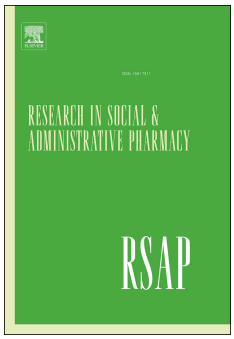

Identification and characterisation of deprescribing tools for older patients: A scoping review

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IDENTIFICATION AND CHARACTERISATION OF DEPRESCRIBING TOOLS FOR OLDER PATIENTS: A SCOPING REVIEW

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Conflict of Interest

The authors declare no conflict of interest.

Abstract

Background: Deprescription is the revision of the therapeutic plan with the aim of simplifying it, taking into account patient preferences, prognosis and environment. This strategy is particularly relevant in older patients, mostly polymedicated individuals, since they are exposed to numerous adverse effects and interactions and tend to have less adherence to treatments.

Objective: To identify the deprescribing tools for older patients available in the scientific literature, classify them according to their design and describe their main features and potential applicability in clinical practice.

Methods: A search was conducted in PubMed and EMBASE for relevant literature published before July 2021. The PRISMA-ScR method was applied, extracting variables related to study and tool characteristics as well as potential clinical applicability. The main inclusion criteria were studies focused on designing or developing deprescribing tools for older patients and those that indicated the features of the deprescribing tool used in detail.

Results: Fourteen of 723 papers met the inclusion criteria, and 12 tools were identified: 6 “algorithm-based tools” and 6 “criterion-based tools”. Though all tools are aimed at older patients, there are certain peculiarities regarding their design, population, application setting and variables included. Of the 6 criterion-based tools found, 4 used the Delphi method for their design and development. Furthermore, most of them agree on the pharmacological groups that are likely to be deprescribed.

Conclusions: Taking into account the importance of the clinical situation and priorities in the care plan in the deprescribing process, the authors believe that tools which help to evaluate these aspects are the most suitable for application in clinical practice. However, it is necessary to continue studying applicability in real-life clinical scenarios and to obtain health results.

Keywords: deprescribing, elderly, tools, older

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Introduction

Polypharmacy, understood as the intake of ≥5 or ≥10 medications (this latter scenario is sometimes described as “excessive” polypharmacy) [1], is a result of population ageing and the growing prevalence of chronic diseases. In many cases, polypharmacy is related to the prescribing of potentially inappropriate medication (PIM), such as medications with an unfavourable risk-benefit ratio, administration that is longer or more frequent than recommended, therapeutic duplication and the absence of indicated medications [2]. Studies determining the incidence or prevalence of PIM state that it depends on the healthcare setting, the characteristics of the population studied and the instrument used to measure it [3]. The prevalence of inappropriate medication consumption in Spain and Europe is estimated to be 34-38% [4, 5]. However, the definition and prevalence of PIM for older patients varies between countries due to the existence of different treatment regimens and the use of different methods.

The response to the existence of PIM has been the development of strategies aimed at reducing or simplifying therapeutic plans [6]. These have traditionally been encompassed in a concept called "appropriateness". In recent years, a pharmacotherapeutic optimization concept called "deprescription" has emerged. Although this concept could be included in the theoretical conception of appropriateness, it is preferable to distinguish them since they have different connotations and because this allows them to be given exclusive characteristics and prevents duplicating strategies. On the one hand, the term *appropriate prescribing* encompasses a wide range of interventions related to prescription quality [7]. A prescription is considered appropriate when it is well tolerated, has a favourable cost-effectiveness profile, and there is clear evidence supporting its use for the indication in question [8]. But the growing problem of polymedication, which is not always inappropriate, gave rise to another concept, deprescribing, which was defined as a review and evaluation process for long-term therapeutic plans, aiming to stop, substitute or modify the dosage of those drugs (which have been appropriately prescribed) that under certain clinical conditions can be considered unnecessary or have an unfavourable benefit-risk ratio [9]. This explains the need to differentiate between appropriateness tools and deprescribing tools. Nowadays, most of the literature suggests that tools used for deprescribing are created to make therapeutic plans more appropriate [10, 11], resulting in the same intervention with another name.

As appropriateness strategies, deprescribing strategies can be classified into explicit and implicit methods. Implicit or “decision algorithm-based methods”, which are focused on the process, consist of guidelines for clinicians to carry out this practice within the overall treatment of the patient.

Explicit or "criterion-based methods" consist of lists of medications or medications associated with certain clinical situations susceptible to deprescribing, allowing these opportunities to systematically be identified in each patient or population [12]. It is fundamental that both types of methods are complementary, as the goal of deprescribing is a structured process focused on the patient, facilitating its application in everyday clinical practice [13].

Our paper intends to make a clear distinction between "criterion-based" and "algorithm-based" tools because we believe that they are not comparable in terms of design and applicability. At the beginning of 2020, a review was published on the various tools applicable in clinical practice, which are classified into seven groups [11]. One of them, called "tools for identifying PIM", is subdivided into explicit (STOPP [14] and Beers [15] criteria) and implicit tools (for example, GP-GP algorithm [16]), but unlike this article, a clear distinction was not made between the terms "appropriate prescribing" and "deprescription" in said review. Finally, around the same time, another review was published [17] focusing on a particular application setting, primary care, and not on a specific type of patient like in our case. It should be noted that, again, no distinction was made between the terms appropriateness/deprescription, but the review did establish differences in "criterion-based" and "algorithm-based" tools.

Based on all the above, the main objective of this scoping review was to identify the deprescribing tools used in older patients available in the scientific literature, describing their main features and potential applicability according to the settings for which they have been created and highlighting their possible clinical utility. Furthermore, considering the versatility of use, the ease of transfer to electronic decision support systems [18], as well as looking at the development and more widespread use of explicit tools [19, 20], "criterion-based" tools were analysed in greater depth.

Methods

A scoping review was performed in accordance with PRISMA-ScR (Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews) guidelines [21].

Data source and search strategy

The search was conducted in MEDLINE (PubMed) and EMBASE using controlled vocabulary and covering the literature published until 31 July 2021. In order to conduct the search and minimise potential publication bias, all the references of the articles found were carefully examined, making it possible to identify studies that had not been detected during the review.

Table 1 shows the detailed search strategy.

Eligibility criteria

Inclusion criteria:

- Studies focused on designing or developing deprescribing tools for older patients (65 years old or older), considering tool as a group of items (criteria or steps) that allows guiding a complete deprescribing process [11].
- Studies describing the features of the deprescribing tool used in detail.

Exclusion criteria:

- Intervention studies focused on applying an existing tool in a patient cohort without explaining the origin of the development of the tool or using an appropriateness tool.
- Studies where the deprescribing tool does not meet the definition of deprescribing set out above, steering towards appropriate prescribing.
- Studies where the deprescribing tool is aimed at a specific medication class, pharmacological group or pathology (i.e. tools to guide the deprescribing of benzodiazepines or IBPs).
- Articles in a language other than English or Spanish.

Study screening and selection

First, two researchers (MMT, BFR) independently read the titles and abstracts of the articles.

Documents that met the inclusion criteria and those that did not provide sufficient information to determine their exclusion were selected. Next, the full texts of the articles selected for the review were read. Finally, two of the researchers carried out a critical reading of the selected full-text articles. To ensure reproducibility and minimal bias, discrepancies were resolved through discussion and consensus with other reviewers (ARP, SSF, MBW).

Quality assessment

Although this section is not necessary to carry out in scoping reviews, a search was conducted for possible quality tools applicable to the papers included in our review. However, because the articles identified use very heterogeneous qualitative methods, quality could not be assessed as it was not possible to find a standardised tool capable of assessing them homogeneously.

Data collection

Reviewer MMT independently extracted data, and ARP and BFR examined all extraction sheets to ensure their accuracy. We also directly communicated with the authors to obtain details not included in the published reports.

For the extraction of data, the selected articles were first arranged according to the type of tool: "criterion-based" or "algorithm-based". The articles found were descriptively assessed, extracting the main characteristics of the tools designed in the various studies and developing their respective narrative findings summaries. The different variables to be analysed were determined and the articles selected were subsequently presented in two descriptive tables, each of them corresponding to one type of tool. Finally, two more tables were developed in order to show the main differences and similarities in detail among the "criterion-based" tools found.

The collected variables were classified into different categories:

a) Focused on the study characteristics:

1. **Year of publication:** the year when the first version of the tool was published.
2. **Geographical location:** the place where each tool was developed (America, Europe and the rest of the world).
3. **Authorship:** the authors' profession and/or the name of any institution or company participating in tool implementation/performance, as appropriate.
4. **Type of tool:** algorithm-based, criterion-based or both.
5. **Objective:** the main objective of the paper in question.

b) Focused on the tool characteristics (only for "criterion-based" tools):

1. **Name of the tool:** how it is referred to, as appropriate.
2. **Original language and translation:** the language in which each tool was designed and the available versions in other languages, as appropriate.
3. **Method** used to design each tool:
    a. Expert panels: consensus method, number of members, multidisciplinary team (yes/no) and specialties included, number of rounds carried out to develop the panel and source of the information used for its creation.
    b. Other.
4. **Appearance**: stratification or classification of the medications included in the tools.
5. **Number of items:** number of items included in each tool.

6. **Active substances/pharmacological groups:** specific active substances, pharmacological groups or both.
7. **Description of the clinical situation** for which deprescribing is recommended (yes/no).
8. **Monitoring parameters:** the tool presents a follow-up plan for patients after deprescribing (yes/no).
9. **Follow-up period:** monitoring parameters are defined (yes/no).
10. **Validation of the tool:** indicates whether the tool is validated and, if so, the type of study used.
11. **Electronic availability:** the tool is available in digital format (yes/no).

c) Potential clinical applicability (only for "criterion-based" tools):

1. **Patients:** the potential target population group, if specified (frail or chronically ill patients, patients of a certain age, etc.).
2. **Application setting:** the scenario where its use is most appropriate, according to method or type of clinical setting involved in its creation (hospital, outpatient or institutionalised setting).

These variables will allow determining which tools are aimed at a specific population/setting and, therefore, their maximum suitability when applied in clinical practice.

Patient and Public Involvement

Patients and/or the public were not involved in this study.

Results

Literature search

A total of 723 articles were identified in the two databases searched (294 in PubMed and 425 in Embase), and 4 papers were included after reviewing the literature references. After duplicates were removed, 492 articles were included, of which 443 were excluded after the title and abstract review, based on the previously established inclusion and exclusion criteria. The excluded articles were: intervention studies not aimed at developing tools (48.5%, *n* = 215); those designed differently from what was defined (33.2%, *n* = 147); those focused on a specific disease or medication (10.3%, *n* = 46); and those not focused on deprescribing (7.9%, *n* = 35).

Of the remaining 49 studies, which were potentially relevant and for which the full text was retrieved, 35 were excluded before data extraction and 14 met the inclusion criteria (Figure 1).

Characteristics of the articles included

Among the 14 articles included, 12 tools were identified: 6 “algorithm-based” tools and 6 “criterion-based” tools. Two of the articles included the validation development of two “criterion-based” tools (LESS-CHRON and STOPPFrail). All “criterion-based” tools, except for one that was an adaptation of an earlier version [29], were the result of an expert panel.

The main characteristics of the “algorithm-based” tools are presented in Table 2.

It should be noted that the target populations towards which the tools were aimed are very similar, though they differ in some respects. While the six “algorithm-based” tools identified were designed to be applied in older patients, two of them focused specifically on patients with limited life expectancy [17,24]. Additionally, their application settings also differ, as two of the algorithms were designed to be applied in institutionalised patients [17,25], another in hospitalised patients [24], one focused on primary care [26] and the two remaining articles do not specify their application setting [22,23]. Most of them were developed by Australian research groups, notably the ADeN (Australian Deprescribing Network) [22,23,24].

With respect to “criterion-based” tools, described in Table 3, six were analysed. One of them is focused on patients with multimorbidity or similar characteristics [6] and two of them are aimed at patients with limited life expectancy [29,31]. These studies are more focused on Europe and America. Concerning their potential clinical applicability, three tools were designed to focus on institutionalised patients [28,29,33]. Two other tools were aimed at all healthcare settings [6,31]; although, in a reliability study, one of them was applied to hospitalised patients [32] and the other to outpatients [30]. The application of the latter in primary care and nursing homes has yet to be studied.

If we focus on the main objective of the articles examined, it is important to stress that the study by Farrell et al. [27] is not aimed at creating an explicit tool but rather sets out a list of priority medications for deprescribing and subsequently creates medication-specific guidelines for clinical practice (available at deprescribing.org). It is therefore not comparable with the rest of the tools identified. However, the groups classified as priority groups are encompassed by the remaining tools identified [6, 28, 29, 31, 33].

Table 4 shows the different variables that were evaluated and analysed in order to gain a deeper understanding of the differences and similarities of the “criterion-based” tools identified. It should be noted that, in most cases, the experts who created the various tools agree on the priority pharmacological groups for deprescribing, which mainly include statins, antipsychotics,

anticholinergics, proton-pump inhibitors and antidepressants (supplementary material). These groups are, at the same time, those that stand out as priorities in the work of Farrell et al. [27].

Once the papers were analysed, it was noted that most tools were designed classifying the medications included into physiological and/or pharmacological groups [6, 27, 29, 31, 33], which favours their clinical applicability. However, the number of items contained in each one is very unbalanced, ranging from 8 to 27.

Table 5 shows the main aspects related to the expert panel method used to create the tools.

Discussion

This scoping review was performed to identify and characterise deprescribing tools for older patients. The main results were both the variability among the tools identified and the healthcare settings they cover, as well as their potential clinical application.

Specifically, 6 articles focused on "algorithm-based" tools (6 tools) and 8 papers focused on "criterion-based" tools (6 tools) were found, so it can be said that the development and presence of both types are balanced. Whilst it is true that combining both types is necessary to obtain a structured deprescribing process focused on the patient [13], we believe that the so-called "criterion-based" tools allow for a more systematic application, which is sometimes desirable in clinical practice, in addition to being more easily transferred to decision support systems [18], making them more versatile than algorithms.

Because deprescribing is a process focused on the patient, it requires a joint assessment of their clinical situation and social context. Furthermore, deprescribing is summarised in five basic principles [3], the last of which is the monitoring of the patient, who should undergo frequent checks and be offered support, so it is important that tools foster systematisation. Of the various tools identified in this review, three assess the clinical situation of the patient at the time of the intervention [6,31,33] and two include monitoring parameters to be measured after the intervention [6,33]. That is extremely important, since stopping a medication when the risks outweigh the benefits is as important as restarting it if required by the clinical conditions of the patient; therefore, we consider it essential to take these aspects into account when choosing which tool to use in clinical practice. It should be noted that the NORGEP-NH tool [28], despite being an appropriateness tool, contains a deprescribing section which does not include monitoring parameters nor does it take into account the patient's clinical situation. The two remaining tools [27,29] do not assess these aspects either.

Regarding the consensus method used in the expert panels, four tools were developed through the Delphi consensus method, and the other used another consensus method without specifying which one [33]. The Delphi process provides structured communication, iteration with controlled feedback and informed input, thereby facilitating rapid synthesis of expert knowledge [36, 37]. The application of this method is justified on the grounds that, although there are certain clinical trials focused on deprescribing, such studies did not generate sufficient scientific evidence to draw accurate conclusions, so it was necessary to resort to a method that allowed designing the different tools by combining the available scientific evidence with the judgement of subject matter experts. Particularly noteworthy is the variability among the various panels: the expert groups involved in the panels of the Farrell et al. [27] and Nyborg et al. [28] studies have many members (47 and 49, respectively), while the rest of the groups [6, 31, 33] include fewer members (7 to 17 experts). Although the number of panel participants depends on their level of expertise and knowledge diversity, and the number considered adequate varies between authors [38], a larger number of experts reduces bias and increases the quality of the panel. Moreover, four panels are multidisciplinary [6, 27, 28, 31], while the remaining one [33] is exclusively composed of pharmacists. This is significant, bearing in mind that the participation of specialists from different areas is essential for the enrichment of the panel.

This is the first scoping review to analyse explicit or "criterion-based" tools and classify them according to the patients' clinical situation in order to provide an overview of all the tools and facilitate some criteria to select the most appropriate one for each situation, thus leading to a more successful deprescribing.

We attempted to identify other scoping reviews conducted on this topic in the scientific literature without success. Therefore, this work was compared with some systematic reviews that have been published in recent years. It is worth noting the many reviews [11,17,19,39-41] carried out to analyse the available evidence on deprescribing, and the different tools designed for this purpose. Page et al. [39] focus on analysing whether deprescribing allows reducing mortality and improving health outcomes, but they also mention the tools applied in the various articles included. However, these are essentially appropriate prescribing tools and anticholinergic scales, and only the CEASE algorithm [23] was included in our review. Two other reviews have been identified [19, 41] that characterise a large number of deprescribing tools, pointing out their advantages and disadvantages. However, the tools included in both articles differ greatly from those analysed in this manuscript, since they focused on the term "appropriate prescribing". Subsequently, Thompson et al. [40] classified the different tools selected into three categories: models of frameworks, medication-specific and entire medication lists. Nevertheless, the latter, whose title essentially refers to "criterion-based" tools, also

includes algorithms, such as those developed by Garfinkel et al. [16], Mckean et al. [24] or Scott et al. [23]. It should be noted that this review, whose objective was to identify tools that could help clinicians in deprescribing, concludes that both LESS-CHRON [6] and STOPPFrail [31] are the most useful tools due to their above-mentioned characteristics.

Among the limitations of this scoping review, the impact of the dissociation between deprescribing and appropriate prescribing on the number of tools included should be acknowledged. This may be because appropriate prescribing began to be developed earlier, and there are many validated tools that are currently used in deprescribing. This is the case of the STOPP [14] and Beers [15] criteria, which are widely used and nonetheless were not included in this review. Furthermore, the tools described respond to the need for deprescribing in the most vulnerable population group: older patients with chronic diseases or the presence of frailty. We therefore did not identify widely used deprescribing tools like OncPal [42] or the one developed by Holmes [35], as they are aimed at other types of patients. In the future, it would be desirable to carry out a comparative analysis with the results of the clinical application of the tools described in order to assess their real utility. Moreover, with the purpose of arranging the types of tools available in order to facilitate selection according to the preferences of the professionals applying them, “algorithm-based” tools were differentiated from “criterion-based” tools. This distinction led to the application of stricter selection criteria than in other reviews, which justifies the number of tools found. The identification of “criterion-based” tools will allow using them in the field of technological transfer since the presence of pre-identified objective criteria is the basis for this procedure. It is important to mention that, although it is true that only two databases have been consulted, which could be considered a limitation, the number of articles identified was actually high and many of those found in Pubmed were duplicated in EMBASE. It is thus reasonable to think that when consulting another database, the same thing could happen. The search was conducted in a non-specific way to avoid losses. This is shown by the high number of articles that were reviewed compared to the final number of articles included.

Conclusion

In conclusion, a total of twelve tools focused on deprescription were identified, six of which were “criterion-based” tools that encompass the groups of drugs that had been considered a priority by experts in the field. Taking into account the importance of the clinical situation and priorities in the care plan in the deprescribing process, the authors believe that tools which help to evaluate these

aspects are the most suitable for application in clinical practice. In the same way, the tools that include information on monitoring parameters are noteworthy.

However, it is necessary to further study their applicability in real-life clinical scenarios in order to make them exploitable and to identify the health outcomes of their use in patients.

Statements

Statement of Ethics

An ethics statement is not applicable because this study is based exclusively on published literature.

Conflict of Interest

The authors declare no conflict of interest.

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Data Availability Statement

All data generated or analysed during this study are included in this article. Further enquiries can be directed to the corresponding author.

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Databases	Search strategy
PubMed	(("deprescriptions"[MeSH Terms] OR "deprescriptions"[All Fields] OR "deprescribing"[All Fields]) OR ("deprescriptions"[MeSH Terms] OR "deprescriptions"[All Fields] OR "deprescription"[All Fields])) AND (tool[All Fields] OR process[All Fields] OR ("standards"[Subheading] OR "standards"[All Fields] OR "criteria"[All Fields]) OR ("algorithms"[MeSH Terms] OR "algorithms"[All Fields] OR "algorithm"[All Fields])) AND ("aged"[MeSH Terms] OR "aged"[All Fields] OR "elderly"[All Fields])
Embase	('deprescribing'/exp OR deprescribing OR 'deprescription'/exp OR deprescription) AND ('tool'/exp OR tool OR process OR criteria OR 'algorithm'/exp OR algorithm) AND ('elderly'/exp OR elderly)

Table 1. Full search strategy

	Study Characteristics				Potential clinical applicability	
	Year	**Geographical location**	**Authorship**	**Objective**	**Patients**	**Setting of application**
Garfinkel D [16]	2007	Israel	Geriatricians and members of the Department of Public Health	To improve drug therapy in elderly patients by developing an algorithm	Frail elderly patients with incurable disease	Hospitalised patients in geriatric nursing departments
Reeve E [22]	2014	Australia	Pharmacists and physicians (pharmacologists)	To elaborate a deprescribing process and analyse each step thereof	Older people with polypharmacy	-
Scott IA [23]	2015	Australia	Internists and pharmacologists	To define the process of PIM deprescribing and the evidence supporting it	Older, multimorbid patients	-
McKean M [24]	2016	Australia	Internists and pharmacologists	To determine whether a structured approach to deprescribing (Scott IA *et al*. [23]) is feasible and reduces medication burden	Elderly (≥65 years) with ≥8 prescribed medications and limited life expectancy	Hospitalized patients
Dharmarajan T.S [25]	2019	America	Geriatricians	To determine the deprescribing success rate and to identify factors that influence the deprescribing process	Elderly patients	Long-term care facilities and geriatric clinics
De las Salas R [26]	2020	America	Pharmacists and members of the Department of Public Health	To develop and validate a stepwise tool to aid professionals in the process of deprescribing	Elderly patients	Global, focused on primary care

Table 2. Description of the basic aspects of the algorithm-based articles included

	Study Characteristics				Potential clinical applicability	
	Year	**Location**	**Authorship**	**Objective**	**Patients**	**Setting of application**
Farrell B [27]	2015	America	University pharmacists and physicians	To identify and prioritize medication classes where evidence-based deprescribing guidelines would be of benefit to clinicians	Elderly patients with chronic diseases	Global, focused on primary care
Nyborg G [28]	2015	Europe	University physicians	To develop a set of explicit criteria for pharmacologically inappropriate medication (appropriate prescribing + deprescribing)	Elderly (>70 years)	Nursing home residents
Pruskowski J [29]	2017	America	Professors of the Pharmacy and Geriatric Medicine Department	To reduce the number of PIM through developing a clinical pharmacist-driven deprescribing initiative	Elderly patients with life-limiting diseases	Long-term care facilities
Rodríguez-Pérez A [6]	2017	Europe	Pharmacists and internists	To create a tool to identify drugs and clinical situations that offers an opportunity of deprescribing	Patients with chronic multimorbidity or with similar characteristics	All healthcare settings
Rodríguez-Pérez A [30]	2019			To evaluate the reliability of the tool in order to determine its possible usefulness in clinical practice		Outpatients
Lavan A.H [31]	2017	Europe	British Geriatrics Society	To develop and validate a list of explicit criteria for potentially inappropriate medication	Frail older patients with limited life expectancy	All healthcare settings
Lavan A.H [32]	2018			To determine the inter-rater reliability amongst physicians		Hospitalised patients
Sanz-Tamargo G [33]	2019	Europe	Clinical pharmacists and members of the Department of Public Health	To adapt the available evidence on deprescribing to the medication management of older people by creating a tool	Older patients	Long-term care facilities

PIM: Potential inappropriate medication

Table 3. Description of the basic aspects of the criterion-based articles included

	Farrell 2015 [27]	**Nyborg 2015** [28]	**Pruskowski 2017** [29]	**Rodríguez 2017** [6]	**Lavan 2017** [31]	**Sanz-Tamargo 2019** [33]
Name of the tool	Not applicable	NORGEP-NH	The DE-PHARMA Project	LESS-CHRON	STOPPFrail STOPP-Pal (Spanish version)	Not applicable
Original language **Translation**	English No	English No	English No	English/Spanish Yes	English Yes [34]	English/Spanish Yes
Method*	Expert panel	Expert panel	Based on Homes *et al*. [35]	Expert panel	Expert panel	Expert panel
Aspect	Pharmacological groups	Criteria for individual medications, combinations and deprescribing	Physiological systems and pharmacological groups	Physiological systems and pharmacological groups	Physiological systems and pharmacological groups	Pharmacological groups/active substances
Number of items	14	34 (8 of deprescribing)	8	27	27	11
Active substances/ pharmacological groups	Pharmacological groups	Both	Both	Both	Both	Both
Description of the clinical situation	No	No	No	Yes	Yes	Yes
Monitoring parameters	No	No	No	Yes	No	Yes
Follow-up period	No	No	No	Yes 1-12 months	No	Yes 1-12 months
Validation **Type of study**	No	Yes Observational study	Yes Observational study	Yes Interobserver and intraobserver reliability study	Yes Inter-rater reliability study	Yes Interobserver variability study
Electronically available tool	No	No	No	In progress	No	No

Table 4. Variables evaluated and analysed in the criterion-based tools included

* The main characteristics of the various expert panels are detailed in Table 5.

	Farrell 2015 [27]	**Nyborg 2015** [28]	**Lavan 2017** [31]	**Rodríguez 2017** [6]	**Sanz-Tamargo 2019** [33]
Consensus method	Delphi	Delphi	Delphi	Delphi	Not defined
Number of members	47	49	17	11	7
Multidisciplinary team	Yes	Yes	Yes	Yes	No
Member specialists	Pharmacists, physicians and nurse practitioners	Geriatricians, general practitioners and clinical pharmacologists	Geriatricians, clinical pharmacologists, palliative care physicians, psychiatrists, general practitioners and clinical pharmacists	Hospital pharmacist, internists, general practitioners and primary care pharmacists	Hospital pharmacists
Number of rounds	3	3	3	2	Not defined
Data source for the development of the tools	Literature review	NORGEP criteria, literature and clinical experience	British National Formulary, literature review and clinical experience	Extensive review of scientific evidence	Bibliographic search and clinical experience

Table 5. Method of expert panels

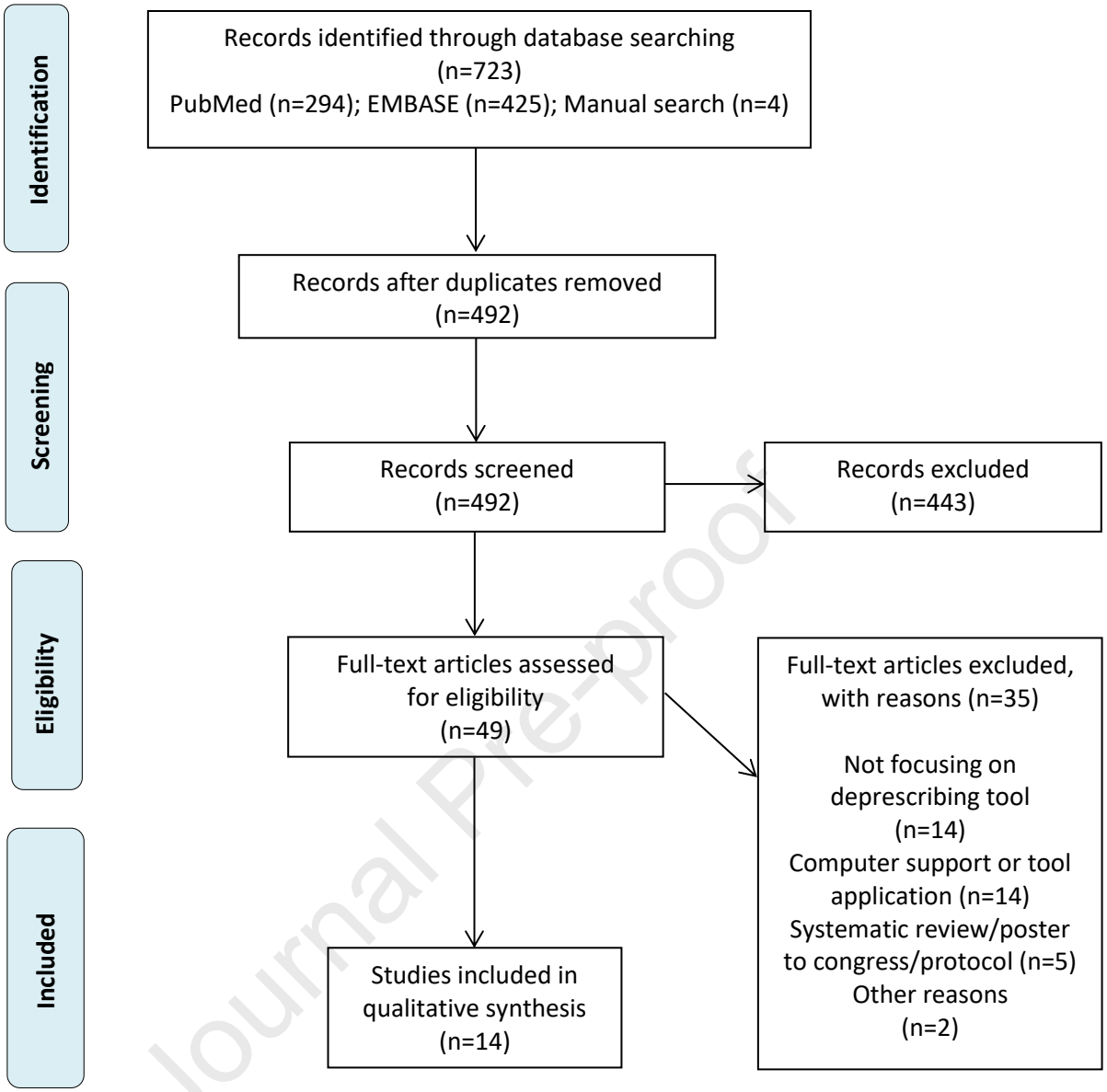

Figure 1. Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist [21]

Highlights

- The presence of “criterion-based tools” and “algorithm-based tools” in the literature is balanced, with six algorithms and six criteria identified.
- The various tools identified differ in many aspects, such as the target population, the design used for their development, their potential setting of application and the variables included in each tool.
- There are many deprescribing tools available in the literature, but it is still critical to identify the real usefulness of each one of them in specific populations, so that they can be exploited and their application in patients yield health outcomes.

Credit Author Statement

MM-T, AR-P and SS-F contributed to the design of the study; MM-T and BF-R realised the acquisition and analysis of data and the peer-review process; MM-T realised the drafting of the manuscript; MM-T, BF-T, AR-P and SS-F revised the manuscript critically for intellectual content and approved the final version to be submitted; AR-P submitted the manuscript.

All authors have approved the final version for publication and take responsibility to ensure that all aspects of the manuscript have been revised and discussed among the authors with the purpose of presenting them with the utmost accuracy and integrity