Supplementary S1. Search Strategies

Databases	Query	Results
PubMed (MeSH)	("Critical Care"[Mesh] OR "Critical care"[tiab] OR "Critical care nursing"[tiab] OR "Critical care unit*"[tiab] OR "intensive care units"[Mesh] OR "Intensive care"[tiab] OR "Intensive Care nursing"[tiab] OR "Intensive care unit*"[tiab] OR "Medical intensive care unit*"[tiab] OR "MICU"[tiab] OR "Surgical intensive care unit*"[tiab] OR "SICU"[tiab] OR "Coronary care unit*"[tiab] OR "CCU"[tiab] OR "Neuroscience intensive care unit*"[tiab] OR "NSICU"[tiab] OR "Neurosurgical intensive care unit*"[tiab]) AND ("Restraint, Physical"[Mesh] OR "Physical Restraint"[tiab] OR "Physical Restraints"[tiab] OR "Physical Restriction"[tiab] OR "Safety Restraint"[tiab] OR "Safety Restraints"[tiab] OR "Medical Restraint"[tiab] OR "Medical Restraints"[tiab] OR "Mechanical Restraint"[tiab] OR "Mechanical Restraints"[tiab] OR "Therapeutic Restraint"[tiab] OR "Patient Restraint"[tiab] OR "Patient Restraints"[tiab] OR "Restraint Device"[tiab] OR "Restraint Devices"[tiab] OR "Immobilization"[Mesh] OR "Immobil*"[tiab] OR "Physical Immobil*"[tiab] OR "Extremit* Immobil*"[tiab]) AND ("Clinical Decision Making"[Mesh] OR "Clinical Decision Making"[tiab] OR "Medical Decision-Making"[tiab] OR "Clinical Judgement"[tiab] OR "Decision Making"[Mesh] OR "Decision Making"[tiab] OR "Policy Making"[tiab] OR "Decision Making, Shared"[Mesh] OR "Shared Decision Making"[tiab])	80
EMBASE	('intensive care'/exp OR 'intensive care unit'/exp OR 'critical care'/exp OR 'critical care':ti,ab,kw OR 'critical care nursing':ti,ab,kw OR 'critical care unit*':ti,ab,kw OR 'intensive care':ti,ab,kw OR 'intensive care nursing':ti,ab,kw OR 'intensive care unit*':ti,ab,kw OR 'medical intensive care unit*':ti,ab,kw OR 'micu':ti,ab,kw OR 'surgical intensive care unit*':ti,ab,kw OR 'sicu':ti,ab,kw OR 'coronary care	281

	unit*':ti,ab,kw OR 'ccu':ti,ab,kw OR 'neuroscience intensive care unit*':ti,ab,kw OR 'nsicu':ti,ab,kw OR 'neurosurgical intensive care unit*':ti,ab,kw) AND ('physical restraint'/exp OR 'immobilization'/exp OR 'physical restraint*':ti,ab,kw OR 'physical restriction':ti,ab,kw OR 'safety restraint*':ti,ab,kw OR 'medical restraint*':ti,ab,kw OR 'mechanical restraint*':ti,ab,kw OR 'therapeutic restraint*':ti,ab,kw OR 'patient restraint*':ti,ab,kw OR 'restraint device*':ti,ab,kw OR 'immobilization':ti,ab,kw OR 'immobiliz*':ti,ab,kw OR 'physical immobilization':ti,ab,kw OR 'extremity immobilization':ti,ab,kw) AND ('clinical decision making'/exp OR 'decision making'/exp OR 'shared decision making'/exp OR 'clinical decision making':ti,ab,kw OR 'medical decision making':ti,ab,kw OR 'clinical judgement':ti,ab,kw OR 'decision making':ti,ab,kw OR 'policy making':ti,ab,kw OR 'shared decision making':ti,ab,kw)	
Cochrane Library	(([mh "Critical Care"] OR [mh "Intensive Care Units"] OR "critical care":ti,ab,kw OR "intensive care":ti,ab,kw OR "intensive care unit*":ti,ab,kw OR "MICU":ti,ab,kw OR "SICU":ti,ab,kw OR "CCU":ti,ab,kw) AND ([mh "Restraint, Physical"] OR [mh "Immobilization"] OR "physical restraint*":ti,ab,kw OR "physical restriction":ti,ab,kw OR "safety restraint*":ti,ab,kw OR "medical restraint*":ti,ab,kw OR "mechanical restraint*":ti,ab,kw OR "patient restraint*":ti,ab,kw OR "restraint device*":ti,ab,kw OR "immobiliz*":ti,ab,kw) AND ([mh "Clinical Decision Making"] OR [mh "Decision Making"] OR [mh "Decision Making, Shared"] OR "clinical decision making":ti,ab,kw OR "medical decision making":ti,ab,kw OR "clinical judgement":ti,ab,kw OR "shared decision making":ti,ab,kw))	20
CINAHL	(((MH "Critical Care") OR (MH "Intensive Care Units+") OR (MH "Critical Care Nursing") OR "critical care" OR "critical care nursing"	26

	OR "intensive care" OR "intensive care unit*" OR "MICU" OR "SICU" OR "CCU" OR "NSICU")) AND ((MH "Physical Restraint") OR (MH "Immobilization") OR "physical restraint*" OR "physical restriction" OR "safety restraint*" OR "medical restraint*" OR "mechanical restraint*" OR "patient restraint*" OR "restraint device*" OR "immobiliz*")) AND ((MH "Decision Making, Clinical") OR (MH "Decision Making+") OR (MH "Professional Judgment") OR "clinical decision making" OR "medical decision making" OR "clinical judgement" OR "shared decision making")))	
Web of Science	TS=("critical care" OR "critical care nursing" OR "critical care unit*" OR "intensive care" OR "intensive care nursing" OR "intensive care unit*" OR "medical intensive care unit*" OR "MICU" OR "surgical intensive care unit*" OR "SICU" OR "coronary care unit*" OR "CCU" OR "neuroscience intensive care unit*" OR "NSICU" OR "neurosurgical intensive care unit*") AND TS=("physical restraint*" OR "physical restriction" OR "safety restraint*" OR "medical restraint*" OR "mechanical restraint*" OR "therapeutic restraint*" OR "patient restraint*" OR "restraint device*" OR "immobilization" OR "immobiliz*" OR "physical immobilization" OR "extremity immobilization") AND TS=("clinical decision making" OR "medical decision making" OR "clinical judgement" OR "decision making" OR "policy making" OR "shared decision making")	42

Supplementary S2. Summary of Included Studies (*N*=24)

No	Authors (year)	Country	Purpose	Study design	Population (Sample size)	Major findings
A1	Canzan et al. (2021)	Italy	To explore nurses' experiences of using PRs in the intensive care setting.	Qualitative	ICU nurses (n=20)	• ICU nurses were the primary decision-makers regarding the use of PRs. • Nurses need to balance the ethical principle of beneficence, ensuring patient safety, with respect for patient autonomy. • Effective communication was essential to help prevent the use of PRs and to support patient understanding when their use became necessary.
A2	Chen et al. (2022)	China	To evaluate the effectiveness of the Restraint Decision Tree on restraint rate, accidental catheter removal rate and nurses' satisfaction in the ICU.	Mixed-methods	Patients admitted to the ICU (IG n=564, CG n=528), and ICU nurses (n=20)	• Rate of restrained patients: 38.1% → 20.9% (p<.01) • Restrained patient days: 30.5% → 18.3% (p<.01) • No significant difference was found in accidental catheter removal (p=.258) or accidental catheter removal with reinsertion (p=.346). • Nurses' satisfaction: 22.20(±2.70) → 36.10(±2.70)
A3	Cui et al. (2021)	China	To explore clinicians' experiences and drivers of PR decision-making in the ICU.	Qualitative	Nurses and intensivists in ICU (n=14)	• Restraint decisions were driven by fear of unplanned-extubation related disputes in a punitive policy climate, amplified by family pressure and resource constraints.

A4	Ertuğrul B, Özden D (2021)	Turkey	To describe ICU nurses' restraint decision-making and use of alternatives, and identify factors constraining these practices.	Mixed-methods	ICU nurses (n=202)	• PR was necessary for patients at risk of self-harm, with dangerous behaviours, and who were trying to remove their catheters. • Restraint decisions and alternative use were constrained by patients' disorientation, nurses' workload, and limited training. • The main alternatives were categorized as sedation, communication, and environmental regulation. • Training (p=.009), working unit (p=.001), and nurses' practice score to use PR (p=.004) were independent risk factors for not using alternative methods of PR.
A5	Freeman et al. (2016)	United Kingdom	To assess ICU nurses' experiences, attitudes, and opinions regarding the application of PRs.	Observational (cross-sectional design)	ICU nurses (n=75)	• Most participants recognized a necessary role for PRs, primarily for ensuring patient safety. • Nurses were willing to discuss PR use with families. • A need for additional training and institutional support for nursing staff was noted.
A6	Gómez Tovar, Henao Castano (2024)	Colombia	To determine the effectiveness of the DyDel nursing intervention versus usual care in reducing the incidence and duration of delirium in adult ICU patients.	Experimental (Randomized controlled trial)	Patients admitted to the ICU (n=213)	• Delirium-focused, family-involved nursing care offers a restraint-sparing decision strategy by meeting patient safety and behavioral needs without PRs. • Incidence of delirium was lower in the intervention group (5.6% vs 14.8%) (p=.037). • Days with delirium was lower in the intervention group (0.07±0.31 vs 0.34±1.28)

						(*p*=.016). • Pain intensity significantly decreased in the intervention group (*p*=.002).
A7	Hall et al. (2018)	United States	To evaluate the impact of a restraint management bundle on restraint use and related quality/safety outcomes among ICU patients.	Quasi-experimental (pretest–posttest design)	Patients admitted to the ICU (n=2,701)	• The proportion of patients restrained decreased (24.3% vs 20.9%) (*p*=.030). • The number of restrained patients per patient-day decreased (0.075 vs 0.059) (*p*=.020). • The number of restraint episodes per patient-day decreased (0.191 vs 0.133) (*p*=.009).
A8	Hevener et al. (2016)	United States	To decrease the use of PRs in a medical-surgical ICU and to determine whether a decision support tool is useful in helping bedside nurses decide whether or not to restrain a patient.	Quasi-experimental (pretest–posttest design)	ICU nurses (n=32) who submitted 1,004 device dislodgment reports. (The unit of analysis was the dislodgment event.)	• The Restraint Decision Wheel (behavior–device–independence levels) standardized nurses' restraint decisions. • The use of restraints in the ICU was reduced 32%. • The restraint use ratio (0.37→0.18) was reduced without unplanned extubations or disruption of life-threatening devices (*p*=.002).
A9	Kang et al. (2024)	South Korea	To develop and evaluate a restraint decision tree for neurocritical patients to reduce PR use and adverse events.	Quasi-experimental (pretest–posttest design)	Patients admitted to the neurointensive care units (n=237, baseline 114/ post-intervention 123)	• Training nurses on the neurocritical restraint decision tree (RDT-N) reducing both the proportion of restrained patients (20.7%→16.3%) and the number of restraints per patient (2.42→1.71).

A10	Kisacik et al. (2020)	Turkey	To assess ICU nurses' knowledge, attitudes, and practices regarding physical restraint use.	Observational (cross-sectional design)	ICU nurses (n=191)	• PR knowledge scores were higher among nurses who used physical restraints daily. • The highest practice scores were observed among those who did not use physical restraints without a physician's order.
A11	Langley et al. (2011)	South Africa	To describe PR use in ICUs and explore clinicians' experiences and views regarding restraint use.	Mixed-methods	ICU patients (n=219) and ICU clinicians (n=20)	• The average number of days restrained was nine. • In only 6 cases were restraints other than wrist ties used. Forty seven of the restrained patients had sedation and analgesic medication prescribed and 59 not. • All participants conceded a place for physical restraint in the ICU, primarily to ensure the safety of patients but were divided as to the reason for restraining patients and disputed the benefits of restraint.
A12	Luk et al. (2015)	Canada	To describe ICU nurses' decision-making and practices regarding PR application and discontinuation, and the alternative measures attempted before restraint use in critically ill adults.	Observational (prospective cohort design)	ICU patients (n=141)	• Nurses' restraint decisions were mainly triggered by patient agitation/line-pulling and were sometimes precautionary, with alternatives underused.

A13	Perez et al. (2021)	Australia	To explore ICU nurses' experiences of using PRs on mechanically ventilated patients in intensive care	Qualitative	ICU nurses (n=12)	• ICU restraint decisions were shaped by unit culture and informal norms, reflecting limited training/protocol support rather than structured clinical reasoning.
A14	Salehi et al. (2020)	Iran	To explore factors behind ethical dilemmas for critical care nurses over using PR for patients	Qualitative	ICU nurses (n=17)	• ICU nurses' restraint decisions were a safety–autonomy trade-off intensified by unclear orders/guidelines and legal liability, producing ongoing uncertainty and moral distress.
A15	Salehi et al. (2021)	Iran	To explore nurses' experiences of the challenges of physical restraint use in intensive care units.	Qualitative	ICU nurses (n=20)	• Restraint decisions were nurse-led amid limited training, unclear guidelines, and lack of feasible alternatives, creating ethical tension and distress.
A16	Sharifi et al. (2020)	Iran	To evaluate Iranian nurses' perceptions about physical restraint use for hospitalized elderly people.	Observational (cross-sectional design)	Nurses from ICUs and medical and surgical wards (n=270)	• Nurses viewed restraints as necessary to prevent falls and tube/catheter removal, highlighting needs for PR education and clear local protocols to expand alternatives.
A17	Shen et al. (2021)	China	To explore and describe ICU nurses' behaviours towards physical restraint use and identify key characteristics of these experiences.	Qualitative	ICU nurses (n=24)	• Nurses used restraints as a last resort in a safety-driven decision process, emphasizing shared decisions with physicians and families.

A18	Vance (2003)	United States	To evaluate whether a decision-making algorithm helps ICU nurses make clinically appropriate restraint decisions, reducing inappropriate restraint use and treatment-interference incidents.	Quasi-experimental (pretest–posttest design)	Patients admitted to the ICU (n=90) and ICU nurses (n=11)	• A stepwise decision algorithm (TIP) standardized ICU nurses' restraint-versus-alternative decisions by defining when restraint is clinically justified.
A19	Via-Clavero et al. (2019)	Spain	To explore the salient behavioural, normative, and control beliefs underlying critical care nurses' intention to use physical restraints (theory of planned behaviour).	Qualitative	ICU nurses (n=26)	• Restraint decisions were safety-driven but largely shaped by contextual constraints (workload, lack of alternatives, sedation practices) and perceived physician/family approval.
A20	Vidal et al. (2025)	France	To evaluate whether a web-based decision support tool can safely and effectively reduce physical restraint use in adult ICU patients compared with usual routine decision-making	Study protocol	ICU adult patients (planned n=4,000)	• A 5-item algorithm (delirium, RASS, recent sedative/analgesic change, family involvement, and tube/line dislodgement risk) provides a structured pathway for ICU restraint decisions.

A21	Doğu et al. (2026)	Turkey	To compare the effectiveness of the Restraint Decision Tree (RDT) and Restraint Decision Wheel (RDW) in supporting PR decisions in the ICU.	Observational	ICU patients (n=105)	• The RDW classified fewer patients as requiring restraint than the RDT, particularly in the evening assessment (4.8% vs. 13.3%). • Consciousness level and previous PR use significantly influenced decisions, and both tools supported structured decision-making.
A22	Ali et al. (2026)	Saudi Arabia	To explore ICU nurses' attitudes, decision-making processes, and ethical dilemmas regarding PR use in critically ill older patients.	Qualitative	ICU nurses (n=15)	• Nurses experienced safety–autonomy conflicts, clinical uncertainty, and moral distress when making PR decisions. • Decisions were influenced by family expectations, staffing and policy constraints, and cultural values.
A23	Xu et al. (2026)	China	To explore the barriers faced by ICU nurses in implementing restraint-minimization practices.	Qualitative	ICU healthcare professionals: managers (n=4), physicians (n=2), and nurses (n=10) (Total n=16)	• Barriers included knowledge and assessment gaps, staffing shortages, poor collaboration, negative experiences, and insufficient organizational support. • Standardized assessment processes, training, and teamwork were needed to support restraint minimization.
A24	Sarmadi et al. (2026)	Iran	To explore ICU nurses' experiences of moral distress related to decisions about PR use.	Qualitative	ICU nurses (n=20)	• PR decisions triggered severe moral distress, emotional exhaustion, guilt, and compromised care quality due to safety–dignity tensions.

		• Decision-making was constrained by staff shortages, heavy workload, and unilateral physician orders. • Nurses highlighted needs for interprofessional decision-making, clear clinical guidelines, and education on restraint alternatives.

ICU: Intensive care unit; PR: Physical restraint

Supplementary S3. Mapping of Original ODSF Constructs to Operational Categories Used in This Review (*N*=24)

ODSF domain	Original ODSF constructs	Operational category used in this review	Examples of extracted data
Decisional needs	Personal and clinical needs	Personal and clinical needs	Agitation or delirium, falls, unplanned extubation or device removal, invasive devices, and changes in clinical or behavioral conditions
	Inadequate knowledge; Decisional conflict	Knowledge and decision uncertainty	Insufficient education or training, limited knowledge of restraint guidelines or policies, and inadequate knowledge of alternatives
			Uncertainty, hesitation, or conflict regarding whether restraint was appropriate, particularly when balancing safety against potential harms or patient autonomy
	Unclear values; Decisional conflict	Competing values	Tensions between patient safety and autonomy, dignity, comfort, or freedom; ethical conflicts and moral distress associated with restraint decisions
	Inadequate support and resources	Support and resource constraints	Staffing shortages, workload, limited alternatives, inadequate guidance, and insufficient organizational or interprofessional support constrained decision-making
	Difficult decision type and timing	Decision type and timing	Decisions regarding restraint initiation, continuation, modification, reassessment, and discontinuation in response to changing patient conditions
Decision	Assess decisional needs	Clinical assessment and	Assessment of behavioral and clinical status, consciousness or

ODSF domain	Original ODSF constructs	Operational category used in this review	Examples of extracted data
support		reassessment	delirium, device-related risk, and continued need for restraint
	Establish rapport and facilitate interactive communication; Clarify the decision and invite participation	Communication and participation	Explanation, reassurance, reorientation, and communication with patients and families when feasible
	Address decisional needs with tailored support	Alternatives and individualized support	Symptom or discomfort management, environmental modification, family presence, observation, mobilization, and less restrictive approaches
	Decision support interventions	Structured clinical decision support	Decision algorithms or trees, Decision Wheel, and restraint-management bundle used to structure assessment and restraint-related decisions
Decision outcomes	Quality of the decision; Appropriate use and costs of health services	Appropriateness of restraint decisions	Inappropriate restraint use and correctness of restraint decisions
	Implementation/continuance of chosen option	Changes in restraint practice	Proportion of restrained patients, restrained patient-days, restraint episodes, number of restraints, and restraint duration
	Impact of decisions and their implementation	Safety and clinical outcomes	Falls, accidental or unplanned device removal, self-extubation, treatment-interference events, and ICU length of stay
	Quality of the decision-making process (related indicators)	Acceptability of decision support	Satisfaction, usefulness, clarity, accessibility, and practical applicability of decision-support approaches

ODSF: Ottawa Decision Support Framework