

# Current Landscape and Future Directions of Deprescribing and Polypharmacy Practices in Jordan

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## Highlights of the Study

- High prevalence of polypharmacy among elderly Jordanians, leading to adverse drug events and higher healthcare costs.
- Significant challenges for healthcare professionals include time constraints, lack of training, and patient fears.
- Educational programs for healthcare providers and patients are essential.
- Need for tailored policies and guidelines to support safe deprescribing.
- Future research should explore digital health solutions for better medication management.

## Keywords

Deprescribing · Polypharmacy · Pharmacy practice · Jordan

## Abstract

This review explores the current landscape and future directions of deprescribing and polypharmacy practices in Jordan. The prevalence of polypharmacy, defined as the concurrent use of multiple medications by an individual, has been increasing in recent years due to various factors, such as population aging and the greater availability of

medications. However, polypharmacy can lead to adverse drug events, suboptimal medication adherence, increased healthcare costs, and reduced quality of life. Deprescribing, on the other hand, involves the discontinuation or reduction of unnecessary or potentially harmful medications to improve patient outcomes. The findings presented in this review highlight the current state of deprescribing and polypharmacy practices in Jordan, including factors influencing their prevalence. Additionally, it discusses the challenges healthcare professionals face in implementing deprescribing strategies and identifies

potential solutions for enhancing these practices in Jordanian healthcare settings. Moreover, this paper provides insights into future directions for deprescribing and polypharmacy practices in Jordan. Overall, this review offers valuable insights into the current landscape of deprescribing and polypharmacy practices in Jordan while also providing recommendations for future directions to optimize medication management strategies that can ultimately benefit patient outcomes within a sound healthcare system framework.

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## Introduction

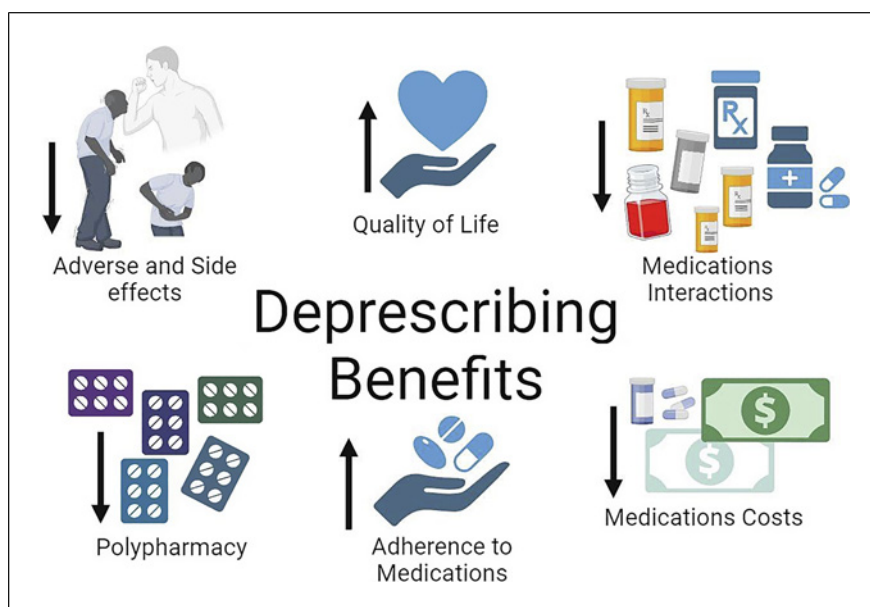
Globally, the deprescribing term was first introduced into the health literature in 2003; however, only in recent years has the term become more widely recognized [1, 2]. Four different deprescribing principles were introduced: developing an individualized treatment plan for each patient, reviewing present medications, recognizing the medications that should be discontinued, replaced, or reduced, and regularly providing ongoing support to the patient [1, 2]. In parallel, several deprescribing models focus mainly on elderly patients, especially in the psychiatric field. Although each deprescribing protocol has its distinct details, in general, they can be categorized into a comprehensive initial case evaluation, inappropriate medication identification, and prioritization of medication discontinuation [1, 2].

The increased prevalence of polypharmacy, commonly defined as the use of five or more medications, is, in part, a consequence of the rising incidence of multimorbidity in the aging population worldwide [3]. In Australia, about 66% of adults aged 75 years or older are exposed to polypharmacy, with 1 in 5 patients taking more than nine medications daily [4]. Similar levels of medication use are also found in developing countries [5]. Significant observational evidence of polypharmacy adverse effects among elderly patients supports the need for deprescribing [6]. A published randomized controlled trial revealed that deprescribing can be applied in frail elderly patients without significant adverse effects on their clinical outcomes or survival [5]. In Jordan, polypharmacy is a significant concern. Studies have shown that a large proportion of the elderly population is affected by polypharmacy and its associated adverse outcomes. As 82.7% of hospitalized patients in Jordan experienced polypharmacy, with a higher prevalence among

the elderly [7]. The high prevalence of polypharmacy in Jordan underscores the urgent need for effective deprescribing practices to reduce medication-related harm and improve patient safety.

A published systematic review of 31 withdrawal trials among individuals aged 65 years or older showed that the use of antihypertensive medications, psychotropic drugs, and benzodiazepines could be discontinued without causing any significant harm or adverse effects in between 20 and 100% of the patients after considering the suitable patient selection and education coupled with careful close monitoring [8]. Another study showed that withdrawal from psychotropic drugs was linked to a decrease in falls and an improvement in cognitive function [9]. Furthermore, the Australian National Blood Pressure study found that 37% of participants maintained normal blood pressure levels 1 year after medication withdrawal [10]. Deprescribing requires a dedicated commitment from both the patient and the prescribing healthcare providers (HCPs), such as the pharmacist, and it is more effective when approached as a collaborative partnership. A remarkable 77% reduction in benzodiazepine use was achieved after educating patients through community pharmacists without any withdrawal seizures or other adverse effects [11]. The process of deprescribing in modern medicine can lead to improved outcomes related to polypharmacy and the use of potentially inappropriate medications in the elderly [2]. Deprescribing is not just a matter of discontinuing a medication. However, it involves a series of well-considered steps aimed at enhancing patient outcomes as discontinuing or ceasing the use of medication is prompted by the situation where the possible or existing harms outweigh the benefits concerning the individual's patient-care objectives, life expectancy, current functioning, preference, and value [2].

Deprescribing offers several benefits, including reducing the risk of adverse events like falls, side effects, and medication interactions [9, 12]. By carefully discontinuing unnecessary medications, patients experience fewer harmful effects and improve overall health. Additionally, deprescribing leads to significant cost savings for both patients and the healthcare system by decreasing the expense of purchasing and managing multiple medications [13]. This approach not only enhances patient safety and medication adherence but also contributes to more efficient use of healthcare resources (Fig. 1) [14]. While the benefits of deprescribing are well documented, there is uncertainty surrounding its impact on broader outcomes like quality of life and patient satisfaction with care. Some studies suggest that deprescribing may not significantly influence mortality, hospitalization rates, or quality of life, indicating a need for cautious implementation and further research [15, 16].



**Fig. 1.** Summary of benefits for deprescribing.

When HCPs review their patients' medications, it encourages them to be more thoughtful and careful when prescribing new medicines. This careful consideration ensures that each prescription is truly necessary, promoting better health outcomes for patients [17, 18]. A recent Australian study has shown that polypharmacy and inappropriate medication use are significant contributors to hospital emergency presentations. This highlights the critical importance of deprescribing in preventing such emergency visits and reducing healthcare burdens [16, 19]. Moriarty et al. [18] stated that just as the World Health Organization (WHO) emphasizes monitoring and discontinuing medications, when necessary, as a component of rational prescribing, clinical guidelines should incorporate deprescribing as part of the prescribing recommendations. However, WHO has launched the "Medication Without Harm" challenge, aiming to reduce severe, avoidable medication-related harm by 50% over 5 years. This initiative underscores the global significance of safe medication practices, including deprescribing, to enhance patient safety and well-being [20]. Additionally, incorporating comprehensive medication reviews into routine care could further improve patient outcomes. CMRs have been shown to reduce all-cause mortality and improve overall health by ensuring that each medication a patient takes is appropriate and necessary [21].

Moreover, deprescribing enables HCPs to deliver a personalized medication regimen that aligns with patient's needs and goals, encouraging patient-centered care [22]. Individuals, especially those with chronic diseases,

may experience a significant burden from managing many medications. Therefore, deprescribing can play a pivotal role in alleviating this burden [23]. The evolution of deprescribing practices has changed the way medications are managed. In the past, medications were prescribed without continuous review, leading to potentially unnecessary medications and polypharmacy. However, developing evidence-based guidelines for deprescribing has gained momentum [24]. Indeed, the Middle East has experienced a rising interest in deprescribing, driven by the awareness and recognition of the potential risks and adverse events associated with polypharmacy and the need to optimize centered patient care. Like many Middle Eastern countries, Jordan recognizes the burden associated with polypharmacy and the importance of deprescribing. In light of the above, the present review aims to shed light on the current landscape and future directions of deprescribing practices, especially in Jordan, and contribute to a broader understanding of deprescribing practices in the Middle East.

## Methodology

### Search Strategy

We conducted a comprehensive literature search across multiple databases to identify relevant studies on deprescribing and polypharmacy in Jordan. The databases searched included PubMed, Scopus, Web of Science, and Google Scholar.

### *Search Terms*

The search strategy utilized a combination of keywords and Medical Subject Headings terms. The following search terms were used: “deprescribing”, “polypharmacy”, “Jordan”, “medication management”, “drug therapy”, “medication review”. These terms were combined using Boolean operators (AND, OR) to ensure a broad and inclusive search.

### *Inclusion and Exclusion Criteria*

Studies were included if they met the following criteria: conducted in Jordan or included a Jordanian population, focused on deprescribing, polypharmacy, or medication management, published in peer-reviewed journals. Studies were excluded if they were editorials or opinion pieces without original research data or papers that were not accessible in full text.

### *Study Selection*

The initial search yielded a total of 150 articles. After removing duplicates, 100 articles remained. These articles were screened by title and abstract for relevance. Full texts of potentially relevant articles were then retrieved and assessed for eligibility based on the inclusion and exclusion criteria. A final set of 88 studies were included in the review; 10 were Jordanian, which is summarized in Table 1.

### *Quality Assessment*

The quality of the included studies was assessed using the Newcastle-Ottawa Scale (NOS) for observational studies to ensure the robustness of the conclusions drawn from them. This scale evaluates the methodological quality of studies based on three broad perspectives: the selection of study groups, the comparability of groups, and the ascertainment of either the exposure or outcome of interest. The NOS scores for the included studies ranged from 5 to 8 out of a maximum of 9, indicating that most studies were of moderate to high quality. Studies with lower scores generally had limitations related to sample size, lack of detailed reporting on follow-up procedures, or potential biases in patient selection. Nevertheless, all of the included studies provided valuable insights into deprescribing practices and polypharmacy in Jordan, contributing to a comprehensive understanding of the current landscape and future directions in this field.

### *Historical Context*

Several strategies can be utilized to improve proper medication use. Effective comprehension of prescription drug labels through medication overview can improve patient adherence to instructions [34]. Drug monitoring is an important and integral part of medication management and

helps in the identification of adverse drug reactions. Pharmacist-led follow-up programs can effectively manage adverse drug reactions and improve patient safety [35]. Medication adherence-enhancing interventions are an important strategy to improve adherence and proper medication use [36]. Medication review and deprescribing evaluate medication and withdraw or reduce the dose of inappropriate or unnecessary medication, thereby improving appropriate medication use. This is especially important in elderly patients and those with polypharmacy and necessitates actively engaging patients in decision-making processes to guarantee appropriate medication use [37].

The deprescribing practices continue to evolve as they gain more recognition as an essential component of medication management and patient-centered care, especially for older adults and those with chronic diseases [38]. One important indicator highlighting the significance of deprescribing is the conduction of a global workshop at the Bruyère Evidence-Based Deprescribing Guidelines Symposium in 2018, which intends to explore the priorities for future work in deprescribing. From the discussions held during this symposium, six primary priorities emerged, including conducting extended and high-quality research to assess outcomes that are meaningful to the patients, prioritizing patient engagement, examining pharmacoeconomics associated with deprescribing interventions, understanding deprescribing interventions in many population groups, producing evidence regarding clinical management such as withdrawal effects, and implementing interventions into practice in clinical settings [39].

Notably, the development and distribution of evidence-based guidelines for deprescribing are becoming more prevalent. These guidelines give HCPs well-defined recommendations for discontinuing a particular medication under specific circumstances [40, 41]. The shift toward deprescribing was driven by a growing awareness of the potential risks of polypharmacy [42, 43]. Moreover, the modern approach to deprescribing is characterized by a patient-centered perspective, emphasizing personalized care, collaborative decision-making, and optimization of medication regimens [44].

Around 20% of adult patients in developing countries use at least five medications, and this is more pronounced in older adults, with up to 70% of hospitalized adults experiencing polypharmacy [45]. Jordan, like many other countries, recognizes the burden associated with polypharmacy, as well as its associated adverse effects; consequently, deprescribing is considered a viable strategy to address this issue. Published studies among Jordanian patients revealed that the patients have positive attitudes regarding deprescribing [25]. In Jordan, a recently

**Table 1.** Published studies regarding deprescribing and polypharmacy in Jordan

Title	Main aim(s)	Sample size	Main outcome(s)	Reference, year
<i>Deprescribing</i>				
Translation and psychometric properties of the Arabic version of the revised patients' attitudes towards deprescribing questionnaire	Validation of the Arabic version of the rPATD  Describe polypharmacy patients' attitudes regarding deprescribing in Jordan	385	Patients have positive attitudes toward deprescribing as they were willing to discontinue one or more of their medications based on the advice of a physician Factor analysis revealed four factors, including burden, appropriateness, concern about stopping, and involvement	[25], 2019
The Association Between e-Health Literacy and Willingness to Deprescribe Among Patients with Chronic Diseases: A Cross-Sectional Study from Jordan	Investigate the relationship between eHealth literacy and the willingness to engage in deprescribing among individuals with chronic health conditions	719	Patients with higher levels of eHealth literacy showed a greater willingness to have their medications prescribed Patient with limited eHealth literacy expressed their concerns about potentially missing out on the advantages of deprescribing	[26], 2022
Attitudes and perceptions of Jordanian pharmacy students toward deprescribing: a cross-sectional study	Assessment of the exposure of pharmacy students to the deprescribing term  Assessment of Jordanian pharmacy knowledge, attitudes, skills, and confidence in deprescribing	408	Around half of the participants had knowledge of the term deprescribing Less than 20% reported exposure to deprescribing instructions Less than half of the participants were confident to recommend deprescribing strategies Participants' perception about deprescribing was positive	[27], 2023
<i>Polypharmacy</i>				
Elderly Patients in Family Practice: Poly pharmacy and Inappropriate Prescribing - Jordan	Evaluation of the polypharmacy problems and the inappropriate medication use among elderly patients	400	The frequency of polypharmacy (44.8%) and inappropriate medication use was relatively high	[28], 2012
The prevalence of drug-drug interactions and polypharmacy among elderly patients in Jordan	Assess the prevalence and type of pDDIs and the prevalence of polypharmacy among Jordanian elderly patients Investigate the variables associated with pDDIs and polypharmacy	367	Polypharmacy was found in almost 75% of the participants  Among the participants, 91% experienced at least one pDDI, with 18.3% having a major pDDI and 76.6% having at least one moderate pDDI	[29], 2018
Potentially inappropriate medications prescribing according to Beers criteria among elderly outpatients in Jordan: a cross sectional study	Investigate the prevalence and predictors of PIMs among Jordanian elderly outpatients	4,622	During the 3-month study period, it was observed that 62.5% of the participants were prescribed at least one PIM Female gender and polypharmacy were found to be significant predictors of PIMs use among elderly	[30], 2019

**Table 1** (continued)

Title	Main aim(s)	Sample size	Main outcome(s)	Reference, year
The prevalence and severity of potential drug-drug interactions among adult polypharmacy patients at outpatient clinics in Jordan	Assessing the prevalence of pDDIs among polypharmacy patients in Jordan  Classifying and rating the identified pDDIs based on the interaction risk, severity, and reliability	801	The mean of the number of medications per patient was 6.6 (SD = 1.96) In 96% of the patients, pDDIs were identified, with a total of 3,359 interactions Most of the pDDIs were categorized as having a "C" risk rating, indicating a moderate level of interaction severity	[31], 2020
Prevalence and Predictors of Polypharmacy in Jordanian Hospitalized Patients: A Cross-Sectional Study	Assessing the prevalence and predictors of polypharmacy among hospitalized patients in Jordan, in order to guide healthcare efforts in reducing the burden on the healthcare system	300	Polypharmacy was found among 82.7% of the participants Polypharmacy was significantly affected by patient's age and the monthly income Elderly patients ( $\geq 65$ years) were found to have polypharmacy significantly more than non-elderly patients	[7], 2021
Association between Charlson Comorbidity Index and polypharmacy: a retrospective database study from Jordan	Assessing the risk contributing to polypharmacy, with a special focus on comorbidity in Jordan	113, 834	Polypharmacy was found in 38% of the participants Polypharmacy exhibited a strong, independent, and positive correlation with comorbidity	[32], 2021
Prevalence of potentially inappropriate prescribing in older adults in Jordan: Application of the STOPP criteria	To measure the prevalence of cases of PIP for older patients and to identify the risk factors for identified cases of PIP	144, 182	A total of 156 cases of PIP were identified upon admission, during hospitalization, and on discharge There was an association between the PIP prevalence and the number of prescribed medications	[33], 2021

pDDI, potential drug-drug interaction; PIM, potentially inappropriate medication; PIP, potentially inappropriate prescribing.

published study was conducted to evaluate pharmacy students' perception, knowledge, and attitudes concerning deprescribing; the results revealed that almost half of the students were aware of the term deprescribing; however, less than 20% of the students indicated that there had been exposure to deprescribing instructions as part of their coursework. Additionally, around 47.0% expressed confidence in suggesting deprescribing strategies for HCPs in patients with inappropriate medications [27].

#### *Current Deprescribing Practices*

The most frequently deprescribed medications include benzodiazepines, which are depressant drugs used to produce sedation and hypnosis to relieve anxiety [46, 47]; proton-pump inhibitors, a class of drugs commonly used to manage acid-related conditions [48, 49]; statins, which

are medications that reduce cholesterol levels [50, 51]; opioid analgesics, which are a class of medications that are used for pain relief and act on opioid receptors to produce morphine-like effects [52]; and antipsychotics [53]. Despite the possible benefits of deprescribing, several barriers exist, such as the patient's fear of symptom recurrence [14], the patient's concern about withdrawal symptoms [54], and insufficient time during medical appointments can pose challenges when it comes to engaging in conversations about the deprescription process with both patients and their families [55]. Doherty et al. [56] conducted a systematic review to explore barriers to deprescribing; several themes were identified across various socio-ecological levels, including cultural, organizational, interpersonal, and individual aspects. Qualitative semi-structured interviews using

theoretical domains framework-based topic guides were also conducted to examine healthcare professionals' barriers to deprescribing; the results revealed four domains, including the absence of formal documentation regarding the outcomes of deprescribing, difficulties in communication with patients and their families, failure to incorporate deprescribing tools into practical use, and the way patients and caregivers perceive medications [57]. Overcoming these barriers requires entire systems, patient-centered methods, and a collaborative approach involving HCPs and patients [56].

Deprescribing practices in Jordan have begun to take shape with a focus on reducing the medication burden among elderly patients and those with chronic conditions. Physicians in Jordan increasingly recognize the importance of deprescribing to mitigate the risks associated with polypharmacy [7]. Specific efforts include establishing multidisciplinary teams in hospitals where pharmacists play a crucial role in reviewing patient medications and identifying candidates for deprescribing [7, 57]. These teams utilize tools such as the Beers Criteria and STOPP/START criteria tailored to the local population to guide their decisions [33]. Additionally, pilot programs have been implemented in certain healthcare settings to educate HCPs and patients about the benefits and safety of deprescribing [58]. Despite these advancements, the practice faces significant barriers, such as limited time during consultations, inadequate training in deprescribing for healthcare professionals, and patients' reluctance to discontinue medications due to fear of symptom recurrence or withdrawal effects [7]. Research specific to Jordan indicates a growing acceptance of deprescribing among HCPs yet emphasizes the need for more comprehensive policies and educational frameworks to support its integration into routine clinical practice [30]. These efforts are essential to ensure the safe and effective reduction of medication load and improve overall patient outcomes in Jordan.

#### *Patient Attitudes and Willingness toward Deprescribing*

In general, deprescribing is a new field of research in Jordan. Studies that evaluate the different aspects of deprescribing are very scarce. However, a number of many studies have shown that polypharmacy is prevalent in Jordan and is linked to many drug-drug interactions [7, 31] ("Table 1"). Studies have assessed polypharmacy in hospitalized patients in Jordan and revealed that the majority of the patients had polypharmacy, especially the elderly [7, 28]. In another study that examined the association between polypharmacy and drug-drug inter-

actions in an outpatient setting, 96% of polypharmacy patients had at least one drug-drug interaction [31]. The previously published information suggests that deprescribing can offer opportunities to reduce the burden of unnecessary drugs and optimize their safety [29]. Nusair et al. [25] study included 358 patients who answered the validated Arabic version of the Patients' Attitudes Towards Deprescribing (rPATD) questionnaire. Results showed that although patients were satisfied with their drug regimens, they welcomed stopping some of their medications if approved by their physicians. This trust was echoed in many studies in different parts of the world; for example, Ng et al. [59] revealed that 93.4% of patients with chronic medical conditions in Singapore were willing to stop one of their medications if advised by the doctor. Another study conducted in the United States (US) showed that 92.0% of older adults expressed willingness to discontinue at least one drug if their physician said it was possible [60]. Similar results were revealed in China [61], New Zealand [62], Italy [63], and Ethiopia [64].

No sufficiently large study was available in Jordan to compare the attitudes of Jordanian patients with different medical conditions and perform subgroup analysis. This is crucial because patients' responses may differ according to their medical conditions; for example, those with a primary diagnosis of cardiovascular disease were more likely to agree that stopping statins may result in a better quality of life than cancer patients [65]. Many patients feel that they are taking too many medications, and this might encourage them to discontinue some [66]. Additionally, no study in Jordan analyzed other possible contributing factors, although deprescribing was not associated with age, sex, number of drugs, or other characteristics [61, 63]. Similar results were obtained from Jordan, where baseline characteristics were not associated with the willingness to deprescribe [26, 32]. This suggests that deprescribing must be individualized according to the patient's needs, preferences, and medical conditions [67]. Khasawneh et al. [26] assessed the association between the willingness of patients to deprescribe and eHealth literacy in Jordan [26, 32]. The desire for dose reduction, the need for medications, and the possibility of adverse effects were predictors of deprescribing. These reasons were also identified in many studies [68, 69].

#### *Barriers to Patient Acceptance of Deprescribing*

In Jordan, many patients express reluctance to stop a medication they have been taking for a long time. Over half of the patients are knowledgeable about their medications and their indications, and they desire



involvement in decisions related to their medication [25]. This indicates that Jordanian patients may have fewer barriers to deprescribing due to low health literacy, which has been reported as a potential barrier elsewhere [29, 69]. However, this perceived knowledge might not be accurate; patients with low eHealth literacy often believe they understand their medications sufficiently, which may not be the case [26]. The study by Khasawneh et al. [26] showed that patients with high eHealth literacy were more likely to accept deprescribing than those with low eHealth literacy, possibly due to their need for adequate knowledge about their medication and medical conditions.

Furthermore, barriers to deprescribing include concerns about symptom recurrence and withdrawal effects. Some patients are hesitant because their HCPs advised them never to stop certain medications, such as statins, and they worry about the consequences of discontinuation and feeling abandoned by their physicians [65]. Trust between patients and their physicians is crucial for willingness to deprescribe. A study by Reeve et al. [66] found a strong correlation between physicians' trust scores and elderly patients' willingness to deprescribe, with 90% of participants inclined to deprescribe if their doctors deemed it suitable, regardless of age.

Additionally, there are barriers related to healthcare professionals. These include time constraints during medical appointments, which limit the opportunity for thorough discussions about deprescribing, and insufficient education on deprescribing practices [54, 56]. Lack of continuity in care and communication issues between HCPs and patients also pose significant challenges [12, 69, 70]. Patient involvement in deprescribing and coordination between HCPs is crucial for deprescribing, especially among older patients [71]. Doherty et al. [56] identified themes across various socio-ecological levels, including cultural, organizational, interpersonal, and individual aspects, as barriers to deprescribing. Alwidyan et al. [57] found that healthcare professionals face barriers such as the absence of formal documentation of deprescribing outcomes, difficulties in communicating with patients and their families, and the failure to incorporate deprescribing tools into practical use.

Overcoming these barriers requires a comprehensive, patient-centered approach and collaboration among HCPs. This includes establishing clear communication channels, providing education and training on deprescribing for healthcare professionals, and ensuring continuous support for patients throughout the deprescribing process.

### *Policy and Guidelines*

Guidelines for initiating medication in different medical conditions are abundant; nonetheless, those related to deprescribing are limited. In Jordan, there are no guidelines for deprescribing, and no studies assess how physicians conduct this process. In a recent review by Scott et al. [72], seven algorithms were identified for deprescribing. Some guidelines generally assess all patients, and some are specific to certain medical conditions or age-groups. Examples include the geriatric medication evaluation algorithm, which was concerned with high-risk medications with serious side effects for the elderly [73]. The prescribing optimization method includes information on compliance, medications that can be stopped, adverse drug reactions, and dosage regimens [74]. The Geriatric Risk Assessment MedGuide monitors the risk of falls or delirium in nursing homes within 24 h of admission [28, 75]. However, there are specific guidelines and algorithms designed to help reduce polypharmacy, particularly in mental health and elderly care. One such tool is the medication algorithm for reducing polypharmacy in mental health, which offers a structured approach to simplify and optimize medication regimens [76]. Another valuable resource is the CEASE guide, specifically designed for the elderly. CEASE stands for confirm, estimate, assess, sort, and eliminate. This guide provides a step-by-step process to evaluate and streamline medications, ensuring that each prescription is necessary and beneficial [77]. These guidelines help HCPs manage medications more effectively, reducing the risks associated with polypharmacy.

These guidelines have limitations; not all were evaluated in interventional trials with appropriate control. Additionally, some are very specific for certain groups of patients or a specific setting that renders them of limited use. Some guidelines contain detailed processes, while others are only descriptive, and some only provide information on the discontinuation of drugs, while others give information on initiation and titration [72]. The most robust guidelines are the Good Palliative-Geriatric algorithm and the confirm, estimate, assess, sort, and eliminate [78]. Despite these shortcomings, they offer consecutive steps that can be applied to patients, incorporated into the electronic support systems, and connected to different hospital units. Future studies are needed to optimize these guidelines or establish new ones with suitable designs and formats for different groups of patients, especially those that might benefit from deprescribing. The application of these guidelines in Jordan requires further investigation and effort.



Deprescribing must first be accepted as a part of the clinical practice and prescribers should be aware of guidelines for different pharmacologic classes and their pivotal role in deprescribing [28, 79]. Physicians and pharmacists must be educated on these guidelines and their limitations to ensure adequate implementation and harmonization of the practices. This education can be part of their continuous professional development hours in the form of workshops and seminars to encourage the application of these guidelines [79]. Time constraints and practicality issues concerning these guidelines can be solved by using a mobile app for deprescribing that allows a portable, easy-to-use, and accessible source of information [79].

In addition, these guidelines can be tailored based on the particular and distinctive characteristics of each country's cultural and clinical practices. This can be achieved by conducting studies evaluating these guidelines' implementation outcomes.

#### *Educational Initiatives*

Although training and education programs for healthcare professionals on deprescribing should be established to promote the concept of deprescribing and encourage its utilization, this process should start at the undergraduate level. Courses can be designed and included in the curriculum to emphasize the importance of and strategies for deprescribing [80]. The courses or activities can be delivered jointly between pharmacy, medicine, and nursing students to improve interprofessional cooperation and collaborative engagement in the decision-making of healthcare professionals. In a study conducted by Al Omari et al. [27], over 12 pharmacy schools enrolled third- and fourth-year pharmacy students, and pharmacy students were eager to recommend deprescribing strategies for HCPs. However, they must be provided with sufficient information on deprescribing practices. Only 47.3% of the students reported exposure to deprescribing during elective courses, and 11.5% reported exposure in required and elective courses [27]. This rate of exposure of pharmacy students to deprescribing in Jordan was comparable to the 59.3% rate revealed by Clark et al. [81] in PharmD students enrolled in Accreditation Council for Pharmacy Education (ACPE)-accredited pharmacy programs across the US. The enthusiasm for this practice expressed by Jordanian pharmacy students was also reflected by Scott et al. [82], who investigated US student pharmacists' perceptions of deprescribing in the curriculum. The qualitative study revealed that the pharmacy students believed that incorporating deprescribing content in different courses would

help them overcome obstacles to implementing deprescribing.

The preparedness of future healthcare workers is different across different medical professions. Zimmerman et al. [83] showed that pharmacy and nursing students believed they were more competent in deprescribing than their medicine peers. A survey of 398 medical and 102 pharmacy final-year students revealed that neither group was confident about deprescribing medication without the supervision of a senior colleague [84].

Deprescribing should be incorporated into carefully designed curricula and experiential education from early to advanced years of learning to address the previously mentioned educational gaps. These courses or activities must also be assessed and taught in an interprofessional approach since it is a multidisciplinary practice where many healthcare professionals can describe or identify cases where deprescribing can benefit or be necessary to the patient. Farrell et al. [85] proposed a deprescribing competency framework that includes strategies that can be implemented in programs to provide graduates with the necessary competencies for managing complicated drug regimens. Interprofessional education activities between pharmacists and physicians and Objective Structured Clinical Exams (OSCEs) that focus on deprescribing issues were proposed by US pharmacy students to improve their deprescribing skills and qualifications [86].

Deprescribing education is not limited to curricula; training programs for HCPs, patient-directed awareness campaigns, and programs can reduce the use of inappropriate medications. A short e-learning module on deprescribing was administered to hospital clinicians, and pre-post-analysis was performed. After viewing the module, there was a small improvement in the awareness of deprescribing and perception of the role these clinicians can play in reducing polypharmacy [87]. Noticeably, even a one-time educational intervention can enhance the deprescribing of drugs such as benzodiazepines, psychotropics, and antihypertensives in both outpatient and inpatient settings [88].

Targeting patients with deprescribing educational material can also promote the reduction of inappropriate medications. An intervention that consisted of mailing deprescribing brochures was evaluated on 348 individuals aged  $\geq 65$  years. The pre-post-pilot trial showed that those who received the brochures were more likely to experience deprescribing than the control [28, 89]. Kuntz et al. [90] evaluated the effect of patient education on individuals aged 64 years and older with or without a

pharmacist consultation. Higher rates of discontinuation of Z-drugs (eszopiclone, zolpidem, or zaleplon) were reported in the patients who received an education with or without a pharmacist consultation.

Community pharmacists play an important role in providing patient education and advice throughout the deprescribing process. A recent review by Bužancic et al. [91] examined studies that evaluated the impact of deprescribing initiated or led by community pharmacists. Four main categories of intervention methods were identified: educational interventions, medication therapy management interventions, pharmacist-led deprescribing interventions, and pharmacist-led collaborative interventions. Compared to usual care, all methods led to more deprescribing and discontinuing medication and financial benefits. However, no benefits were seen in reducing mortality, hospitalization, or falls. Findings suggest that community pharmacists can play an important role in monitoring the deprescribing process and follow-up of patients after the deprescribing process to assess the outcomes and evaluate its success [91]. In Jordan, community pharmacies are well dispersed in different rural and urban areas, and the contribution of community pharmacists to healthcare is pivotal. The activities that include patient education on the importance of deprescribing, monitoring of tapering and discontinuation of medications, and follow-up of patients who underwent deprescribing to evaluate its impact on the patient's health and well-being are applicable in Jordan and can be achieved. However, this contribution by the community pharmacists requires collaboration between physicians and pharmacists to harmonize efforts and ensure the sustainability of these services. Additionally, these activities may be challenged by time constraints, pharmacists may be overwhelmed by them, and the success of the process may require policymakers to provide incentives and reimbursements for pharmacists who participate in deprescribing activities.

Unfortunately, no studies in Jordan have evaluated the effect of these educational tools, whether targeted at HCPs or patients, on deprescribing rates. These studies are essential to evaluate and discover the best method or technology that can be used to educate both parties.

#### *Future Directions*

Enhancing deprescribing practices is a crucial aspect of modern healthcare systems, aimed at optimizing medication use and reducing unnecessary prescriptions. In order to achieve this goal, it is essential to explore potential research areas and understand the specific context of deprescribing in different regions, especially low-

middle-income countries. This includes examining the role of technology and digital health solutions in advancing deprescribing practices. By leveraging these advancements, healthcare professionals can enhance patient-centered care and improve medication management strategies. Accordingly, many recommendations could be raised for enhancing deprescribing practices, identifying potential research areas to further understand deprescribing in Jordan, and exploring the role of technology and digital health in advancing this important aspect of medical practice.

One recommendation for enhancing deprescribing practices is the implementation of comprehensive education and training programs for healthcare professionals. These programs should focus on raising awareness about the importance of deprescribing and providing clinicians with the necessary skills to identify appropriate medication-reduction candidates. By understanding the specific challenges and cultural considerations surrounding deprescribing in Jordan, we can develop targeted strategies to promote safe and effective medication reduction.

Another area that warrants further investigation is the role of technology and digital health in advancing deprescribing efforts. With advancements in electronic health records and telemedicine technologies, there is great potential to leverage these tools to support shared decision-making between patients and HCPs. This can include providing personalized medication information, tracking adherence patterns, and facilitating communication between healthcare teams.

Moreover, research should be conducted to evaluate the effectiveness of different interventions, such as decision support systems or mobile applications, that aid in optimizing medication regimens while minimizing adverse drug events. These interventions can assist both patients and healthcare professionals make informed decisions regarding medication management. We can gain valuable insights into improving deprescribing practices by thoroughly exploring these research areas within Jordan's unique context. Integrating technology and digital health solutions can transform how HCPs approach medication reduction strategies while ensuring patient safety and well-being. Many studies concerning this aspect were performed; McDonald et al. [92] conducted a cluster randomized clinical trial that enrolled hospitalized patients 65 years and older. The aim was to assess the effect of an electronic deprescribing decision support tool on adverse drug reactions post-discharge. Results from the study showed that the intervention led to deprescribing and was safe but did not have an impact on

adverse drug reactions. Hayes et al. [93] conducted a systematic review of the literature to explore which emergency department-based geriatric medication programs reduced potentially inappropriate medications and adverse drug reactions. Findings from the review support the lack of beneficial effects of deprescribing on the fall rates, but there was an improvement in the administration of recommended doses and deprescribing of inappropriate medications [93]. Results from such studies should be interpreted with caution since they study different programs, populations, and outcomes. Similar studies can be conducted in Jordan to evaluate the effect of deprescribing on different outcomes and which subgroup of patients can benefit the most from the process.

## Conclusion

The current deprescribing in Jordan reflects both progress and challenges. While there has been awareness and efforts toward reducing inappropriate medication use, there is still a need for further research, education, and policy development. Continued research is crucial in identifying medication-related harm, evaluating the effectiveness of deprescribing interventions, and understanding patient perspectives. Education is essential to ensure that healthcare professionals have the knowledge and skills to implement deprescribing strategies safely and effectively. Moreover, policy development is necessary to establish guidelines, protocols, and incentives that support deprescribing practices. Collaborative efforts between HCPs, policymakers, researchers, and patients

are vital in driving sustainable change in medication use. By recognizing the importance of continued research, education, and policy development in deprescribing practices within the Jordanian healthcare system, we can work toward optimizing medication therapy for better patient outcomes while minimizing potential risks associated with polypharmacy.

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## Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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No underlying data were collected or produced in this study.

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