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Review

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Approaches to deprescribing cardiovascular medications in patients receiving palliative care: a scoping review

Gabriela Perez-Tamayo, Mohit Sirole, Elizabeth Fernandez*, Krystel Chedid, Iram Sirajuddin, and Rajesh Jha

Kansas College of Osteopathic Medicine (KansasCOM), Wichita, KS, USA

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***Correspondence:**
Elizabeth Fernandez
Kansas College of Osteopathic Medicine, 217 E. Douglas Ave., Wichita, KS 67202, USA.
Email: efernandez5@mail.kansashsc.org

ORCID iDs
Gabriela Perez-Tamayo
https://orcid.org/0009-0008-6613-6871
Mohit Sirole
https://orcid.org/0009-0009-1137-3615
Elizabeth Fernandez
https://orcid.org/0009-0006-5860-2962
Krystel Chedid
https://orcid.org/0000-0001-8009-7153
Iram Sirajuddin
https://orcid.org/0009-0007-3187-1115
Rajesh Jha
https://orcid.org/0000-0002-0197-1314

ABSTRACT

This scoping review conducted from April 1, 2025, to May 31, 2025, aims to use palliative care as a valuable opportunity to reduce polypharmacy and enhance patient-centered care in the final days of life. To conduct this scoping review with systematic components, a database search was conducted on PubMed and EBSCO to identify studies focused on deprescribing cardiovascular medications in patients subject to polypharmacy in nursing homes. Eligible studies were inclusive of human patients aged 65 and older, patients receiving palliative care or with a limited life expectancy and focused on examining the effects of deprescribing practices and other outcomes affected. Study quality was assessed using the Cochrane Risk of Bias assessment tools RoB-2 and ROBINS-I. The quality assessment was performed by two reviewers, and discretion was discussed until consensus was achieved. In total, 31 studies met the inclusion criteria and were included in the discussion of the review, and 11 of those were included in the quantitative data analysis. There was a notable variation in both baseline medication uses and rates of discontinuation seen across the studies. Rates of deprescribing for antihypertensives varied widely, reported as low as 16.6% in large retrospective cohort studies and as high as 87.8% in structured intervention trials using specified guideline tools such as STOPPFrail. Deprescribing should be routine in palliative assessments, guided by frameworks that consider prognosis, symptoms, and patient values. Limitations of this scoping review include heterogeneity of the studies, which limits direct comparability between them and difficulty in generalizing the findings to a broader palliative care population and assessing the quality of life (QoL) as only a few studies used a validated instrument or patient outcome, but not all were able to assess them in the same manner. Due to the need for properly structured deprescribing guidelines, physicians lack the time and tools to utilize shared decision making to their advantage in many places. The findings from this review suggest that a tailored deprescribing strategy could effectively complement traditional pharmacological treatments by decreasing potential adverse effects and medication burden in vulnerable populations, especially those diagnosed with cardiovascular disease.

Keywords: Deprescribing; Cardiovascular diseases; Hypertension; Palliative care; Polypharmacy; End-of-life care; Shared decision-making

Abbreviations

ACE, angiotensin-converting enzyme; ARB, angiotensin II receptor blocker; BP, blood pressure; CCB, calcium channel blocker; MLTC, multiple long-term condition; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; QoL, quality of life; RCT, randomized controlled trial.

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Competing interest

The authors declare that they have no competing interests.

Availability of data and materials

The datasets generated and/or analyzed during the current study are included in this article and its supplementary information files.

Ethics approval and consent to participate

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Consent for publication

Not applicable.

Authors' contributions

Conceptualization: Perez-Tamayo G, Sirole M, Chedid K, Sirajuddin I, Jha R; Data curation: Perez-Tamayo G, Sirole M; Formal analysis: Perez-Tamayo G, Sirole M; Investigation: Perez-Tamayo G, Sirole M; Methodology: Perez-Tamayo G, Sirole M; Project administration: Perez-Tamayo G, Chedid K, Sirajuddin I, Jha R; Resources: Perez-Tamayo G, Sirole M; Software: Fernandez E; Supervision: Chedid K, Sirajuddin I, Jha R; Validation: Jha R; Visualization: Perez-Tamayo G, Jha R, Fernandez E; Writing - original draft: Perez-Tamayo G, Sirole M; Writing - review & editing: Perez-Tamayo G, Fernandez E, Chedid K, Sirajuddin I, Jha R.

BACKGROUND

Deprescribing is best understood as the intentional, patient-centered process of discontinuing medications when harms outweigh benefits, considering the individual's goals, functional status, prognosis, and preferences [1]. The future of deprescribing in palliative care relies on personalized, goal-aligned communication and blended tools using both explicit and implicit criteria to assess medication appropriateness [2]. It is an increasingly recognized component of modern healthcare, particularly for older adults with multiple long-term conditions (MLTCs), where polypharmacy is common and often problematic [3]. As chronic disease management guidelines have evolved to address individual conditions in isolation, many patients, especially those aged 65 and older, are prescribed complex medication regimens that may no longer align with their current goals of care or physiological capacity [4]. In this context, deprescribing serves as a critical re-evaluation process, helping clinicians and patients to remove or reduce medications that are potentially inappropriate, ineffective, or burdensome [1,2,4].

Deprescribing interventions frequently involve structured medication reviews conducted by clinical pharmacists, with decisions informed by tools such as STOPPFrail or disease-specific algorithms [5,6]. These interventions often include input from multiple members of the healthcare team and span across care settings, from outpatient clinics to nursing homes and hospice environments [7]. Community-dwelling older adults represent a priority population for safe medication use, as they often manage their medications independently and face heightened risks from adverse drug events due to polypharmacy [8].

Among individuals with cardiovascular disease and co-existing MLTCs, deprescribing decisions become more complex. Clinical care is often challenged by "therapeutic competition," where recommendations for one condition may conflict with treatment goals for another, and by increased vulnerability to medication-related harm [4]. This complexity is particularly relevant in patients with limited life expectancy, where the benefits of long-term preventive therapies may no longer outweigh their risks.

Although current clinical guidelines have made significant strides in preventing undertreatment of chronic disease, they have also contributed to an increased medication burden in aging populations. This has resulted in unintended consequences such as reduced physical function, diminished quality of life (QoL), and increased caregiver stress [4]. Greater attention is now being directed toward the integration of deprescribing into routine practice, not merely as a response to polypharmacy, but as a strategy to align pharmacologic treatment with evolving patient priorities and clinical realities [2,9].

Polypharmacy

Nursing home residents are among the greatest consumers of prescription medications [10]. This is important for several reasons. First, polypharmacy in this population is strongly associated with an increased risk of adverse drug events, including falls, cognitive impairment, hospitalizations, and mortality [11,12]. Second, many older adults entering long-term care facilities or receiving palliative care have significantly limited life expectancy, raising concerns about the ongoing appropriateness of medications originally prescribed for disease prevention or chronic disease management [5].

Polypharmacy is a pervasive concern in the care of older adults with serious illness, particularly those receiving palliative or end-of-life care [2,13]. As patients approach the final stages of life,

the goals of medical treatment typically shift from prolonging survival to prioritizing comfort, symptom control, and QoL [10,14]. Despite this transition, medications, especially those intended for long-term prevention, are often continued without adequate reassessment of their risk-benefit balance in the context of declining physiological reserve [15,16].

Cardiovascular medications, including statins, beta-blockers, angiotensin-converting enzyme (ACE) inhibitors, and antiplatelets, are frequently prescribed with the intention of long-term use. These medications are the most commonly prescribed in the United States and while the benefits of these medications for reducing primary and secondary cardiovascular events are well established, they have also contributed to the rising rates of polypharmacy and adverse drug events in adults [17]. In individuals nearing the palliative phase, the anticipated long-term benefits of these medications may no longer be relevant, particularly when weighed against potential side effects and the burden of polypharmacy. Supporting this, Sheppard et al. demonstrated that deprescribing antihypertensive medications in adults aged 80 and older with controlled blood pressure (BP) did not lead to increased rates of hospitalization or mortality over extended follow-up. These findings suggest that for many patients in palliative settings, continued use of chronic cardiovascular medications should not be automatic, but instead reassessed in light of shifting clinical priorities.

In patients with MLTCs, the therapeutic trade-offs become especially complex. The cumulative burden of multiple medications may contribute to fatigue, orthostatic hypotension, delirium, and decreased QoL [18,19]. Moreover, the evidence supporting many cardiovascular drugs in older adults with multimorbidity is sparse, and clinical trials rarely include this population. As such, medication appropriateness must be individualized, taking into account the patient's functional status, prognosis, symptom burden, and treatment preferences [4,20].

What is deprescribing?

Deprescribing is a deliberate clinical intervention that differs fundamentally from medication nonadherence or neglect. Instead, it is guided by ongoing evaluation of the patient's clinical status, prognosis, medication-related risks, and goals of care. Ideally, this would be conducted through a shared decision-making process between clinicians, patients, and caregivers [14]. This process generally involves several key components: a comprehensive medication review, identification of potentially inappropriate medications based on current evidence and individual circumstances, clear goals for medication withdrawal, and ongoing monitoring for withdrawal effects or symptom recurrence [4,21].

In patients receiving palliative or end-of-life care, the rationale for deprescribing is especially compelling. Statins, antihypertensives, and antiplatelets are several types of preventative medications that are initiated by physicians early in life to prevent long term complications but eventually may provide little to no benefit in a patient under palliative care [3,22]. Ultimately, deprescribing should be viewed not as a denial of care but as an act of precision and compassion that aims to realign medical treatment with the lived reality of patients approaching the final stage of life. When implemented thoughtfully, deprescribing can reduce the risk of medication-related harm, lower treatment burden, and reinforce the principles of autonomy, comfort, and individualized care that are central to high-quality palliative care [21,23].

Initiation for deprescribing

Commonly prescribed cardiovascular agents (such as ACE inhibitors and beta-blockers), diuretics, statins, antiplatelets, and nitrates, are typically initiated early in the management of

chronic conditions such as hypertension, heart failure, and coronary artery disease, and are often continued indefinitely [14]. While appropriate in earlier stages of disease, continued use of these medications in patients with limited life expectancy may yield limited beneficial effects. The therapeutic benefits of many cardiovascular drugs generally accrue over extended periods ranging from several months to years. In contrast, their adverse effects may present more immediately and with greater clinical significance in the context of declining physiological reserve [13,22]. Adverse effects occur in up to 30% of older outpatients and in 44% of older hospitalized patients, accounting for one-tenth of all emergency department visits. Patients taking greater than seven medications have approximately 80% more risk of an adverse drug reaction [4].

Among the most common and concerning adverse effects are hypotension-related symptoms, including dizziness and falls, which can result in serious injury or hospitalization in frail individuals [13,22]. Other documented harms include fatigue and myalgia, particularly with statins, persistent cough associated with ACE inhibitors, electrolyte imbalances commonly seen with diuretics, and an increased risk of bleeding from antiplatelet agents in patients with hypertension and other cardiovascular comorbidities [13,14,22]. The cumulative overload of these effects may impair daily functioning, reduce adherence, and contribute to overall treatment burden. Additionally, polypharmacy can interfere with effective symptom management, increase the likelihood of drug-drug interactions, and negatively impact patients' QoL near the final phase of illness [13,22].

While deprescribing has emerged as a key strategy for reducing medication-related harm and aligning treatment with patient goals, its implementation in cardiovascular care remains variable and underdeveloped [14,22]. Clinicians often encounter uncertainty regarding the appropriateness of discontinuation, particularly in patients with multiple comorbidities or recent cardiovascular events. Ambiguity around the timing of deprescribing, lack of disease-specific guidance, and concerns about withdrawal effects or perceived harm may further complicate decision-making [2,7]. As a result, potentially inappropriate cardiovascular medications are frequently continued in palliative settings, despite limited beneficial effects.

Guidelines for deprescribing

Although the importance of deprescribing in serious illness is increasing, physicians often operate without robust, universally adopted guidelines to support decision-making. In practice, deprescribing is frequently guided by clinical judgment, experience, and informal consultation with colleagues rather than formal tools [7,14]. When used, structured tools such as STOPPFrail, STOPP/START, OncPal, and Beers Criteria are typically applied more broadly to polypharmacy in geriatrics than specifically to palliative care. These instruments offer valuable starting points but lack the disease-specific nuance and patient-centered customization required in complex end-of-life care [1,9].

Multiple studies suggest that even when deprescribing tools are available, their real-world usage remains limited. Barriers include time constraints, lack of training, fear of patient or family pushback, clinical uncertainty about when benefits no longer outweigh risks, and the absence of institutional or policy-level mandates to encourage deprescribing [1,2,9]. In a qualitative study, clinicians also cited concerns about legal liability and insufficient interprofessional communications as key reasons for hesitating to deprescribe medications, even when clinically appropriate [7,14].

One of the most widely studied tools is STOPPFrail, a set of explicit deprescribing criteria tailored for older adults with limited life expectancy and poor functional status. Developed to reduce potentially inappropriate medications in frail populations, STOPPFrail guides the discontinuation of medications with primarily preventative indications, such as statins, bisphosphonates, and antihypertensives, when the time to benefit exceeds the expected survival [5,10]. A randomized trial by Curtin et al. [5] demonstrated that using STOPPFrail in a structured deprescribing intervention led to a significant reduction in medication burden without negatively impacting survival, suggesting its potential utility in geriatric and palliative care populations.

However, STOPPFrail has limitations. Its recommendations are not condition-specific and may not provide sufficient guidance on managing medications used for symptom control or those with dual preventive and symptomatic indications, such as beta-blockers or diuretics in heart failure. Furthermore, its uptake in clinical practice remains low, in part due to clinicians' discomfort with deprescribing in the absence of clear institutional support or training [14]. It was further demonstrated that in general the criteria developed by Hoel et al. [24] identified more potentially inappropriate medications than STOPPFrail.

In contrast, the OncPal Deprescribing Guideline was developed specifically for patients with advanced cancer receiving palliative care. It offers medication-specific recommendations, considering both time-to-benefit and relevance to symptom management [16]. OncPal includes guidance on deprescribing cardiovascular medications such as statins, antihypertensives, and antiplatelets in patients with limited prognosis, based on available evidence of futility in the cancer setting. However, OncPal has not been validated in non-cancer populations, including those with chronic organ failure or multimorbidity [25,26].

Both tools also lack seamless integration into electronic health record systems and do not account for nuanced patient factors that strongly influence deprescribing decisions in real-world settings, such as individual goals of care, emotional readiness, or caregiver perspectives [7,23]. Many clinicians report that available deprescribing tools do not align with time-constrained practice environments and that the absence of clear institutional or policy-level support hinders consistent use [2,9]. Taken together, while frameworks like STOPPFrail and OncPal provide valuable starting points, their implementation remains inconsistent, and neither fully addresses the multidimensional needs of palliative patients, particularly in cardiovascular care. There is a clear need for more comprehensive, flexible, and disease-specific guidelines that incorporate patient-centered outcomes, prognostic uncertainty, and interprofessional input into the deprescribing process.

Barriers to deprescribing

Many studies reported deprescribing rates without specifying the original indication for the medication, patient goals of care, or symptom burden [15,16,18,19]. Without this contextual information, it is difficult to assess whether medication discontinuation was clinically appropriate or aligned with the individual needs and preferences of patients. This limitation was noted in several reviews and qualitative studies, which emphasized the importance of goal-concordant deprescribing but observed that documentation of such alignment was often missing from real-world data [2,7,23].

While the resources analyzed provide insight into real-world practices, they do not fully reflect what is needed to advance clinical care. Significant efforts in real-world medicine must

still be made to develop feasible and sustainable practice models that support structured, patient-centered deprescribing conversations. These models should enable clinicians and patients to engage in shared decision-making that is concordant with individual preferences, values, and late-stage care goals. Several authors have called for such frameworks, noting that time constraints, role ambiguity, and the absence of systematic guidance often hinder clinicians from initiating meaningful deprescribing discussions [2,10].

In addition to clinical consequences, the continuation of cardiovascular medications with limited benefit at the time nearing death may impose avoidable financial burdens on patients, families, and the healthcare system. Garfinkel et al. [11] introduced a geriatric-palliative deprescribing protocol in a population of frail, disabled older adults, demonstrating that targeted medication discontinuation significantly reduced drug costs without compromising care quality. Their intervention led to a 41% reduction in the number of prescribed medications per patient and a corresponding decrease in total medication expenditure. Notably, this reduction was accompanied by improvements in functional status and a decline in adverse drug events, emphasizing that cost savings did not come at the expense of patient well-being.

Beyond direct expenses, polypharmacy imposes indirect financial burdens through increased healthcare utilization due to adverse drug events, greater caregiver involvement, and logistical challenges in managing complex regimens. Ní Chróinín et al. [10] noted that medications are often continued due to clinician concerns about litigation, discomfort deviating from disease-specific guidelines, or adherence to professional norms, even when their benefits become negligible. Tjia et al. [2] further observed that deprescribing is often hindered by systemic barriers such as fragmented care, time constraints, and unclear provider roles, all of which contribute to prolonged use of low-value therapies. Together, these findings suggest that deprescribing in palliative care not only reduces harm but also offers a practical and underutilized means of easing economic and caregiving burdens at the final stages of life.

METHODS

A structured review was conducted from April 1, 2025, to May 31, 2025, to identify studies investigating deprescribing practices within palliative and end-of-life care settings with a specific focus on cardiovascular medications.

Search strategy

A comprehensive search utilizing the primary databases PubMed and EBSCO was conducted from April 1, 2025, to May 31, 2025. A search strategy was employed using a combination of Medical Subject Headings and free-text terms. Core search terms included: "*Palliative Care*," "*Deprescribing Approaches*," "*Hospice Care*," "*End-of-Life Care*," and "*Quality of Life*." They were combined with additional terms to target cardiovascular-specific deprescribing, such as "*Deprescribing Antihypertensives*," "*Long-term Cardiovascular Medications*," and "*Hospitalization and Mortality Approaches*." Boolean operators (e.g., AND, OR) were used to optimize search sensitivity. These specific keywords were utilized for determining which studies were potentially relevant to our focus in this review prior to the screening process. Studies were screened by first and second authors based on their relevance to the research question. Studies were reviewed by authors to ensure studies aligned with the shift in goals of medical treatment from prolonging survival to prioritizing comfort, symptom control and QoL. Since

cardiovascular comorbidities are fairly common among older adults with hypertension, we have chosen to broadly focus our research on hypertension in conjunction with other cardiovascular conditions.

Eligibility criteria

Inclusion and exclusion criteria were as follows:

- Inclusion criteria:
  - Human patients aged 65 and older.
  - Peer-reviewed studies published after 2010.
  - Patients receiving palliative or end-of-life care, or with a limited life expectancy due to chronic comorbid conditions and their prognosis.
  - Studies that examined deprescribing practices, decision-making frameworks, clinician-patient communication, or outcomes such as symptom burden, hospitalization, mortality, or QoL.
  - Studies reflecting both frailty, comorbidities, or palliative care and the intervention of deprescribing cardiovascular medications.

- Exclusion criteria:
  - Studies not involving human patients with a limited life expectancy due to chronic comorbid conditions and their prognosis.
  - Studies that did not address polypharmacy or cardiovascular medication classes.
  - Articles lacking outcomes related to deprescribing interventions or clinical decision making.
  - Studies involving young and healthy populations where intervention was not relevant to frailty or advanced age.
  - Studies published prior to 2010 and that were not peer reviewed.

Studies were included only if they examined management or discontinuation of patients affected by polypharmacy. Priority was given to studies in which the intervention of deprescribing was based on the assessment that the risks of continued medication use exceeded the benefits. An initial pool of 46 articles was identified through title and abstract screening. Studies published before 2010 were excluded to ensure recency and clinical relevance. This criterion was established recognizing that deprescribing is a component of modern healthcare, with recent guidelines representing current clinical perspectives.

Eligible studies included both observational and interventional designs. Publications addressing implementation barriers, provider perspectives, and clinical practice models were also included. Limitations and strengths of eligible studies were reviewed and examined for generalized quality assessment while also critically assessed to determine suitability for inclusion. After full-text review, 31 studies met all inclusion criteria and were included in the final scoping analysis, and 11 of those studies were utilized for the data analysis.

Quality assessment and data extraction

To ensure a transparent and rigorous evaluation of the studies included in the quantitative analysis, the Cochrane Risk of Bias assessment tools were used as guiding frameworks. Randomized trials were evaluated using the RoB-2 tool [27], while non-randomized trials were assessed with the ROBINS-I tool [28], following the principles outlined in the *Cochrane Handbook for Systematic Reviews of Interventions*. Each study was reviewed independently by multiple reviewers to appraise the quality of evidence and identify potential sources of bias.

Table 1. Risk of bias assessment for randomized controlled trials using the Cochrane RoB-2 tool

Study	D1	D2	D3	D4	D5	Overall
Curtin et al., 2020 [5]	Low	Some	Some	Low	Low	Some
Dalleur et al., 2014 [12]	Some	Some	Some	Low	Low	Some
Luymes et al., 2018 [18]	Some	Some	Some	Some	Low	High
Sheppard et al., 2024 [29]	Low	Low	Low	Low	Low	Low
Potter et al., 2016 [30]	Low	Some	Some	Low	Some	Some

The risk of bias assessment via the RoB-2 tool was used to assess randomized studies based on the following domains: Domain 1 (D1): bias arising from the randomization process; Domain 2 (D2): bias due to deviations from intended interventions; Domain 3 (D3): bias due to missing outcome data; Domain 4 (D4): bias in measurement of the outcome; and Domain 5 (D5): bias in selection of the reported results.

Table 2. Risk of bias assessment for non-randomized studies using the Cochrane ROBINS-I tool

Study	D1	D2	D3	D4	D5	D6	D7	Overall
Ní Chróinín et al., 2015 [10]	Serious	Moderate	Low	Low	Low	Serious	Moderate	Serious
Garfinkel et al., 2007 [11]	Critical	Serious	Critical	Low	Serious	Serious	Moderate	Critical
Sussman et al., 2015 [15]	Serious	Moderate	Serious	Low	Moderate	Low	Serious	Serious
Zueger et al., 2019 [16]	Serious	Moderate	Low	Low	Low	Low	Moderate	Serious
McAlister et al., 2018 [19]	Serious	Moderate	Moderate	Low	Moderate	Low	Moderate	Serious
Odden et al., 2024 [20]	Low	Serious	Moderate	Low	Moderate	Low	Moderate	Serious

The risk of bias assessment via the ROBINS-I tool was used to assess non-randomized studies based on the following domains: Domain 1 (D1): Risk of bias due to confounding; Domain 2 (D2): Risk of bias in classification of interventions; Domain 3 (D3): Risk of bias in selection of participants into the study (or into the analysis); Domain 4 (D4): Risk of bias due to deviations from intended interventions; Domain 5 (D5): Risk of bias due to missing data; Domain 6 (D6): Risk of bias arising from measurement of the outcome; and Domain 7 (D7): Risk of bias in selection of the reported result.

Any differences in judgment were discussed collaboratively until consensus was reached, ensuring a consistent and fair evaluation across studies. For RoB-2 assessments shown in **Table 1** [5,12,18,29,30], bias was categorized as "low," "some concerns," or "high," whereas the ROBINS-I tool, shown in **Table 2** [10,11,15,16,19,20], classified studies as having "low," "moderate," "serious," or "critical" risk of bias. Data extraction focused on key study details, including author information, sample size, intervention type, and relevant outcome measures at baseline and post-intervention. The associated confidence intervals or *P*-values were other numerical outcomes that were extracted when reported in the study. Although this process was not designed as a full systematic review, the approach aimed to maintain methodological transparency and minimize bias in interpreting the available evidence.

Data synthesis and statistical analysis

Given the heterogeneity of study designs, populations, and measured outcomes, a descriptive scoping synthesis was performed instead of a meta-analysis. Deprescribing rates were recorded as reported in each study. In cases where explicit percentages were not provided, deprescribing rates were calculated manually using available trial numbers, such as the number of participants in each intervention group or the number of medications prescribed. For consistency, when studies reported medication continuation rates, we calculated deprescribing rates by subtracting the reported percentages from 100%. To ensure accuracy, an additional investigator verified the calculations independently and confirmed the percentages with the initial data collector. This approach was applied consistently across all studies to ensure comparability against all included studies.

All studies were categorized by medication class and summarized in a results table to allow for comparison across different deprescribing interventions and clinical settings. Variations in study sample size and quality were not accounted for in the data analysis. No formal pooled statistical analysis was conducted due to the variability among study methodologies.

This scoping abstract and review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020

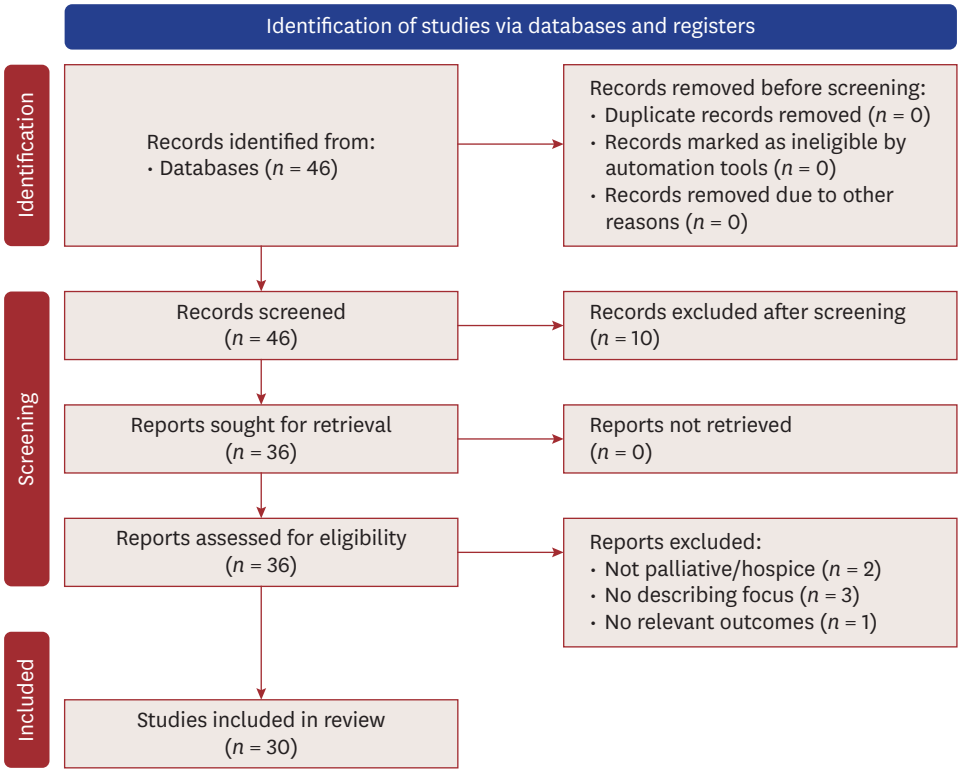

Fig. 1. PRISMA flow diagram illustrating the study selection process.
PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

guidelines [31] and PRISMA 2020 abstract checklist [32]. A PRISMA flow diagram for the study selection process is shown in **Fig. 1**. Patterns in medication class were compared and discussed along with common trends seen in the classes of deprescribed medications in older, frail individuals. For this analysis, components of PRISMA guidelines were used to strengthen the review process and ensure transparent reporting of search strategies, study selection, data extraction, and synthesis.

RESULTS

A total of 11 studies were included in the quantitative data extraction, consisting of randomized control trials ($n = 5$) and non-randomized control trials ($n = 6$). Sample sizes ranged from 8 to 292,170 participants and rate of deprescribing varied widely depending on the medication class and study design of the project. ACE inhibitors were prescribed in 76.8% to 94.1% of cases while angiotensin II receptor blockers showed a 77.8% deprescribing rate. Other classes of medication such as antihyperlipidemics were deprescribed in 83.6% of patients and antihypertensives were deprescribed from a range of 16.6% to 87.8% depending on the study. **Fig. 2** is representative of the changes in deprescribing rates of antihypertensives among the studies included. Beta blockers were deprescribed from a range of 16.7% to 71.5%, dihydropyridine calcium blockers were deprescribed at a rate of 77.2%, diuretics at a rate of 84.2% to 85%, and nitrates and statins were deprescribed at a rate of 100% and 83.6%, respectively. Overall, the deprescribing rates were generally higher when using structured intervention trials such as the STOPPFrail or OncPal criteria compared

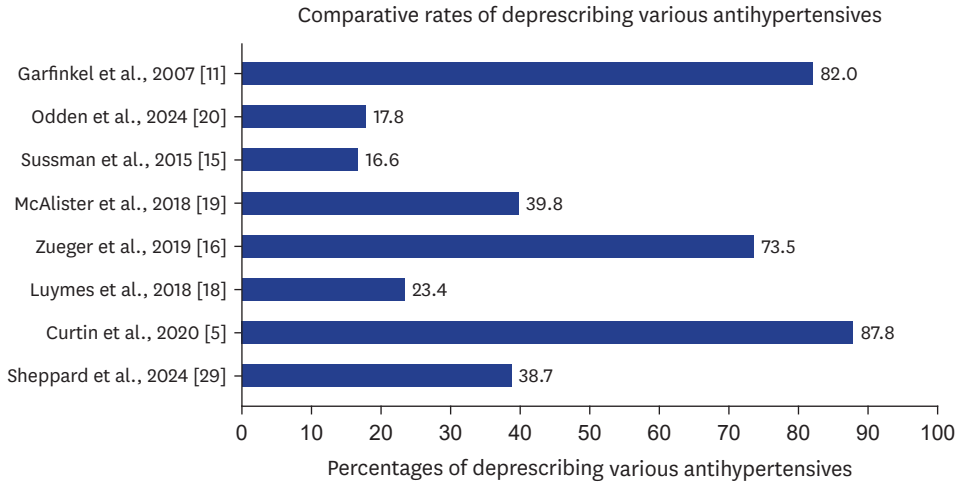

Fig. 2. This bar graph summarizes reported deprescribing rates for antihypertensive medication across multiple studies regardless of specific drug class. The variability in rates underscores differences in study design, population characteristics and deprescribing strategies within palliative care setting.

to large observational studies that dealt more with surveys or deprescribing as physicians choose to. Detailed results for each study including design and limitations are summarized in **Table 3** [5,10-12,15,16,18-20,29,30]. **Fig. 3** depicts the changes of deprescribing rates among the different classes of medications used in the different studies.

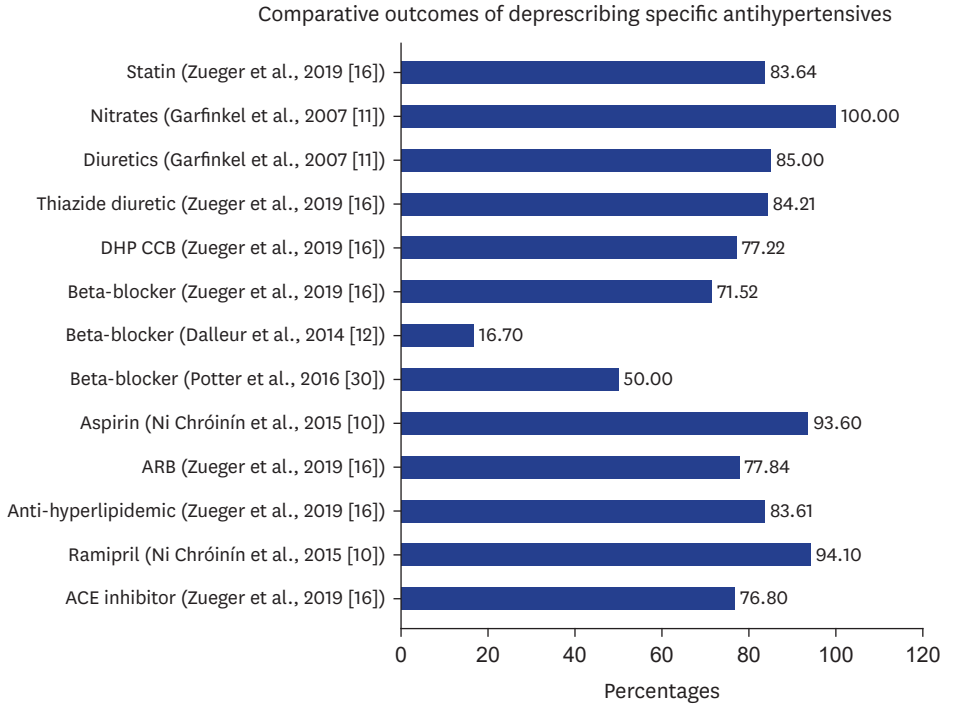

Fig. 3. This bar graph summarizes reported rates of deprescribing for various cardiovascular medication classes in palliative care settings. Data were drawn from survey studies, retrospective cohorts, and clinical trials included in this review. The figure highlights the variability in deprescribing practices across different medication classes and study designs, reflecting both clinical decision-making patterns and patient population differences in the reviewed literature.

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Table 3. Detailed results for each study

Reference	Type of study	Design limitations	No. of study sample	Description of study	Result (% of medication deprescribed)
ACE inhibitors					
Zueger et al., 2019 [16]	Retrospective cohort study	Limited causal inference	12,674	Analyzed Medicare Part D data to determine how frequently cardiovascular medications were discontinued hospice enrollment.	76.8%
Ní Chróinín et al., 2015 [10]	Cross sectional survey study	Self-reported data	134	Surveyed geriatricians to identify clinical factors influencing decisions to deprescribe cardiovascular medications in palliative care.	94.1%
Antihyperlipidemic					
Zueger et al., 2019 [16]	Retrospective cohort study	Limited causal inference	26,559	Analyzed Medicare Part D data to determine how frequently cardiovascular medications were discontinued hospice enrollment.	83.6%
Antihypertensives					
Sheppard et al., 2024 [29]	RCT	Limited generalizability to broader populations	282	Tested the safety and outcomes of deprescribing antihypertensives in patients over 80 who had well-controlled BP.	38.7%
Curtin et al., 2020 [5]	RCT	Limited power for certain outcomes	130	Investigated use of STOPPFrail criteria to guide deprescribing antihypertensives, measuring the intervention's effectiveness in medication reduction.	87.8%
Luymes et al., 2018 [18]	RCT	Risk of contamination	492	Evaluated long-term safety of deprescribing cardiovascular medications in patients identified as low cardiovascular risk over a two-year follow-up period.	23.4%
Zueger et al., 2019 [16]	Retrospective cohort study	Limited causal inference	45,068	Analyzed Medicare Part D data to determine how frequently cardiovascular medications were discontinued hospice enrollment.	73.5%
McAlister et al., 2018 [19]	Retrospective cohort study	Residual confounding factors	292,170	Reviewed medical records to assess how often antihypertensive and glucose-lowering medications were deintensified in patients with newly diagnosed with diabetes.	39.8%
Sussman et al., 2015 [15]	Retrospective cohort study	Potential confounding factors	211,667	Studied deintensification rates of BP and diabetes medications in patients who were well controlled.	16.6%
Odden et al., 2024 [20]	Comparative effectiveness research study	Long term adherence uncertain	2,334	Used observational data to assess antihypertensive deprescribing outcomes in long-term care residents.	17.8%
Garfinkel et al., 2007 [11]	Comparative study	Small sample size	119	Compared older adults' palliative medication reviews for deprescribing and mortality outcomes.	82.0%
ARB					
Zueger et al., 2019 [16]	Retrospective cohort study	Limited causal inference	6,535	Analyzed Medicare Part D data to determine how frequently cardiovascular medications were discontinued hospice enrollment.	77.8%
Aspirin					
Ní Chróinín et al., 2015 [10]	Cross sectional survey study	Self-reported data	134	Surveyed geriatricians to identify clinical factors influencing decisions to deprescribe cardiovascular medications in palliative care.	93.6%
Beta-blocker					
Potter et al., 2016 [30]	RCT	Small sample size	95	Evaluated the effect of deprescribing beta blockers among frail older adults living in residential aged care facilities.	50.0%
Dalleur et al., 2014 [12]	RCT	Short follow-up period	8	Measured the effect of medication reviews guided by STOPPFrail criteria on the discontinuation of potentially inappropriate beta-blocker prescriptions.	16.7%
Zueger et al., 2019 [16]	Retrospective cohort study	Limited causal inference	15,999	Analyzed Medicare Part D data to determine how frequently cardiovascular medications were discontinued hospice enrollment.	71.5%
Dihydropyridine CCB					
Zueger et al., 2019 [16]	Retrospective cohort study	Limited causal inference	15,732	Analyzed Medicare Part D data to determine how frequently cardiovascular medications were discontinued hospice enrollment.	77.2%
Diuretic					
Zueger et al., 2019 [16]	Retrospective cohort study	Limited causal inference	12,589	Analyzed Medicare Part D data to determine how frequently cardiovascular medications were discontinued hospice enrollment.	84.2%
Garfinkel et al., 2007 [11]	Comparative study	Small sample size	119	Compared older adults' palliative medication reviews for deprescribing and mortality outcomes.	85.0%

(continued to the next page)

Table 3. (Continued) Detailed results for each study

Reference	Type of study	Design limitations	No. of study sample	Description of study	Result (% of medication deprescribed)
Nitrate					
Garfinkel et al., 2007 [11]	Comparative study	Small sample size	119	Compared older adults' palliative medication reviews for deprescribing and mortality outcomes.	100.0%
Statin					
Zueger et al., 2019 [16]	Retrospective cohort study	Limited causal inference	24,387	Analyzed Medicare Part D data to determine how frequently cardiovascular medications were discontinued hospice enrollment.	83.6%

ACE, angiotensin-converting enzyme; RCT, randomized controlled trial; BP, blood pressure; ARB, angiotensin II receptor blocker; CCB, calcium channel blocker.

DISCUSSION

This scoping review on cardiovascular deprescribing in palliative care populations highlights substantial variability in both baseline medication uses and rates of discontinuation. The data demonstrates that while cardiovascular medications are frequently prescribed to patients in the advanced stages of clinical illness, deprescribing occurs inconsistently and appears influenced by clinical context, drug class, and study setting [5,14,16,22]. It is also important to note current barriers to deprescribing including beliefs about the necessity, fear of missing out on future benefits, mistrust of recommendations to stop, fears about negative outcomes when stopping medication, lack of physician support or time, previous bad experiences with stopping, and discouragement by a physician, family, or friends [14].

These barriers are especially important in older patients treated for hypertension. Sussman et al. [15] found that deprescribing intervention following low measurements of BP (specifically under 120/65 mmHg) or HbA1c levels is uncommon, even across aging patients who are well beyond intended treatment goals. In the same study, data showed adverse effects from intensive BP lowering in similar populations and guidelines have moved to recommend higher systolic BP thresholds in older patients. Of importance, Luymes et al. [18] conducted trials in an attempt to stop preventative cardiovascular medication that produced an increase in systolic BP of 6 mmHg at 24 months and a higher risk of developing hypertension over 2 years. These findings support the conclusion that deprescribing in low-risk patients is safe in the short term with BP and cholesterol monitoring. In addition, Curtin et al. [5] confirms this finding in a randomized control trial of 381 older adults, where antihypertensives were the most frequently deprescribed and did not lead to substantial rises in BP or adverse effects over a 3-month period. The shift from strict numerical thresholds to symptom control and comfort more closely align with the principles of QoL in palliative care.

While considering clinical vignettes, physicians reported that they would deprescribe ramipril and aspirin in 94.1% and 93.6% ($P < 0.001$) of cases, respectively. The primary rationale for discontinuation was advanced dementia, followed by concerns related to overall pill burden [10]. These cardiovascular medications are often initiated early in chronic disease management and may be continued reflexively, even after the original indication becomes less relevant [2,4,16]. The same explanation may apply to antihypertensives, which were deprescribed in 87.8% (mean change of regular medications: −2.6 vs. −0.36; 95% confidence interval [CI], −2.3 to 7.1; $P < 0.001$) [5] and 82% ($P < 0.001$) [11] of patients in 2 separate studies. These agents are frequently used not only for hypertension but also for heart failure, angina, or renal protection, broadening their indications and complicating decisions around discontinuation [14].

Despite the high usage of these medications, deprescribing rates remain modest in many cases. For example, only 17.8% (difference 2.4 percentage points; 95% CI, −2.3 to 7.1 percentage points) of 2,334 patients in one large-scale study had cardiovascular medications deprescribed over 12 weeks [20]. A much lower rate (16.63%) was observed in a national cohort of over 211,000 patients [15], in contrast to a 39.8% ($P < 0.001$) deprescribing rate reported in another large group of 292,170 patients [19]. It is worth noting that differences in sample sizes can exaggerate effect sizes if results are significant. One possible explanation for this variability is the difference in institutional deprescribing practices or patient populations. Larger databases may include more diverse patient profiles, including individuals with less advanced disease or longer prognoses, leading to a more conservative approach to medication withdrawal. Additionally, electronic health records and administrative claims data used in large-scale studies may under capture informal deprescribing that occurs during care transitions.

Drug class also appears to influence deprescribing behavior. For example, nitrates were discontinued in 22 patients with a 100% success rate and no recurrence of symptoms, suggesting that despite their common use for symptom relief (e.g., angina), they can be safely stopped in many frail elderly patients under careful supervision ($P < 0.001$) [11]. In contrast, beta-blockers, used for a range of indications from hypertension to heart failure to atrial fibrillation, showed deprescribing rates ranging from 16.7% ($P < 0.013$) [12] to 50% (mean change of regular medications: −1.9 vs. +0.1; 95% CI, 0.08 to 3.8; $P = 0.04$) [32]. This variation may reflect differing patient symptomatology, prognosis, or clinician comfort with tapering beta-blockers, which require more caution due to the risk of rebound tachycardia or withdrawal-induced instability in certain cardiovascular conditions.

The balance between symptom burden and potential harms influences the decision to discontinue medications. In the study, diuretics (mainly furosemide) were discontinued in 27 patients with an 85% success rate, indicating that while these drugs provide symptomatic relief of dyspnea in heart failure or fluid overload, they can often be safely stopped without significant symptom recurrence [11]. Conversely, antihypertensives were discontinued with an 82% success rate, reflecting that these medications are more frequently deprescribed to reduce adverse effects such as hypotension, dizziness, or falls in a frail population [11].

Higher deprescribing rates in some studies likely reflect structured interventions, targeted populations, or specialized care settings. For example, hospice-based studies, such as Zueger et al. [16], reported antihypertensive discontinuation rates as high as 73.52%, likely driven by the hospice models' focus on comfort and routine medication reviews. Similarly, smaller single-center studies, reporting rates of 38.65% (mean change of regular medications: −0.35; 95% CI, −0.52 to −0.18) [27] and 23.37% (difference 0.1 percentage points; 95% CI, −0.3 to 0.6 percentage points; $P < 0.05$) [18], may reflect the impact of controlled deprescribing protocols, the direct involvement of multidisciplinary palliative care teams, and a deliberate focus on goal-concordant care. The findings from all included studies showed to be statistically significant, providing evidence to support the trends that were observed throughout this review.

In contrast, large nationwide studies evaluating general older adult populations report markedly lower deprescribing rates. These lower rates likely reflect heterogeneous practice environments, clinician variability in applying deprescribing principles, and less standardized deprescribing protocols outside of specialized care contexts [15,20].

In conjunction, these findings suggest that deprescribing of cardiovascular medications in palliative care is shaped not only by clinical indication and prognosis but also by medication class, prescriber behavior, and system-level factors [2,10,14]. Symptom-directed agents, however, are often continued, particularly when they contribute to QoL. For example, Alwidyan et al. [33] reported that hospice providers frequently continued medications such as nitrates and diuretics in patients with advanced heart failure when these agents were perceived to alleviate symptoms like dyspnea and chest discomfort, even in the absence of long-term prognostic benefit.

Further research is needed to understand better how decisions are made at the point of care and to develop structured, evidence-informed deprescribing pathways tailored to the palliative setting. Importantly, studies should also assess outcomes such as symptom control, patient and caregiver satisfaction, and health system utilization to guide safe and goal-aligned medication management at the end of life.

CONCLUSION

While deprescribing is feasible across various settings, rates remain inconsistent due to differences in patient populations, care environments, and prescribing behaviors. Notably, the robustness of the conclusion may be affected by the absence of weighing studies based on variations such as study quality, sample size, and difference in guidelines.

In summary, deprescribing medications and therapies in older, frail individuals, when guided by careful monitoring and patient centered goals, has many lenses of high-quality evidence in its defense. A randomized control trial was performed in 2025 by Benetos et al. [34] which suggests that deprescribing antihypertensive medications in older, frail patients, can be performed safely without causing clinically significant increases in either cardiovascular events or BP. These findings were able to highlight that BP management in older adults should emphasize more individualized targets and careful monitoring, in comparison to strict adherence to prognosis-based thresholds in treatment [34].

Ultimately, the observational design of the included studies, focus on a specific patient population, and a brief follow-up period, restrict both the ability to generalize findings and draw firm causal conclusions. These limitations emphasize the importance of close monitoring, personalized clinical decision making, and careful interpretation when considering these results for a refined population of patients receiving palliative care.

Limitations

A major limitation of this review is the predominance of observational studies and lack of randomized control trials that assessed deprescribing cardiovascular medications at end of life. Due to the likelihood of confounding variables and selection bias in observational studies, causal inference is limited. The variables across studies are associated but not causally linked. This review was limited by the serious risk of bias in most included studies which restricts the certainty of the findings in the overall conclusions and the generalizability of this study to other populations. Because of this, results may not accurately reflect the true effect of the interventions and exposures that occurred in the studies. Collectively, these limitations reduce the confidence of the findings and suggest that the true effect of deprescribing interventions may differ from what was actually observed.

Many of the included studies varied widely in design, sample size, care setting, and methodology, ranging from small, single-center studies to large administrative database analyses. This heterogeneity limits direct comparability and reduces the ability to draw consistent conclusions across settings. Additionally, some studies applied highly specific inclusion and exclusion criteria, such as restricting analysis to patients with certain prognostic scores, disease types, or medication histories. While these approaches improve internal validity, they may limit the generalizability of findings to the broader palliative care population characterized by multimorbidity and less predictable illness trajectories [3,18]. The Hawthorne effect may have influenced provider or patient behaviors in studies involving active deprescribing interventions. Clinicians aware they were being observed or participating in a deprescribing study may have been more likely to discontinue medications than they would under routine care, inflating success rates and reducing the ecological validity of the findings [5,11].

The assessment of QoL also remains a major limitation across the literature. Few studies incorporated validated QoL instruments or patient-reported outcome measures, making it difficult to assess whether deprescribing truly improved patient comfort, function, or symptom burden [2,23]. Deprescribing in patients with psychiatric comorbidities introduces additional complexity that was rarely addressed in the reviewed studies. Medications such as antidepressants, antipsychotics, and anxiolytics may be prescribed both for chronic mental health needs and for acute symptom control at the end of life. Clinicians may be reluctant to withdraw these agents due to fear of destabilization, behavioral distress, or withdrawal syndromes [14,21].

Finally, systemic and policy-level barriers remain. Despite growing support for deprescribing, there are no widely adopted guidelines tailored to cardiovascular medications in palliative care. Clinicians often lack structured tools, institutional protocols, or dedicated time to engage in shared decision-making around medication discontinuation. Additionally, fee-for-service payment models and documentation requirements may incentivize ongoing prescribing rather than comprehensive medication review [1,7,9].

Future directions

The variability in deprescribing practices and limited evidence highlight key areas for future research. High-quality prospective studies are needed to assess the safety, effectiveness, and patient-centered outcomes of deprescribing cardiovascular medications in palliative care. Current studies are mostly observational with short follow-up. Sussman et al. [15] notes physicians and current guidelines do not assess the harms of intensive therapy as they do benefits, new guideline tools should emphasize the importance of a new perspective focusing on personalized care.

There is a need to develop and validate clinical decision-making frameworks specifically for deprescribing cardiovascular medications at the end of life. Curtin et al. [5] led a study specifically using STOPPFrail and found some explicit criteria to hold limited relevance in practice and other commonly used medications that were not included. Existing deprescribing frameworks such as STOPPFrail and OncPal offer useful guidance for recognizing medications that could potentially be deprescribed, however their application to antihypertensive deprescribing is often limited. Tools such as these often focus on medication classes and broad populations of frail individuals, without accounting for dynamic patient-specific factors, symptoms, or risks. Because of this, individualized clinical

judgement remains a crucial step in realigning prescription decisions with a patient's prognosis and goals in treatment. Findings from the ECSTATIC trial by Luymes et al. [18] highlight the need for an increasingly flexible, context-sensitive strategy that enables a safe and effective cardiovascular deprescribing method for better defined populations.

New models should consider medication purpose, expected time to benefit, patient life expectancy, and symptom burden. Implementation science is essential to integrate deprescribing into routine care by identifying barriers and facilitators at the clinician, patient, and system levels. Research should also evaluate workflow changes, multidisciplinary teams, and electronic health record prompts to support deprescribing discussions and actions. Using a multidisciplinary team approach, a trial of 426 skilled long term nursing facilities in the Netherlands found that there was a 39% elimination of at least 1 inappropriate medication compared with 30% in control [28]. Additionally, one source identified improved symptom control that led to reduced healthcare utilization and lower costs due to the direct involvement of an inpatient palliative care clinical pharmacy specialist [31].

Many patients in these studies had multiple chronic conditions, each affecting function and QoL. This multimorbidity complicates isolating the specific effects of deprescribing cardiovascular medications, as other illnesses or treatments may influence outcomes. Additionally, several studies had short follow-up periods, from weeks to months. While suitable for some end-of-life populations, these brief durations limit understanding of long-term effects, risks, and sustainability of deprescribing. Key outcomes like survival, symptom changes, and delayed adverse effects may have been missed, making longitudinal data essential for advancing deprescribing practices.

Future efforts should focus on developing structured communication strategies and decision aids to support shared decision-making among clinicians, patients, and caregivers. These tools must help clarify patient values and goals, explain the risks and benefits of continued medication, and promote informed, goal-aligned choices. Addressing health literacy and cultural differences is vital for broad applicability. Policy changes and education will be needed to make deprescribing a system-supported standard of care, including training healthcare professionals at all levels and updating clinical guidelines and quality metrics to encourage appropriate medication discontinuation in late-stage care. To summarize, advancing deprescribing in palliative care requires a multifaceted approach involving rigorous research, effective implementation, and a strong commitment to patient autonomy and centered outcomes.

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