Supplemental material 1 Summary of included articles

No	Author (first), year	Setting, country	Aim	Participants	Methods	Findings (Themes)
1	Aghabarary, 2016	Critical care units, Iran	Exploring Iranian nurses' perceptions of futile care	20 nurses	A qualitative exploratory study, the conventional content analysis approach	The nonfutility of care: care tantamount with outcome • Care as a purposeful and inevitable process • The necessity for differentiating between medical futility and futile care Sense of burnout • Ineffective interventions and tragic end • Burnout-induced malpractice Subjectivity and relativity of the concept of medical futility • Differences in patients, families, and health care professionals' values and preferences • Vagueness of boundaries
2	Aghabarary, 2017	Critical care units, Iran	Exploring Iranian nurses' and physicians' perceptions of the reasons behind providing futile medical treatments	21 nurses, 9 physicians	A qualitative exploratory design using in-depth, semi-structured interviews and conventional content analysis	Having an obligation to provide medical treatments despite knowing their futility • Patients' and family members' request for continuing life-sustaining treatments ▪ Religious and cultural beliefs ▪ Preventing prospective pangs of conscience ▪ Patients' and family members' unrealistic expectations from medical technology ▪ Patients' and family members' fear over loneliness and being neglected ▪ Fulfilling patients' and family members' emotional needs • Healthcare professionals' personal motives ▪ Adherence to religious beliefs ▪ Commitment to legal, ethical, and professional responsibilities ▪ Healthcare professionals' uncertainty over terminality ▪ Fears and worries ▪ Emotions and feeling of empathy with patients' family members ▪ Providing opportunities for medical advancements ▪ Taking personal and professional profits • Organizational atmosphere and structure ▪ Lack of legal permission for discontinuing treatments Structural and functional defects of ethics committees ▪ Lack of proportionate palliative care centers, hospices, and home care facilities
3	Badger, 2005	Medical intensive care unit, United States	Describing MICU nurses' coping behaviors while caring for a patient whose medical treatment transitioned from cure- to comfort-oriented care	24 nurses	A descriptive qualitative research design	Coping strategies • Cognitive techniques ▪ Putting up with it: visualizing, learning from experience, reminiscing, and putting things into perspective • Affective techniques ▪ Laughter, externalizing feelings, and emotionally compartmentalizing • Behavioural techniques ▪ Retreating, avoiding, and distancing behaviours

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4	Bruce, 2015	Intensive care units, United States	Determining the key sources of moral distress in diverse critical care professionals and how they manage it in the context of team-based models	16 nurses, 7 physicians and 7 Ancillary Staff	Case study using structured interview	Sources of Moral Distress: Intrateam discordance (Nonbeneficial treatment; Lack of full disclosure); Clinician-patient/family discordance; Intrafamily discordance Maladaptive behaviors: Pas-de-deux; Fighting; Desensitization Constructive behaviors: Venting; Mentoring; Building team cohesion
5	Choi, 2022	Intensive care unit, South Korea	Exploring nurse's, physician's and family member's experiences of withholding or withdrawing life-sustaining treatment in an intensive care unit	23 nurses, 10 physicians and four family members	Focused ethnography using semi-structured interview and thematic analysis	Constructing death: Family member's power (Family value; Legal requirement; Key family member; Financial issues; Continuation of Life-sustaining treatment; The value of family presence) Medical consideration (Treatment futility; Compromised decisions) Patient's dignity (Visualising patient's suffering; Desiring a comfortable death; Patient's consciousness; Patient's wishes) Customer ideology (Customer-service provider relationship)
6	Close, 2019	Three tertiary hospitals in metropolitan Brisbane, Australia	Increasing knowledge of how doctors perceive futile treatments and scarcity of resources at the end of life. In particular, their perceptions about whether and how resource limitations influence end-of-life decision making.	11 medical specialties	Qualitative study using in-depth, semistructured, face-to-face interviews	Perceptions of the relevance of resources to doctors' current practice • Resources are not relevant to decisions to withhold or withdraw life-sustaining treatment • Resources are relevant to decisions to withhold or withdraw life-sustaining treatment • Resources are relevant but are a secondary consideration • Situations when resources are the main driver of decisions Perceptions of the relationship between resources and the concept of 'futility' • Resource considerations are part of the definition of futility • 'Futility' is used to conceal rationing Resource-related distress and recommendations to address it • The waste and opportunity cost of futile treatment causes distress • Distress related to being forced into a gatekeeping role without appropriate supports • 'Scepticism that the government will engage in rationing end-of-life care

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7	Espinosa, 2010	Intensive care units, United States	Exploring the experiences of intensive care nurses who provide terminal care in the ICU	18 registered nurses	A descriptive phenomenological approach	Barriers to optimal care	Lack of involvement in the plan of care
							Differences between the medical and nursing practice models
							Disagreement among physicians and other healthcare team members
							Perception of futile care and unnecessary suffering
							Unrealistic expectations of the family
							Lack of experience and education of the nurse
						Internal conflict	Feelings of relief
							Desire for patient comfort and good memories for family
							Abandonment and powerless
							Medication administration
							Difficulty with younger patients
						Coping	Building trust with the family
							Crying
							Humor
							Talking to others about terminal care
							Avoiding care for the terminal patients
8	Heland, 2006	An adult intensive care unit, Australia	Investigating the perceptions and experiences of nurses practising in adult intensive care units with regard to medical futility	Seven intensive care nurses.	A qualitative exploratory descriptive design	• Intensive care nurses' definition of medical futility • Medical futility and challenges for nurses/engagement in decision making • Medical futility and the intensive care nursing role	
9	Hsu, 2018	An intensive care unit, Taiwan	Understanding the medical futility experiences of ICU nurses.	Eight intensive care nurses	A phenomenological perspective	• Definitions of Medical Futility and Types of Patients • Considerations of Medical Futility • The Occurrence of Medical Futility • Nurses' Responses to Medical Futility	
10	Nikbakht Nasrabadi, 2021	An intensive care unit, Iran	Exploring the nurses' experience of moral distress in the long-term care of older adults	Nine critical care nurses	A phenomenological method by Van Manen	Advocating	Good dying
							Symptom management
						Defense mechanisms	Coping
							Spirituality
						Care burden	Futile care
							Emotional work
							Powerlessness
						Relationship	Relationship between patient and family
							Relationship with healthcare team
							Relationship with institution
						Organizational issues	Inadequate staffing
							Inadequate training, preparation, education, or mentoring
							Workload and Support

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11	Pattison, 2013	A specialist hospital, United Kingdom	Exploring the meaning of the issues around end-of-life care, of dying, and those caring for, and witnessing the dying of critically ill cancer patients, as explored through family, practitioner and patient experiences	Seven critical care consultants, seven critical care nurses, two oncologists, two palliative care consults, seven patients, six patient's spouses, six bereaved families	Heideggerian phenomenology using van Manen and Attride-Stirling's thematic network analysis	Essence: Continuum of moving to EOL in cancer critical illness • Global Order themes ▪ Dual prognostication ▪ The meaning of decision-making ▪ Care practices at end of life: choreographing a good death • Organising themes ▪ Family vs patients" split loyalties ▪ A good death ▪ Involvement in care ▪ Personal dissonance ▪ Reaching the defining futility ▪ Thinking the unthinkable ▪ Domains of knowledge ▪ Story of cancer and critical care ▪ Emotions of EOL work
12	Vieira, 2022	An adult intensive care unit, Portugal	Identifying the perceptions of expert nurses from adult intensive care units about therapeutic futility in nursing.	Five nurses	Focus group interview and conventional content analysis	Situation of declared futility in nursing • Biophysiological indicators incompatible with life • Intensive care culture of life extension • Surgical situations of high irreversibility, uncontrollable, associated with severe comorbidities • Contexts in which, according to scientific evidence, the results are unattainable and do not justify the implementation of interventions Futile nursing interventions • Interdependent nursing interventions • Autonomous nursing interventions • Interventions implemented exclusively by norms or protocols, routines, scores • Interventions associated with exclusively diagnostic complementary exams Recognition of therapeutic futility in nursing • By the nursing team • By the family Scope of therapeutic futility in nursing • Ridicule of care • Transposing the limits of interventions and care • No benefit • Therapeutic incarceration

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13	Voultsos, 2021	University nursing school, Greece	Investigating the medical futility experiences of nurses with a long history of caring for severely ill or terminally ill patients.	16 nurses (at least 10 year experiences of caring severely and critically ill patients)	A prospective qualitative study	• The concept of "futile medical care" • Patient reliance on machines – technological dependency • Reasons behind providing futile medical care • Consumption of considerable resources • Who is the decider? The nursing professionals' role in deciding on the futility of a certain treatment • Provision of information to family members • Participants' personal responses to situations where futile care is provided • The concept of a "good or dignified death"
14	Willmott, 2016	Three tertiary public hospitals, Australia	Exploring in detail doctors' perceptions of the key reasons why futile treatment is provided	96 physicians (15 emergency, 12 intensive care, 10 palliative care, 10 oncology, 9 renal medicine, 9 internal medicine, 9 respiratory medicine, 8 surgery, 5 cardiology, 5 geriatric medicine and 4 medical administrators)	A qualitative study using semi-structured interview	Doctor-related factors: Trained to treat; Inexperience with death and dying; Don't want to give up hope; Aversion to death; Worries about legal risk; Poor communication; Doing everything possible; Emotional attachment to patients; Personality, personal experiences or religion Patient-related factors: Family or patient request; Prognostic uncertainty; Lack of information about patient wishes Hospital-related factors: Specialisation; Medical hierarchy; Hospitals designed to provide acute care so it does; Hard to stop once started; Time pressure; After-hours care
15	Workman, 2003	Six university-affiliated intensive care units, Canada	Developing an empiric description of intensive care unit (ICU) physicians' and nurses' (participants) experiences providing life-sustaining treatments at the insistence of family members, treatments that they believed should have been withheld or withdrawn.	Six nurses and six physicians	A qualitative study using semi-structured, open-ended interview	• The suffering of dying patients • Distressed family members • A breakdown in the relationship with family members

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16	Yekefallah, 2015	11 teaching hospitals, Iran	Defining the concept of futile care in the viewpoints of nurses working in intensive care units (ICUs)	25 nurses	A phenomenological study by Van Manen	Uselessness	Aimlessness of care	
							Ineffective care	
							Certainty in lack of recovery	
						Waste of resources	Waste of time	
							Waste of money	
						Torment	Patients' suffering	
							Nurses' suffering	
						Aspects of futility	Measures taken by the medical team	Futile admission
								Futile diagnostic procedures
								Futile medical orders
							Measures taken by the nursing team	Futile nursing interventions
								Irrelevant duties for nurses