

# Clinical and Ethical Approaches to Medical Futility in End-of-Life Care: A Scoping Review

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## Abstract

Medical futility (MF) remains a complex and debated concept in clinical practice, particularly among patients with terminal illness or limited life expectancy, largely due to inconsistencies in its definition and variability in its application, which complicate clinical decision-making. A scoping review was conducted following the methodologies proposed by Arksey, Levac, the Joanna Briggs Institute, and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines to analyze evidence on therapeutic futility in terminally ill adults and the clinical, ethical, and prognostic criteria influencing end-of-life decision-making. A total of 36 published studies were included. Regarding study design, retrospective observational studies predominated (12/36, 33.3%), followed by qualitative studies (9/36, 25.0%), cross-sectional studies (6/36, 16.7%), and, to a lesser extent, prospective or cohort studies (3/36, 8.3%), mixed-methods or case-control studies (2/36, 5.6%), and one case report (1/36, 2.8%). Most studies focused on patients (21/36, 58.3%), primarily in critical care settings or among individuals with advanced disease. A considerable proportion exclusively evaluated healthcare professionals (10/36, 27.8%). Regarding the clinical context, ICUs represented the predominant clinical setting, including general, oncological, surgical, neurological, and medical intensive care units. Other settings included non-critical hospital environments (5/36, 13.9%), oncology-specific settings (3/36, 8.3%), prehospital or emergency care settings (2/36, 5.6%), and additional areas, such as psychiatry, bioethics, or palliative care (3/36, 8.3%). The most frequently identified criterion for MF was the use of treatments without expected clinical benefit (10/36, 27.8%). Ethical and clinical dimensions were addressed across all included studies, with a predominance of multidimensional approaches integrating principles, such as autonomy, beneficence, and justice. Small sample sizes and single-center designs predominated, particularly among qualitative and retrospective studies. MF is a complex and multidimensional concept influenced by clinical, ethical, and sociocultural factors. The heterogeneity in its definition and application complicates the standardization of decision-making, particularly in settings such as ICUs.

**Categories:** Other, Palliative Care, Internal Medicine

**Keywords:** clinical prognosis, end-of-life care, ethical decision-making, medical futility, therapeutic proportionality

## Introduction And Background

Medical futility (MF) is generally defined as a medical intervention that fails to provide meaningful benefit to the patient because it does not achieve its intended clinical objective or improve quality of life [1,2]. However, the absence of a universally accepted definition has led to substantial variability in its interpretation and application in clinical practice [2,3]. Decision-making regarding potentially futile treatments remains one of the most challenging aspects of modern medicine [2]. In high-complexity settings, such as intensive care units (ICUs), oncology, and palliative care, these decisions frequently generate ethical tensions, interprofessional conflicts, and challenges within the physician-patient-family relationship [1-3]. Furthermore, perceptions and management of MF are strongly influenced by contextual, cultural, religious, legal, and subjective factors, contributing to considerable heterogeneity in clinical practice [3,4].

The evaluation of MF requires a comprehensive and multidisciplinary approach that integrates scientific evidence with patients' values, family preferences, and religious or cultural beliefs [3,5]. Decisions regarding treatment limitation, including do-not-resuscitate (DNR) orders and the withdrawal of life-sustaining therapies, are frequently made late in the course of illness and often occur with limited involvement of patients and their families [5,6]. Variability in decisions to withhold, withdraw, or redirect treatment may also be associated with unrealistic expectations regarding prognosis and therapeutic outcomes [5,6]. Consequently, shared decision-making models have emerged as a fundamental strategy for improving end-of-life care and reducing the use of non-beneficial interventions [6,7].

Despite increasing interest in MF, important gaps persist in the literature regarding the integration of

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clinical, ethical, and sociocultural dimensions into healthcare decision-making, particularly in real-world clinical settings [8,9]. Most available studies focus on specific populations or contexts and employ heterogeneous methodologies and definitions of futility, limiting the comparability and generalizability of findings [7-9]. This scoping review aims to identify patterns, barriers, and facilitators related to the assessment and management of MF in clinical practice, thereby contributing to the development of strategies that support more ethical, consistent, and patient- and family-centered decision-making.

Review

Methods

This scoping review was conducted to evaluate therapeutic proportionality and the futility of medical interventions in adult patients with terminal illness or limited life expectancy. The review followed the methodological framework proposed by Arksey et al. [10], subsequently refined by Levac et al. [11], in addition to the recommendations of the Joanna Briggs Institute for scoping reviews [12]. Reporting was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines [13].

Formulation of the Research Question

The research question was structured using the PICO (Population, Intervention, Comparison, and Outcome) framework. The population included adult patients (≥ 18 years) with terminal illness, irreversible conditions, or limited life expectancy. The intervention corresponded to the evaluation of potentially futile medical interventions, limitation of therapeutic effort, or therapeutic adequacy. The comparison included the absence of therapeutic limitation or conventional management. Finally, the outcomes focused on the clinical, ethical, and prognostic criteria used to define futility or therapeutic proportionality, as well as their impact on clinical decision-making at the end of life. Based on these elements, the guiding question was the following: What clinical, ethical, and prognostic criteria are used to evaluate the proportionality or futility of medical interventions in adult patients with terminal illness or limited life expectancy, and how do they influence healthcare decision-making?

Literature Search Strategy

The search strategy was designed to identify relevant studies in international biomedical databases, including PubMed/MEDLINE, Scopus, and Embase. Controlled vocabulary terms (MeSH and Emtree) and keywords related to "medical futility", "therapeutic proportionality", "limitation of therapeutic effort", "end-of-life care", "intensive care unit", and "decision-making" were used (Table 1).

Table with 1 column and 4 rows containing search strategies for PubMed/MEDLINE, Scopus, and Embase.

TABLE 1: Search strategies

Eligibility Criteria

Studies conducted in adult populations (≥ 18 years) with terminal illness, irreversible conditions, or limited life expectancy were included if they evaluated therapeutic futility, therapeutic proportionality, or the limitation/adequacy of therapeutic effort. Observational studies, clinical trials, qualitative research, systematic reviews, and bioethical analyses with a clinical basis were considered, provided that they were published in English or Spanish. Studies in pediatric populations, exclusively veterinary research, opinion

articles without clinical support, editorials without structured analysis, protocols without results, and publications without full-text access were excluded.

#### *Study Selection*

Study selection was carried out in two phases. In the first phase, two independent reviewers screened titles and abstracts to identify potentially eligible studies using the Rayyan platform [14]. In the second phase, a full-text review of selected articles was performed to confirm final inclusion. Discrepancies between reviewers were resolved through discussion and consensus. The selection process was documented following the PRISMA flow diagram [13].

#### *Data Extraction*

Data extraction was performed using a previously designed standardized matrix to ensure consistency and comparability among included studies. Information collected from each article included author, year of publication, and country of origin; study design; characteristics of the clinical population and sample size; healthcare setting; criteria used to define futility or therapeutic proportionality; ethical or clinical dimensions addressed; main results; and limitations reported by the authors. This process allowed for systematic organization of the evidence and facilitated subsequent comparative analysis.

#### *Synthesis and Analysis of Evidence*

Given the heterogeneity of the included studies in terms of methodological design, populations, clinical settings, and definitions of futility, a narrative descriptive synthesis was conducted [15]. Studies were grouped according to the type of criteria evaluated (clinical, ethical, or prognostic), healthcare setting (such as ICU, oncology, or palliative care), and type of clinical decision (treatment limitation, withdrawal of life support, or do-not-resuscitate orders). This approach enabled the identification of common patterns, variability in clinical practice, and key factors influencing end-of-life decision-making, as well as highlighting the main knowledge gaps in the existing literature.

## **Results**

A total of 36 published studies were included (Figure 1) [16–51]. Regarding geographical distribution, most studies were conducted in the United States (8/36, 22.2%) [17,22–24,26,27,36,51], followed by Australia (3/36, 8.3%) [21,28,30], France (3/36, 8.3%) [33,47,48], and South Korea (2/36, 5.6%) [18,32] (Table 2). Regarding study design, retrospective observational studies predominated (12/36, 33.3%) [18,20,23,26,28,32,34,39–41,46,50], followed by qualitative studies (9/36, 25.0%) [16,17,29–31,43,45,49,51], cross-sectional studies (6/36, 16.7%) [22,25,35,37,38,44], and, to a lesser extent, prospective or cohort studies (3/36, 8.3%) [21,27,33], mixed-methods or case-control studies (2/36, 5.6%) [36,42], and one case report (1/36, 2.8%) [24] (Table 3). Most studies focused on patients (21/36, 58.3%), primarily in critical care settings or among individuals with advanced disease [18,20,23,26,28,32–34,39–42,46,48,50]. A considerable proportion exclusively evaluated healthcare professionals (10/36, 27.8%) [17,22,25,30,31,37,38,43,44,49], while some studies incorporated mixed perspectives from patients, family members, and healthcare professionals (3/36, 8.3%) [16,36,45], and one study focused exclusively on surrogate family members (1/36, 2.8%) [51].

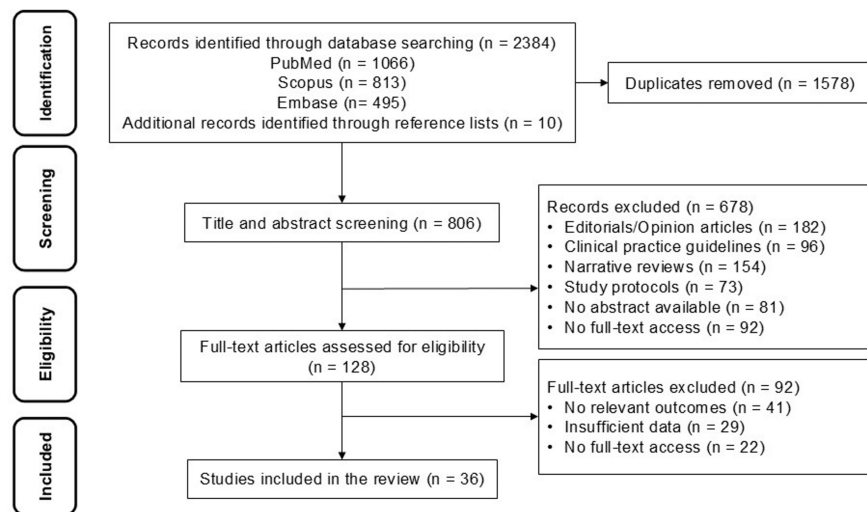


**FIGURE 1: PRISMA-sc flowchart**

PRISMA-sc: Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews

| Author/Country/Year                           | Clinical population                                                                 | Futility criterion evaluated                                  | Ethical/clinical dimension                                                       | Main result                                                    |
|-----------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------|
| Udeh et al. [16] - Nigeria - 2025             | n=40 (10 patients, 10 family members, 20 professionals); patients aged 30-59; 5M/5F | Treatments without clinical benefit                           | Autonomy, beneficence, justice                                                   | Ethical conflicts and pressure for futile treatments           |
| Piscitello et al. [17] - United States - 2025 | n=16 professionals; age/sex not reported                                            | Physiological futility                                        | Clinical ethics                                                                  | Variability in decisions                                       |
| Kim et al. [18] - South Korea - 2023          | n=227; mean age 66.2; 115M/112F                                                     | LST without benefit                                           | Legal, family                                                                    | Increased withdrawal of support after legislation              |
| Martins et al. [19] - Portugal - 2019         | n=120; elderly patients; caregivers mostly women                                    | Acceptance/rejection of futile measures                       | Autonomy, religion                                                               | Unrealistic expectations about treatments                      |
| Nieder et al. [20] - Europe - 2011-2018       | n=33; median age 70; 22M/11F                                                        | Low clinical utility                                          | Proportionality                                                                  | 36% inappropriate decisions; low survival                      |
| Carter et al. [21] - Australia - 2019         | n=831; mean age 72.3; 56% male                                                      | Non-beneficial treatment (NBT)                                | Ethical conflicts                                                                | 12.4% NBT; strong association with conflicts                   |
| Chamberlin et al. [22] - United States - 2019 | n=333 clinicians; age/sex not reported                                              | Perception of futility                                        | Burnout, moral distress                                                          | 75.7% report futile care; association with burnout             |
| Kamat et al. [23] - United States - 2012      | n=53 oncology ICU patients; >70% life support                                       | Futility and limitation of support                            | Communication, conflicts                                                         | ↑ DNR (26→72%); high mortality (~77%)                          |
| Lopez et al. [24] - United States -           | n=1 patient (female, 30 years; extreme BMI ~10-14)                                  | Therapeutic futility due to complete treatment refractoriness | Autonomy, capacity, proportionality, treatment limits                            | Transition to palliative/hospice care due to lack of options   |
| Palda et al. [25] - Canada - ~2005            | n=255 professionals (141 nurses, 114 physicians) from ~157 centers (64 complete)    | Definition based on the Canadian Medical Association          | Perception of futility, decision-making, ethical burden, institutional resources | High perceived frequency of futility (87-95% in the last year) |
| Rivera et al. [26] - United States - 2001     | n=100 patients; mean age 73.5; 57% female                                           | Treatment without benefit                                     | Motivational factors                                                             | Unrealistic expectations                                       |

|                                                               |                                                                         |                                                                                                |                                                                                      |                                                                                                |
|---------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| Curtis et al. [27] - United States - 2000                     | n=57 AIDS patients; age 39; 91% male                                    | Low probability of benefit                                                                     | Autonomy                                                                             | 61% accept limitation                                                                          |
| Bloomer et al. [28] - Australia - 2010                        | n=70; mean age 69.3                                                     | Futility (60.7%)                                                                               | End-of-life                                                                          | High NFR and communication                                                                     |
| Loneragan et al. [29] - United Kingdom - 2020                 | n=18 professionals                                                      | Dynamic futility                                                                               | Clinical decision-making                                                             | Role of time                                                                                   |
| Willmott et al. [30] - Australia - 2016                       | n=96 physicians                                                         | Treatments without benefit                                                                     | Multiple factors                                                                     | Family pressure and curative culture                                                           |
| Beck et al. [31] - Germany -                                  | n=28 ICU physicians; experience 1-34 years; mostly male                 | Decisions to limit life support (mechanical ventilation) based on prognosis and patient wishes | Ethical and legal confusion; difference between withdrawing vs withholding treatment | High confusion: many consider withdrawing ventilation illegal                                  |
| Lee et al. [32] - South Korea - 2020                          | 227 patients (80 in ICU)                                                | Withdrawal vs withholding LST                                                                  | Role of intensivist                                                                  | ↑ withdrawal with intensivists                                                                 |
| Chauchard et al. [33] - France - 2026                         | 73 ICU patients                                                         | Prognosis and quality of life                                                                  | Legality and family                                                                  | Withholding predominates, high satisfaction                                                    |
| Lee et al. [34] - Singapore - 2018                            | 53 patients                                                             | Futility vs imminent death                                                                     | Surgeon-intensivist conflict                                                         | 71.7% conservative management                                                                  |
| Druwé et al. [35] - International study (24 countries) - 2018 | 4018 CPR events reported by clinicians (physicians, nurses, paramedics) | Clinical perception of inappropriate CPR (perceived futility)                                  | Clinical judgment, uncertainty, prognostic factors                                   | 8% CPR considered inappropriate; higher futility perception in patients ≥80 years              |
| Zier et al. [36] - United States - 2009                       | 50 surrogates / 31 patients                                             | Medical prediction of futility                                                                 | Family perception                                                                    | 64% distrust; continuation even with an extremely poor prognosis                               |
| Kadooka et al. [37] - Japan - 2012                            | 401 physicians / 1134 general population                                | Clinical judgment vs social acceptance                                                         | Physician-society conflict                                                           | Laypeople more likely to treat; physicians prioritize prognosis and QOL                        |
| Pasieka et al. [38] - Poland - 2025                           | 354 clinicians                                                          | Use of futility guidelines                                                                     | Healthcare system                                                                    | High theoretical acceptance, low implementation (35.3%)                                        |
| Serenari et al. [39] - Multinational - 2025                   | 788 patients                                                            | Early recurrence/early death                                                                   | Clinical prediction                                                                  | 13.6% futile surgery; advanced tumor factors                                                   |
| Hariharan et al. [40] - Barbados - 2003                       | 662 patients (30 futility)                                              | Irreversible neurological status/non-response                                                  | Sociocultural factors                                                                | Continued treatment despite futility; ventilation never withdrawn                              |
| Jukić et al. [41] - Croatia - 2016                            | 1567 patients                                                           | GCS <8 + intensive support                                                                     | Real-world clinical practice                                                         | Persistence of support even without recovery expectation                                       |
| Cruz et al. [42] - Brazil - 2015                              | 276 patients (38 futility, 238 controls)                                | Life support in terminal patients without therapeutic options                                  | Tumor type, palliative care involvement, age, communication                          | Palliative care ↓ futility; hematologic malignancies ↑ risk                                    |
| Lo et al. [43] - Singapore - 2022                             | 32 clinicians                                                           | Treatments perceived as non-beneficial                                                         | Family, cultural, clinical, institutional factors                                    | Family as main driver; collectivist culture; variability among clinicians                      |
| Kalkan [44] - Turkey - 2018                                   | 376 physicians                                                          | CPR considered futile under specific conditions                                                | Ethical/legal beliefs, experience, DNR perception                                    | Only 47.7% would respect DNR; ethical/legal confusion; 57% see no dilemma in not resuscitating |
| Aizawa et al. [45] - Japan - 2013                             | 19 participants                                                         | Treatments prolonging life without benefit and with suffering                                  | Values, intentions, social consensus, family and medical perspectives                | Futility depends on intention, suffering, and consensus                                        |
|                                                               |                                                                         |                                                                                                |                                                                                      | 5.1% LTE; withholding                                                                          |

|                                            |                                                                                  |                                                                                              |                                                                |                                                                                                         |
|--------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Becerra-Bolaños et al. [46] - Spain - 2024 | 80 patients with LTE (of 2055)                                                   | LTE: withholding, withdrawal, brain death                                                    | Age, comorbidity, severity, admission type, life support       | predominated (83.8%); mortality 93.7%; joint decisions                                                  |
| Ferrand et al. [47] - France -             | 816 patients                                                                     | Withholding and withdrawal of life support                                                   | Age, chronic disease, prognosis, pain, quality of life, family | Withholding predominated (88%); decisions due to imminent death                                         |
| Azoulay et al. [48] - France - 2012        | 7,899 patients (256 with birthdays during stay; 223 matched with 1,042 controls) | Prolongation of life support and delay in treatment limitation decisions (DFLST)             | Clinical and ethical                                           | ICU birthday patients had longer stays, higher treatment intensity, and delayed limitation decisions    |
| Robertsen et al. [49] - Norway - 2019      | 18 physicians (neurosurgeons, intensivists, rehabilitation specialists)          | Uncertainty about initiating, continuing, or withdrawing life support in severe brain injury | Ethical and clinical                                           | Doubt is frequent; managed with "trial treatments," time for reassessment, interdisciplinary discussion |
| Huang et al. [50] - Taiwan - 2010          | 873 deceased ICU patients (of 14,698 admissions)                                 | DNR orders and treatment intensity changes                                                   | Clinical and ethical                                           | High DNR rate (>65%); associated with lower treatment intensity                                         |
| Parrish et al. [51] - United States - 2025 | 18 surrogate family members of critically ill patients                           | Potentially non-beneficial treatments in ICU                                                 | Ethical and clinical                                           | Decision-making influenced by communication barriers                                                    |

TABLE 2: Characteristics of the included studies and clinical settings

AIDS, acquired immunodeficiency syndrome; BMI, body mass index; CPR, cardiopulmonary resuscitation; DFLST, decisions to forgo life-sustaining therapy; DNR, do-not-resuscitate; GCS, Glasgow Coma Scale; ICU, intensive care unit; LST, life-sustaining treatment; LTE, limitation of therapeutic effort; NBT, non-beneficial treatment; NFR, not-for-resuscitation; QOL, quality of life

| Author/Country/Year                           | Design                      | Clinical context           |
|-----------------------------------------------|-----------------------------|----------------------------|
| Udeh et al. [16] - Nigeria - 2025             | Cross-sectional qualitative | Oncology and ICU           |
| Piscitello et al. [17] - United States - 2025 | Qualitative                 | ICU                        |
| Kim et al. [18] - South Korea - 2023          | Retrospective               | Neurosurgery               |
| Martins et al. [19] - Portugal - 2019         | Observational               | Palliative care            |
| Nieder et al. [20] - Europe - 2011-2018       | Retrospective               | Oncology                   |
| Carter et al. [21] - Australia - 2019         | Multicenter cohort          | Hospital                   |
| Chamberlin et al. [22] - United States - 2019 | Cross-sectional             | Academic hospital          |
| Kamat et al. [23] - United States - 2012      | Retrospective               | Oncology ICU               |
| Lopez et al. [24] - United States - 2010      | Case report                 | Psychiatry/palliative care |
| Palda et al. [25] - Canada - ~2005            | Cross-sectional             | ICU in hospitals >200 beds |
| Rivera et al. [26] - United States - 2001     | Retrospective               | Tertiary hospital          |
| Curtis et al. [27] - United States - 2000     | Prospective                 | Advanced HIV               |
| Bloomer et al. [28] - Australia - 2010        | Retrospective               | ICU                        |
| Lonergan et al. [29] - United Kingdom - 2020  | Qualitative                 | ICU                        |
| Willmott et al. [30] - Australia - 2016       | Qualitative                 | Hospital                   |
| Beck et al. [31] - Germany - 2008             | Qualitative (interviews)    | ICU                        |
| Lee et al. [32] - South Korea - 2020          | Retrospective               | ICU                        |
| Chauchard et al. [33] - France - 2026         | Prospective                 | ICU France                 |
| Lee et al. [34] - Singapore - 2018            | Retrospective               | Surgical ICU               |

|                                                               |                            |                                    |
|---------------------------------------------------------------|----------------------------|------------------------------------|
| Druwé et al. [35] - International study (24 countries) - 2018 | Cross-sectional            | Emergency and prehospital services |
| Zier et al. [36] - United States - 2009                       | Mixed (observational)      | ICU                                |
| Kadooka et al. [37] - Japan - 2012                            | Cross-sectional            | End-of-life decisions              |
| Pasieka et al. [38] -Poland - 2025                            | Cross-sectional            | ICU                                |
| Serenari et al. [39] - Multinational -2025                    | Retrospective              | Oncologic surgery                  |
| Hariharan et al. [40] - Barbados - 2003                       | Retrospective              | Surgical ICU                       |
| Jukić et al. [41] - Croatia - 2016                            | Retrospective              | ICU                                |
| Cruz et al. [42] - Brazil - 2015                              | Retrospective case-control | Oncology ICU                       |
| Lo et al. [43] - Singapore - 2022                             | Qualitative                | Cardiology/ICU                     |
| Kalkan [44] - Turkey - 2018                                   | Cross-sectional            | Pulmonology/ICU                    |
| Aizawa et al. [45] - Japan - 2013                             | Qualitative                | Bioethics/decision-making          |
| Becerra-Bolaños et al. [46] - Spain - 2024                    | Retrospective              | Post-surgical ICU                  |
| Ferrand et al. [47] - France - 2006                           | Cross-sectional            | Prehospital care                   |
| Azoulay et al. [48] - France - 2012                           | Prospective                | ICU                                |
| Robertsen et al. [49] - Norway - 2019                         | Qualitative                | ICU                                |
| Huang et al. [50] - Taiwan - 2010                             | Retrospective              | Surgical ICU                       |
| Parrish et al. [51] - United States - 2025                    | Qualitative                | Medical ICU                        |

TABLE 3: Ethical and clinical dimensions and main findings of the studies on medical futility
ICU, intensive care unit; HIV, human immunodeficiency virus

Regarding the clinical context, ICUs represented the predominant clinical setting [16-18,23,25,28,29,31-35,38,40-44,46,48-51], including general, oncological, surgical, neurological, and medical ICUs. Other settings included non-critical hospital environments (5/36, 13.9%) [21,22,26,30,37], oncology-specific settings (3/36, 8.3%) [19,20,39], prehospital or emergency care settings (2/36, 5.6%) [35,47], and additional areas, such as psychiatry, bioethics, or palliative care (3/36, 8.3%) [24,27,45] (Table 3). The most frequently identified criterion for MF was the use of treatments without expected clinical benefit (10/36, 27.8%) [16,20,21,23,26,30,41-43,46], followed by futility based on poor physiological prognosis or low probability of survival (8/36, 22.2%) [17,18,34,35,40,41,48,50]. Other approaches included limitation of life-sustaining treatment through withholding or withdrawal decisions (6/36, 16.7%) [18,32,33,46-48], clinicians' subjective perceptions of futility (6/36, 16.7%) [22,25,35,36,37,44], and specific criteria related to cardiopulmonary resuscitation, surgical interventions, or legal frameworks (3/36, 8.3%) [35,39,44].

Ethical and clinical dimensions were addressed across all included studies, with a predominance of multidimensional approaches integrating principles such as autonomy, beneficence, and justice [16,24,27,45] (Table 2). Ethical conflicts and decision-making challenges were frequently reported (8/36, 22.2%) [16,21,23,29,31,34,43,51], as were the influence of family and sociocultural factors (6/36, 16.7%) [19,25,36,37,40,43] and legal or regulatory considerations (5/36, 13.9%) [18,31,33,44,48]. To a lesser extent, studies explored moral distress and burnout among healthcare professionals (3/36, 8.3%) [22,25,38], as well as issues related to therapeutic proportionality and clinical communication (4/36, 11.1%) [23,28,42,51].

Small sample sizes and single-center designs predominated, particularly among qualitative and retrospective studies [16,17,29,31,49], limiting the generalizability of the findings. Several studies based on surveys or clinicians' perceptions were subject to self-report and response bias [22,25,38,44], while retrospective designs were associated with potential selection, classification, and information biases [20,42,47,50]. Additionally, substantial heterogeneity was observed in the conceptualization and definition of MF, ranging from physiological criteria to subjective perceptions, sociocultural interpretations, and legal frameworks [17,35,37,45], complicating comparisons across studies and limiting the synthesis of evidence. A strong influence of cultural, legal, and institutional contexts was also identified [18,37,40,44], reducing the transferability of findings across different countries and healthcare systems.

Discussion

This scoping review shows that MF remains a complex and context-dependent concept, characterized by substantial variability in its definition and clinical application across healthcare settings and countries [16,17,35,37]. The absence of universally accepted criteria contributes to inconsistencies in decision-making and may generate conflicts among healthcare professionals, patients, and family members [16,36,43]. Across the included studies, futility was rarely determined solely by physiological prognosis or lack of therapeutic benefit; instead, ethical principles such as autonomy, beneficence, proportionality, and justice were consistently integrated into clinical decision-making [16,20,24,27]. These findings reinforce the idea that MF should be approached as a multidimensional construct requiring individualized and patient-centered assessment rather than exclusively biomedical evaluation [45,49].

The ICU emerged as the principal setting in which MF-related decisions occur, reflecting the high technological intensity and prognostic uncertainty characteristic of critically ill patients [17,28,33,48]. Several studies highlighted that uncertainty regarding prognosis, combined with variability in professional experience and ethical interpretation, may contribute to the continuation of potentially non-beneficial treatments and delayed limitation of life-sustaining therapies [23,29,49]. Communication barriers and unrealistic expectations among families were also recurrent factors associated with the persistence of futile interventions [19,26,36,51]. In parallel, healthcare professionals frequently reported moral distress, burnout, and ethical burden associated with the provision of care perceived as futile [22,25], emphasizing the need for structured communication strategies and shared decision-making models capable of aligning treatment goals with patient values and prognosis [21,36].

The findings also demonstrate that sociocultural, legal, and institutional contexts strongly influence perceptions and management of MF [18,31,37,40,44]. While some healthcare systems prioritize treatment continuation despite poor prognosis, others adopt more restrictive approaches focused on quality of life and proportionality of care. These differences highlight the absence of a universally standardized approach and support the need for ethical and regulatory frameworks adapted to local cultural and healthcare realities while preserving core bioethical principles [31,45]. Moreover, institutional factors such as the availability of palliative care services, ethical support, and futility guidelines may reduce variability in clinical practice and facilitate more consistent end-of-life decision-making [38,42].

Another relevant finding is the marked variability in how healthcare professionals define and operationalize MF. Several studies showed inconsistencies regarding the thresholds for withholding or withdrawing treatment, perceptions of inappropriate care, and interpretation of prognostic uncertainty [17,31,35,44,49]. This lack of standardization may contribute to unequal clinical practices, ethical conflicts, and prolonged use of non-beneficial interventions. The development of clearer conceptual and institutional frameworks could support more consistent and transparent decision-making processes [37,38].

The evidence suggests that improving the management of MF requires a multidimensional approach integrating clinical prognosis, ethical deliberation, communication skills, and sociocultural considerations. Strategies such as early palliative care integration, time-limited therapeutic trials, interdisciplinary discussions, and clearer institutional protocols may help reduce the use of disproportionate interventions and improve patient-centered care [24,29,31,42,49]. However, the predominance of observational and qualitative designs, together with substantial conceptual heterogeneity among studies, limits the comparability of findings. Future research using more robust and standardized methodological approaches is needed to strengthen the evidence base and support the development of clearer clinical and ethical frameworks for addressing MF [16,22,35,38].

#### *Limitations and Strengths*

This review has several limitations that should be considered when interpreting the findings. First, as a scoping review, its primary purpose was to map and characterize the breadth of the available literature on MF rather than to provide quantitative synthesis or formal comparative analysis, which inherently results in a more descriptive approach than that of systematic reviews or meta-analyses. Although the analytical component of the manuscript was strengthened through thematic integration and synthesis of findings, the exploratory nature of the review limited the possibility of performing statistical analyses or quantitative assessments of heterogeneity.

Additionally, although the search strategy included major biomedical databases such as PubMed/MEDLINE, Scopus, and Embase, grey literature was not included, which may have excluded relevant non-indexed evidence. The available studies also showed substantial methodological and conceptual heterogeneity, including differences in study design, clinical contexts, definitions of MF, and outcome measures. A considerable proportion of the included studies were retrospective or qualitative, many with single-center designs and relatively small sample sizes, limiting the generalizability and comparability of findings. Furthermore, several studies relied heavily on subjective perceptions of futility and lacked standardized operational criteria, making evidence integration more challenging.

Despite these limitations, this review provides a broad overview of the ethical, clinical, and sociocultural dimensions of MF across diverse healthcare settings. In addition, prior registration of the review protocol in

the Open Science Framework (OSF) [52] strengthens the methodological transparency, reproducibility, and rigor of the study.

## Conclusions

MF is a complex and multidimensional concept, influenced by clinical, ethical, and sociocultural factors. Heterogeneity in its definition and application complicates the standardization of decision-making, particularly in settings such as the ICU. The findings of this review highlight the need to integrate clinical criteria with patient values, strengthen communication, and promote shared decision-making. The development of clearer conceptual frameworks and clinical tools is required to better guide clinical practice.

## Additional Information

### Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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