

Supplementary Material

Characterizing Gaps in Delirium Prevention: A Multicentre Cross-Sectional Analysis of Nurse-Reported Screening, Barriers, and ICU–Ward Practice Differences

This supplementary material provides detailed descriptive distributions, denominator checks, outcome-eligibility decisions, model diagnostics, and sensitivity analyses supporting the main manuscript. The primary comparative model refers to the prespecified adjusted ordinal logistic-regression model comparing intensive care unit (ICU) and general-ward nurses, adjusted for hospital site, current-unit experience, and education. Sensitivity analyses examine whether the primary ICU–ward findings are stable after excluding facility-metadata flagged records, using an alternative experience covariate, or omitting hospital fixed effects.

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Supplementary Table S1. Shared preventive-practice distributions

Four-level distributions of the 18 shared delirium-prevention practices by clinical setting.

Practice	Setting	Always	Frequently	Sometimes	Never
Early exercise and mobilization	Ward	26 (25.74)	60 (59.41)	13 (12.87)	2 (1.98)
Early exercise and mobilization	ICU	36 (27.07)	67 (50.38)	27 (20.30)	3 (2.26)
Pain relief	Ward	44 (43.56)	52 (51.49)	5 (4.95)	0 (0.00)
Pain relief	ICU	81 (60.90)	47 (35.34)	5 (3.76)	0 (0.00)
Support daytime wakefulness and high-quality night-time sleep	Ward	45 (44.55)	46 (45.54)	10 (9.90)	0 (0.00)
Support daytime wakefulness and high-quality night-time sleep	ICU	30 (22.56)	73 (54.89)	29 (21.80)	1 (0.75)
Prevent exposure to excessive noise	Ward	42 (41.58)	50 (49.50)	6 (5.94)	3 (2.97)
Prevent exposure to excessive noise	ICU	26 (19.55)	63 (47.37)	44 (33.08)	0 (0.00)
Facilitate regular family and friend visits	Ward	48 (47.52)	44 (43.56)	8 (7.92)	1 (0.99)
Facilitate regular family and friend visits	ICU	25 (18.80)	67 (50.38)	37 (27.82)	4 (3.01)
Provide adequate room lighting	Ward	43 (42.57)	54 (53.47)	4 (3.96)	0 (0.00)
Provide adequate room lighting	ICU	26 (19.55)	79 (59.40)	28 (21.05)	0 (0.00)
Provide cognitive-stimulation activities	Ward	10 (9.90)	15 (14.85)	42 (41.58)	34 (33.66)
Provide cognitive-stimulation activities	ICU	3 (2.26)	31 (23.31)	62 (46.62)	37 (27.82)
Provide a clearly visible clock and calendar	Ward	13 (12.87)	14 (13.86)	45 (44.55)	29 (28.71)
Provide a clearly visible clock and calendar	ICU	1 (0.75)	46 (34.59)	64 (48.12)	22 (16.54)
Ensure availability of glasses and hearing aids	Ward	28 (27.72)	55 (54.46)	16 (15.84)	2 (1.98)
Ensure availability of glasses and hearing aids	ICU	25 (18.80)	81 (60.90)	27 (20.30)	0 (0.00)
Provide orientation to place, time, and person	Ward	41 (40.59)	56 (55.45)	4 (3.96)	0 (0.00)
Provide orientation to place, time, and person	ICU	57 (42.86)	70 (52.63)	6 (4.51)	0 (0.00)
Educate family members on supporting orientation	Ward	17 (16.83)	36 (35.64)	44 (43.56)	4 (3.96)
Educate family members on supporting orientation	ICU	17 (12.78)	60 (45.11)	50 (37.59)	6 (4.51)
Avoid unnecessary room or ward changes	Ward	13 (12.87)	44 (43.56)	40 (39.60)	4 (3.96)
Avoid unnecessary room or ward changes	ICU	24 (18.05)	80 (60.15)	28 (21.05)	1 (0.75)
Ensure adequate hydration	Ward	51 (50.50)	50 (49.50)	0 (0.00)	0 (0.00)
Ensure adequate hydration	ICU	75 (56.39)	51 (38.35)	7 (5.26)	0 (0.00)
Ensure adequate oxygenation	Ward	69 (68.32)	32 (31.68)	0 (0.00)	0 (0.00)
Ensure adequate oxygenation	ICU	121 (90.98)	11 (8.27)	1 (0.75)	0 (0.00)
Avoid unnecessary catheterization	Ward	51 (50.50)	41 (40.59)	9 (8.91)	0 (0.00)
Avoid unnecessary catheterization	ICU	36 (27.07)	77 (57.89)	20 (15.04)	0 (0.00)
Review for polypharmacy	Ward	50 (49.50)	47 (46.53)	4 (3.96)	0 (0.00)
Review for polypharmacy	ICU	82 (61.65)	46 (34.59)	5 (3.76)	0 (0.00)
Ensure adequate nutrition	Ward	47 (46.53)	51 (50.50)	3 (2.97)	0 (0.00)
Ensure adequate nutrition	ICU	71 (53.38)	60 (45.11)	2 (1.50)	0 (0.00)
Avoid physical restraints	Ward	29 (28.71)	46 (45.54)	24 (23.76)	2 (1.98)
Avoid physical restraints	ICU	21 (15.79)	47 (35.34)	50 (37.59)	15 (11.28)

Supplementary Table S2. Missingness and denominator checks

Core missingness and denominator checks.

Variable	Valid <i>n</i>	Missing <i>n</i>	Complete
Participant_ID	234	0	Yes
unit_type_code	234	0	Yes
hospital_code	234	0	Yes
education_level_code	234	0	Yes
current_unit_experience_years	234	0	Yes
derived_total_experience_years	234	0	Yes
facility_metadata_conflict_flag	234	0	Yes
practice_early_mobilization	234	0	Yes
practice_pain_relief	234	0	Yes
practice_sleep_support	234	0	Yes
practice_noise_reduction	234	0	Yes
practice_family_visits	234	0	Yes
practice_adequate_lighting	234	0	Yes
practice_cognitive_stimulation	234	0	Yes
practice_visible_clock_calendar	234	0	Yes
practice_visual_hearing_aids	234	0	Yes
practice_orientation	234	0	Yes
practice_family_orientation_education	234	0	Yes
practice_avoid_room_unit_changes	234	0	Yes
practice_adequate_hydration	234	0	Yes
practice_adequate_oxygenation	234	0	Yes
practice_avoid_unnecessary_catheter	234	0	Yes
practice_polypharmacy_review	234	0	Yes
practice_adequate_nutrition	234	0	Yes
practice_avoid_physical_restraints	234	0	Yes
Setting	234	0	Yes
Hospital	234	0	Yes
CurrentUnitExperience5y	234	0	Yes
EducationBinary	234	0	Yes

Conditional-denominator checks.

Item	Observed <i>n</i>	Expected <i>n</i>
Admission barrier denominator	234	234
Routine-monitoring method denominator	44	44
Routine-monitoring barrier denominator	190	190

Supplementary Table S3. Outcome eligibility and category collapsing

Outcome eligibility and category-collapsing decisions for shared practice items.

Practice	Original pooled counts	Final grouped categories	Decision	Reason
Early mobilization	[62, 127, 40, 5]	1:62 2:127 3+4:45	Ordinal	Retained ordinal outcome after pooled blind category rules
Pain relief	[125, 99, 10, 0]	1:125 2:99 3:10	Ordinal	Retained ordinal outcome after pooled blind category rules
Sleep support	[75, 119, 39, 1]	1:75 2:119 3+4:40	Ordinal	Retained ordinal outcome after pooled blind category rules
Noise reduction	[68, 113, 50, 3]	1:68 2:113 3+4:53	Ordinal	Retained ordinal outcome after pooled blind category rules
Family visits	[73, 111, 45, 5]	1:73 2:111 3+4:50	Ordinal	Retained ordinal outcome after pooled blind category rules
Adequate lighting	[69, 133, 32, 0]	1:69 2:133 3:32	Ordinal	Retained ordinal outcome after pooled blind category rules
Cognitive stimulation	[13, 46, 104, 71]	1:13 2:46 3:104 4:71	Ordinal	Retained ordinal outcome after pooled blind category rules
Visible clock/calendar	[14, 60, 109, 51]	1:14 2:60 3:109 4:51	Ordinal	Retained ordinal outcome after pooled blind category rules
Visual/hearing aids	[53, 136, 43, 2]	1:53 2:136 3+4:45	Ordinal	Retained ordinal outcome after pooled blind category rules
Orientation	[98, 126, 10, 0]	1:98 2:126 3:10	Ordinal	Retained ordinal outcome after pooled blind category rules
Family orientation education	[34, 96, 94, 10]	1:34 2:96 3:94 4:10	Ordinal	Retained ordinal outcome after pooled blind category rules
Avoid room/unit changes	[37, 124, 68, 5]	1:37 2:124 3+4:73	Ordinal	Retained ordinal outcome after pooled blind category rules
Adequate hydration	[126, 101, 7, 0]	1:126 2+3:108	Descriptive Only	Ordinal structure unstable and routine binary class count below threshold
Adequate oxygenation	[190, 43, 1, 0]	1:190 2+3:44	Descriptive Only	Ordinal structure unstable and routine binary class count below threshold
Avoid unnecessary catheterization	[87, 118, 29, 0]	1:87 2:118 3:29	Ordinal	Retained ordinal outcome after pooled blind category rules
Polypharmacy review	[132, 93, 9, 0]	1:132 2+3:102	Descriptive Only	Ordinal structure unstable and routine binary class count below threshold
Adequate nutrition	[118, 111, 5, 0]	1:118 2+3:116	Descriptive Only	Ordinal structure unstable and routine binary class count below threshold
Avoid physical restraints	[50, 93, 74, 17]	1:50 2:93 3:74 4:17	Ordinal	Retained ordinal outcome after pooled blind category rules

Supplementary Table S4. Ordinal-model diagnostics

Proportional-odds diagnostic results.

Practice	Categories	Diagnostic status	df	<i>p</i>	PO supported	sup-
Early mobilization	3	UNAVAILABLE: critical fit warning		NA	NA	
Pain relief	3	Fitted	7	0.133	Yes	
Sleep support	3	Fitted	7	0.803	Yes	
Noise reduction	3	Fitted	7	0.334	Yes	
Family visits	3	UNAVAILABLE: critical fit warning		NA	NA	
Adequate lighting	3	Fitted	7	0.025	No	
Cognitive stimulation	4	UNAVAILABLE: critical fit warning		NA	NA	
Visible clock/calendar	4	UNAVAILABLE: critical fit warning		NA	NA	
Visual/hearing aids	3	Fitted	7	0.152	Yes	
Orientation	3	UNAVAILABLE: critical fit warning		NA	NA	
Family orientation education	4	UNAVAILABLE: critical fit warning		NA	NA	
Avoid room/unit changes	3	Fitted	7	0.131	Yes	
Avoid unnecessary catheterization	3	Fitted	7	0.277	Yes	
Avoid physical restraints	4	UNAVAILABLE: critical fit warning		NA	NA	

Threshold-specific nonparallel ordinal sensitivity estimates for available diagnostic models.

Practice	Threshold-specific coefficient	OR (95% CI)	<i>p</i>
Pain relief	Setting_ICU_1	2.27 (1.29–3.99)	0.004
Pain relief	Setting_ICU_2	1.45 (0.40–5.31)	0.571
Sleep support	Setting_ICU_1	0.34 (0.19–0.62)	< 0.001
Sleep support	Setting_ICU_2	0.34 (0.15–0.74)	0.007
Noise reduction	Setting_ICU_1	0.26 (0.14–0.49)	< 0.001
Noise reduction	Setting_ICU_2	0.14 (0.06–0.32)	< 0.001
Adequate lighting	Setting_ICU_1	0.30 (0.16–0.56)	< 0.001
Adequate lighting	Setting_ICU_2	0.15 (0.05–0.45)	< 0.001
Visual/hearing aids	Setting_ICU_1	0.52 (0.27–0.98)	0.042
Visual/hearing aids	Setting_ICU_2	0.94 (0.47–1.86)	0.858
Avoid room/unit changes	Setting_ICU_1	1.81 (0.84–3.89)	0.129
Avoid room/unit changes	Setting_ICU_2	2.70 (1.49–4.90)	0.001
Avoid unnecessary catheterization	Setting_ICU_1	0.37 (0.21–0.66)	< 0.001
Avoid unnecessary catheterization	Setting_ICU_2	0.69 (0.30–1.59)	0.385

Supplementary Table S5. Binary routine-implementation sensitivity analyses

Binary routine-implementation sensitivity models.

Practice	Stable	OR (95% CI)	BH <i>q</i>	Status
Early mobilization	Yes	0.37 (0.17–0.82)	0.030	Fitted and stable
Pain relief	No	1.53 (0.41–5.65)	0.671	UNAVAILABLE: critical fit warning
Sleep support	Yes	0.35 (0.16–0.78)	0.023	Fitted and stable
Noise reduction	Yes	0.13 (0.05–0.31)	<0.001	Fitted and stable
Family visits	Yes	0.07 (0.02–0.23)	<0.001	Fitted and stable
Adequate lighting	Yes	0.13 (0.04–0.40)	0.001	Fitted and stable
Cognitive stimulation	Yes	0.86 (0.45–1.66)	0.764	Fitted and stable
Visible clock/calendar	Yes	1.43 (0.77–2.67)	0.447	Fitted and stable
Visual/hearing aids	Yes	0.94 (0.47–1.86)	0.897	Fitted and stable
Orientation	No	1.09 (0.29–4.11)	0.897	UNAVAILABLE: critical fit warning
Family orientation education	Yes	1.27 (0.74–2.19)	0.534	Fitted and stable
Avoid room/unit changes	Yes	2.74 (1.50–5.00)	0.003	Fitted and stable

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Binary routine-implementation sensitivity models. (continued)

Practice	Stable	OR (95% CI)	BH q	Status
Avoid unnecessary catheterization	Yes	0.65 (0.27-1.52)	0.495	Fitted and stable
Avoid physical restraints	Yes	0.28 (0.15-0.52)	<0.001	Fitted and stable

Supplementary Table S6. Directional consistency check

Directional consistency check for ICU-ward effect interpretation.

Practice	Ward routine %	ICU routine %	ICU-ward diff.	Adjusted ordinal OR	Interpretation
Noise reduction	91.09	66.92	-24.17	0.21	OK
Avoid physical restraints	74.26	51.13	-23.13	0.28	OK
Family visits	91.09	69.17	-21.92	0.19	OK
Adequate lighting	96.04	78.95	-17.09	0.25	OK
Orientation	96.04	95.49	-0.55	1.15	Near-null check passed

Supplementary Table S7. Sensitivity analyses for adjusted ICU–ward comparisons

The reference estimate is the primary adjusted ordinal model reported in the main manuscript. The log-OR difference and percent OR change compare each sensitivity model with the primary model. The interpretation column summarizes whether the sensitivity estimate materially changed relative to the primary model; it is not a separate hypothesis test.

Item-level sensitivity analyses for the adjusted ICU–ward comparisons.

Practice	Primary model OR (95% CI)	Sensitivity model OR (95% CI)	log-OR diff.	OR change %	BH <i>q</i>	Interpretation
Exclusion of facility-metadata flagged records						
Early mobilization	0.70 (0.42-1.18)	0.70 (0.41-1.19)	-0.006	-0.6	0.261	No material change
Pain relief	2.18 (1.26-3.77)	2.12 (1.21-3.73)	-0.028	-2.7	0.016	No material change
Sleep support	0.34 (0.20-0.59)	0.36 (0.21-0.62)	0.035	3.6	<0.001	No material change
Noise reduction	0.21 (0.12-0.36)	0.20 (0.11-0.35)	-0.046	-4.5	<0.001	No material change
Family visits	0.19 (0.11-0.33)	0.19 (0.11-0.34)	0.020	2.0	<0.001	No material change
Adequate lighting	0.25 (0.14-0.44)	0.23 (0.13-0.42)	-0.088	-8.4	<0.001	No material change
Cognitive stimulation	0.87 (0.53-1.43)	0.94 (0.56-1.57)	0.076	7.9	0.878	No material change
Visible clock/calendar	1.16 (0.70-1.93)	1.14 (0.68-1.92)	-0.023	-2.3	0.800	No material change
Visual/hearing aids	0.68 (0.40-1.14)	0.62 (0.36-1.07)	-0.083	-7.9	0.138	No material change
Orientation	1.15 (0.68-1.95)	1.10 (0.64-1.89)	-0.045	-4.4	0.858	No material change
Family orientation education	1.12 (0.68-1.84)	1.04 (0.62-1.73)	-0.077	-7.4	0.884	No material change
Avoid room/unit changes	2.29 (1.35-3.87)	2.22 (1.29-3.81)	-0.031	-3.0	0.008	No material change
Avoid unnecessary catheterization	0.43 (0.25-0.72)	0.37 (0.21-0.65)	-0.131	-12.3	0.001	No material change
Avoid physical restraints	0.28 (0.17-0.47)	0.26 (0.15-0.45)	-0.053	-5.2	<0.001	No material change
Alternative experience covariate						
Early mobilization	0.70 (0.42-1.18)	0.70 (0.42-1.18)	0.004	0.4	0.259	No material change
Pain relief	2.18 (1.26-3.77)	2.21 (1.28-3.81)	0.011	1.1	0.008	No material change
Sleep support	0.34 (0.20-0.59)	0.35 (0.21-0.59)	0.016	1.6	<0.001	No material change
Noise reduction	0.21 (0.12-0.36)	0.21 (0.12-0.37)	0.012	1.2	<0.001	No material change
Family visits	0.19 (0.11-0.33)	0.19 (0.11-0.33)	-0.013	-1.3	<0.001	No material change
Adequate lighting	0.25 (0.14-0.44)	0.26 (0.15-0.45)	0.030	3.1	<0.001	No material change
Cognitive stimulation	0.87 (0.53-1.43)	0.89 (0.54-1.45)	0.016	1.6	0.651	No material change
Visible clock/calendar	1.16 (0.70-1.93)	1.18 (0.71-1.94)	0.010	1.0	0.651	No material change
Visual/hearing aids	0.68 (0.40-1.14)	0.70 (0.41-1.17)	0.026	2.7	0.259	No material change
Orientation	1.15 (0.68-1.95)	1.15 (0.68-1.96)	0.004	0.4	0.651	No material change
Family orientation education	1.12 (0.68-1.84)	1.12 (0.68-1.84)	0.000	0.0	0.651	No material change
Avoid room/unit changes	2.29 (1.35-3.87)	2.30 (1.36-3.89)	0.007	0.7	0.004	No material change
Avoid unnecessary catheterization	0.43 (0.25-0.72)	0.43 (0.25-0.73)	0.013	1.3	0.004	No material change
Avoid physical restraints	0.28 (0.17-0.47)	0.29 (0.17-0.48)	0.027	2.7	<0.001	No material change
Hospital-omitted model						
Early mobilization	0.70 (0.42-1.18)	0.80 (0.48-1.32)	0.127	13.6	0.477	No material change
Pain relief	2.18 (1.26-3.77)	1.92 (1.15-3.22)	-0.126	-11.9	0.023	No material change
Sleep support	0.34 (0.20-0.59)	0.35 (0.21-0.58)	0.010	1.0	<0.001	No material change
Noise reduction	0.21 (0.12-0.36)	0.27 (0.16-0.45)	0.246	27.9	<0.001	Magnitude shift flagged
Family visits	0.19 (0.11-0.33)	0.23 (0.14-0.40)	0.202	22.4	<0.001	Magnitude shift flagged

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Item-level sensitivity analyses for the adjusted ICU–ward comparisons. (continued)

Practice	Primary model OR (95% CI)	Sensitivity model OR (95% CI)	log-OR diff.	OR change %	BH <i>q</i>	Interpretation
Adequate lighting	0.25 (0.14-0.44)	0.25 (0.14-0.44)	0.007	0.7	<0.001	No material change
Cognitive stimulation	0.87 (0.53-1.43)	1.09 (0.67-1.76)	0.220	24.6	0.804	Magnitude shift flagged
Visible clock/calendar	1.16 (0.70-1.93)	1.45 (0.89-2.36)	0.219	24.5	0.187	Magnitude shift flagged
Visual/hearing aids	0.68 (0.40-1.14)	0.68 (0.40-1.13)	-0.003	-0.3	0.187	No material change
Orientation	1.15 (0.68-1.95)	1.08 (0.65-1.80)	-0.062	-6.0	0.804	No material change
Family orientation education	1.12 (0.68-1.84)	1.06 (0.66-1.73)	-0.053	-5.2	0.804	No material change
Avoid room/unit changes	2.29 (1.35-3.87)	2.24 (1.35-3.74)	-0.020	-1.9	0.004	No material change
Avoid unnecessary catheterization	0.43 (0.25-0.72)	0.39 (0.23-0.65)	-0.087	-8.3	<0.001	No material change
Avoid physical restraints	0.28 (0.17-0.47)	0.35 (0.21-0.58)	0.238	26.9	<0.001	Magnitude shift flagged

Supplementary Table S7b. Sensitivity-analysis overview

Overview of clinical sensitivity analyses.

Sensitivity analysis	Stable models	FDR-significant findings	Material magnitude shifts	magnitudes	FDR-status changes
Exclusion of facility-metadata flagged records	14/14	8	0		0
Alternative experience covariate	14/14	8	0		0
Hospital-omitted model	14/14	8	5		0