
- *« an analgesic is given and then when it's time for the physio … well, the patient is gone for an exam »*
- *«because the plans are not up to date »*
- *« and also the lack of staff at the moment »*
- *« three-day weekend […] they don't have chairs »*
- *« we try during the morning rounds to give our pain medications […] But it's not necessarily possible »*
- *« if they had a bad experience when they first got up »*
- *« they are afraid (families) […] that anxiety, they transfer it to the patient. »*

ORIGINAL ARTICLE

"You've got to keep moving, keep going": Understanding older patients' experiences and perceptions of delirium and nonpharmacological delirium prevention strategies in the acute hospital setting

My own outlook on life	Motivation and goals and independent will	Internal drive within the individual as a general status. Specific goals or aims for hospitalisation (e.g. preference for walking regularly to keep mobile, desire to discharge to home)
	Previous experiences and roles	Previous hospital and life experiences and usual life roles shaping outlook and beliefs
	Attitudes & views	Perspective, point of view or general attitude to life including perceptions of control.
	Sense of capability and accomplishment	Expressed or implied sense of achievement or failure related to life in general or hospitalisation
Feeling well enough	Symptoms and Illness and Impact of medication	Impact of current illness, medications and/or symptoms during hospitalisation.
	Health beliefs, habits or behaviours	Beliefs related to own health/illness and wellness and general health beliefs, as well as health habits or behaviours
Getting the information I need, feeling part of the team and feeling heard	Communication, instructions and education	Direct or indirect sending and receiving of information (e.g. between staff, patient and family) Perceptions of quality and impact of this process.
	Feeling heard and understood	Sense of being listened to and validated by staff
	Understanding and remembering	Comprehension and recall of messages provided may include clarity or confusion about messages

The impact of hospital (environment and routines)	Hospital equipment, resources and environment	Access/availability of equipment and resources to support engagement in hospital environment (may be usual or newly required)
	Availability of staff assistance	Availability/access of assistance from staff when required in hospital
	Clarity of roles and routines	Clarity of patient, staff, family roles (tasks, duties, contributions) and routines (e.g. completion of basic cares)
	Permission giving, flexibility and choice	Perceived approval, empowerment, freedom allowed from staff and or the hospital processes. Affects feeling of being allowed to conduct own activities in hospital
Support and encouragement networks	Staff/Volunteer support	May include "nonroutine" help, encouragement or psychosocial support from staff and/or volunteers
	Family Carer support	May include hands on help or psychosocial support within hospital or via phone from family carers, or friends
	Connection/interaction with other patients	May include sharing of experiences, encouragement and support or interaction/activity with other inpatients (prescribed or additional activity)

How do we help improve things?

Thank you!
Questions?

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