**Supplemental material 1 Summary of included articles**

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<th>No</th>
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<th>Findings (Themes)</th>
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<tbody>
<tr>
<td>1</td>
<td>Aghabarary, 2016</td>
<td>Critical care units, Iran</td>
<td>Exploring Iranian nurses’ perceptions of futile care</td>
<td>20 nurses</td>
<td>A qualitative exploratory study, the conventional content analysis approach</td>
<td>The nonfutility of care: care tantamount with outcome</td>
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<td>• Care as a purposeful and inevitable process</td>
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<td>• The necessity for differentiating between medical futility and futile care</td>
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<td><strong>Sense of burnout</strong></td>
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<td>• Ineffective interventions and tragic end</td>
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<td>• Burnout-induced malpractice</td>
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<td><strong>Subjectivity and relativity of the concept of medical futility</strong></td>
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<td>• Differences in patients, families, and health care professionals’ values and preferences</td>
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<td>• Vagueness of boundaries</td>
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<td>2</td>
<td>Aghabarary, 2017</td>
<td>Critical care units, Iran</td>
<td>Exploring Iranian nurses’ and physicians’ perceptions of the reasons behind providing futile medical treatments</td>
<td>21 nurses, 9 physicians</td>
<td>A qualitative exploratory design using in-depth, semi-structured interviews and conventional content analysis</td>
<td>Having an obligation to provide medical treatments despite knowing their futility</td>
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<td>▪ Preventing prospective pangs of conscience</td>
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<td>▪ Patients’ and family members’ unrealistic expectations from medical technology</td>
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<td>• Patients’ and family members’ fear over loneliness and being neglected</td>
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<td>▪ Fulfilling patients’ and family members’ emotional needs</td>
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<td>▪ Commitment to legal, ethical, and professional responsibilities</td>
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<td>▪ Healthcare professionals’ uncertainty over terminality</td>
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<td>▪ Emotions and feeling of empathy with patients’ family members</td>
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<td>▪ Lack of legal permission for discontinuing treatments</td>
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<td>▪ Structural and functional defects of ethics committees</td>
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<td>▪ Lack of proportionate palliative care centers, hospices, and home care facilities</td>
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<td>3</td>
<td>Badger, 2005</td>
<td>Medical intensive care unit, United States</td>
<td>Describing MICU nurses’ coping behaviors while caring for a patient whose medical treatment transitioned from cure- to comfort-oriented care</td>
<td>24 nurses</td>
<td>A descriptive qualitative research design</td>
<td><strong>Coping strategies</strong></td>
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<td>▪ Putting up with it: visualizing, learning from experience, reminiscing, and putting things into perspective</td>
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<td>▪ Laughter, externalizing feelings, and emotionally compartmentalizing</td>
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<td>▪ Retreating, avoiding, and distancing behaviours</td>
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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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</table>
| 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 powerlessness  
- 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 consultants, 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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<td>16</td>
<td>Yekefallah, 2015</td>
<td>11 teaching hospitals, Iran</td>
<td>Defining the concept of futile care in the viewpoints of nurses working in intensive care units (ICUs)</td>
<td>25 nurses</td>
<td>A phenomenological study by Van Manen</td>
<td>Uselessness</td>
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