

BMJ Open Computerised decision to reduce inappropriate medication in the elderly: a systematic review with meta-analysis protocol

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ABSTRACT

Introduction Life expectancy continues to increase in developed countries. Elderly people are more likely to consume more medications and become vulnerable to age-related changes in drugs' pharmacokinetics and pharmacodynamics. Recent studies have identified opportunities and barriers for deprescribing potentially inappropriate medications. It has already been demonstrated that computerised decision support systems can reduce physician orders for unnecessary tests. We will systematically review the available literature to understand if computerised decision support is effective in reducing the use of potentially inappropriate medications, thus having an impact on health outcomes.

Methods and analysis A systematic review will be conducted using MEDLINE, CENTRAL, EMBASE and Web of Science databases, as well as the grey literature assessing the effectiveness of computer decision support interventions in deprescribing inappropriate medication, with an impact on health outcomes in the elderly. The search will be performed during January and February 2018. Two reviewers will conduct articles' screening, selection and data extraction, independently and blind to each other. Eligible sources will be selected after discussing non-conformities. All extracted data from the included articles will be assessed based on studies' participants, design and setting, methodological quality, bias and any other potential sources of heterogeneity. This review will be conducted and reported in adherence to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement of quality for reporting systematic reviews and meta-analyses.

Ethics and dissemination As a systematic review, this research is exempt from ethical approval. We intend to publish the full article in a related peer-reviewed journal and present it at international conferences.

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INTRODUCTION

In developed countries, ageing population is increasing.¹ Caring for older adults is a challenge for healthcare providers, as they are

Strengths and limitations of this study

- We aim to clarify whether new technologies, namely computerised decision systems, can help in reducing inappropriate medication in the elderly.
- This protocol was written following the recently published Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols guidelines.
- We will conduct a comprehensive systematic review on this clinical topic using, if possible, meta-analytic methods.
- Studies with high heterogeneity and varying quality may limit the quality of evidence for this systematic review.

more likely to have multimorbidities^{2,3} and to consume more medication.⁴

Polypharmacy, defined as 'the use of multiple drugs administered to the same patient, most commonly seen in elderly patients',^{5,6} although frequent has a negative impact on senior health.^{7,8} There is an increased risk of drug interactions and prescriptions of potentially inappropriate medications,⁴ changes in pharmacokinetics and pharmacodynamics and limited generalisation of clinical research results due to common exclusion of subjects aged more than 65 years old.⁹ So, prescribing medication for elderly patients should be evidence based and particularly cautious.

In several cases it is urgent to deprescribe, this is to begin 'the process of withdrawal of inappropriate medication, supervised by a health care professional with the goal of managing polypharmacy and improving outcomes.'¹⁰

Inappropriate medication prescription, meaning 'the practice of administering medications in a manner that poses more risk than benefit, particularly where safer alternatives exist,'^{5,11} can be reduced by several

interventions.¹² However, they are not widely known and therefore used. In one hand, general practitioners report interest in learning and using more mobile technologies to assist in clinical care¹³; on the other hand, they refer an insufficient emphasis on geriatric pharmacotherapy training.¹⁴

It has already been shown that computerised decision support systems can reduce physicians' orders of unnecessary tests.¹⁵ This systematic review aims to determine if computerised decision support is effective in reducing potentially inappropriate medication prescription in the elder population.

Other studies have addressed strategies to improve care of elderly in what concerns inappropriate medication prescription.^{12 16} In 2013, one synthesis study identified eight randomised controlled trials (RCT), two cluster RCTs and two controlled before-and-after studies.⁹ In 2015, another study included 12 RCTs.¹³ Both studies reported high heterogeneity on the included studies. However, these studies have not focused on computerised decision support systems. In addition, we consider that since the last study search, more adequate studies have been published and that, for the first time, a meta-analysis will be possible to conduct.

METHODS AND ANALYSIS

Eligibility criteria

In this systematic review, we will select (1) interventional studies, such as RCTs, non-randomised controlled studies and quasirandomised controlled studies; (2) those that include participants aged 65 years or more, to whom one or more regular medications were prescribed, and (3) assess the impact of computerised decision support systems in withdrawal of potentially inappropriate medication prescription. On the other hand, studies including only moribund, terminal or palliative participants will be excluded. Studies published or in press will be included independent of the language, year of publication and setting in which it was conducted (hospitals, nursing centres, communities, and so on). Potentially inappropriate medications will be defined using the Beers criteria¹⁷ and STOPP/START criteria.¹⁸

Information sources

Our sources of information will include electronic databases (namely MEDLINE, CENTRAL, EMBASE, Web of Science), trial registries, different types of grey literature and contact with specialists in the field. If further data are needed, authors of the selected articles will be contacted. The search will be performed in January and February 2018. The search will have no language restrictions. In those cases that none of the research team members are able to translate the included study, we will first contact the authors to ascertain if the main data are available in other languages and seek to translate whenever necessary. A second search using all identified keywords and

proprietary names of computerised decision support systems will then be undertaken across all included databases.

Search strategy

Our initial search syntax in CENTRAL will be: (1) MeSH descriptor: [Medical Informatics Applications] explode all trees; (2) Computer decision support; (3) MeSH descriptor: [Deprescriptions] explode all trees; (4) MeSH descriptor: [Inappropriate Prescribing] explode all trees; (5) no. 1 or 2; (6) no. 3 or 4; (7) no. 5 and no. 6.

For PubMed, the query will be "(Medical Informatics Applications [MeSH Terms] OR (medical AND informatics AND applications)) AND ((Deprescriptions [Mesh Terms] OR deprescription OR deprescribing OR Inappropriate Prescribing [Mesh Terms] OR (inappropriate AND prescribing*) OR (inappropriate AND prescription*) OR (over* AND prescribing*)) OR medication errors [MeSH Terms] OR (error* AND medication) OR (drug AND use AND error*) AND (decision support systems, clinical [MeSH Terms] OR 'clinical decision support systems' OR (clinical AND decision AND support*) OR decision making, computer-assisted [MeSH Terms] OR (computer AND assisted AND decision AND making) OR (medical AND computer AND assisted AND decision AND making) OR medical order entry systems [MeSH Terms] OR (medical AND order entry systems) OR (medications AND alert AND systems) OR 'computerized physician order entry systems' OR 'computerized provider order entry systems' OR 'computerized physician order entry' OR 'computerized provider order entry')."

For Web of Science the query will be "TS=('Medical Informatics Applications' OR (medical AND informatics AND applications)) AND TS=((Deprescriptions OR deprescription OR deprescribing OR 'Inappropriate Prescribing' OR (inappropriate AND prescribing*) OR (inappropriate AND prescription*) OR (over* AND prescribing*)) OR 'medication errors' OR (error* AND medication) OR (drug AND use AND error*) AND TS=('clinical decision support systems' OR (clinical AND decision AND support*) OR decision making, computer-assisted [MeSH Terms] OR (computer AND assisted AND decision AND making) OR (medical AND computer AND assisted AND decision AND making) OR 'medical order entry systems' OR (medical AND order entry systems) OR (medications AND alert AND systems) OR 'computerized physician order entry systems' OR 'computerized provider order entry systems' OR 'computerized physician order entry' OR 'computerized provider order entry')."

Study selection process

The selection process procedure will be made by two reviewers following several steps.

First, they will independently review the title and abstract of each reference. Each one will be categorised into either relevant, unsure or irrelevant. If a reference

is considered irrelevant by the two authors it will be eliminated.

In the next phase, the two authors will review the full text of the remaining references and each one will independently select which articles should be included.

The two authors will compare their selected articles and discuss any disagreement in each phase.

If the two reviewers cannot reach an agreement all the authors of the paper will make the final decision.

Data extraction and management

Once the articles to be included are selected, data will be extracted and entered into data sheets independently by two reviewers. These two sheets, including their differences, will be checked by a third reviewer.

The following information will be extracted from each article: (1) study characteristics, intervention type; type of study; country, setting, follow-up duration; (2) participants' number and age; and (3) clinical outcomes. The primary outcome to be considered is the effect of intervention on withdrawal of potentially inappropriate medications (discontinuation rate). The authors will give priority to the following outcomes, by order of importance: mortality, hospitalisation, any reported adverse drug withdrawal effects and quality of life measurements.

Any potential difference among reviewers will be discussed with the team, and if not resolved, the manuscript authors will be contacted. Also, if required data are missing from the article or are incomplete or unclear, inquiries will similarly be sent to the authors.

Risk of bias

Two reviewers will assess, independently and blinded to each other, the risk of bias by applying the Cochrane Collaboration Risk of Bias tool to all the included studies.¹⁹

Data synthesis

The final report will present the available data of the computer decision to support in reducing inappropriate medication prescription in older adults.

Each outcome will be combined and calculated using the statistical software RevMan V.5.1,²⁰ according to statistical guidelines referenced in the current version of the Cochrane Handbook for Systematic Reviews of Interventions.²¹

If we are able to include a group of studies that are sufficiently comparable and reliable we will conduct a meta-analysis. We consider that we should use a random effects model taking in consideration the previous systematic reviews' results. We expect to encounter a sufficient number of studies, reporting a sufficient number of events, but that are not completely comparable (concerning the intervention, context and population).

If heterogeneity is severe (I^2 superior to 40%–50%) and studies' results are strongly biased, we will not perform a meta-analysis; thus, a narrative, qualitative summary will be done instead.

Effect sizes and 95% CI will be expressed as ORs. When a study reports zero event in both arms, we will consider using zero-cell correction methods.

Subgroup analyses will be used to explore possible sources of heterogeneity based on the following: setting, type of software, medication and participants' clinical characteristics.

Regarding subgroups, we assume it will be relevant to include subgroups regarding the tool used by software to identify targets: STOPP/START criteria subgroup and the Beers criteria. We will also conduct metaregression to evaluate whether the covariates have significant influence on heterogeneity.

Forest plots will be produced when three or more studies are included in a meta-analysis. Data in tables will be presented by therapeutic class based on the Anatomical Therapeutic Classification codes.

Studies rated as having a high risk of bias will be included in the narrative synthesis but not on our meta-analysis and discussed in detail.

A systematic narrative synthesis will be provided in the text and tables to summarise and explain the characteristics and findings of the studies; it will explore the relationship within and between studies, in line with guidance from the Centre for Reviews and Dissemination.

To determine whether publication bias is present, we will include funnel plot and statistical tests in the assessment, namely Begg's test and Egger's test.

We will also ascertain if each RCT had its protocol published before recruitment of patients was initiated.

The quality of evidence for all outcomes will be judged with the Grading of Recommendations Assessment, and the Development and Evaluation working group methodology.²²

The final paper will be prepared following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.^{23 24}

ETHICS AND DISSEMINATION

As a systematic review, this research is exempt from ethical approval. We intend to publish the full article in a related peer-reviewed journal and present it in international conferences.

DISCUSSION

Although electronic health records are common in clinical practice, there is a lack of evidence of computer decision support systems regarding health outcomes. Deprescribing potentially inappropriate medication in the elderly is particularly difficult, although computer support may be an important tool. This systematic review will help identify the success of computerised decision support to reduce inappropriate medication prescription. Therefore, this review will be relevant for patients, health professionals and policymakers. One potential limitation of this study will be if we find a limited number of studies

with considerable differences regarding their characteristics and methodology. This may impair our conclusions and impede meta-analysis. In addition, depending on the data available and obtained results we may not be able to define which is the best decision support available.

Contributors LM had the original idea for the systematic review. LM, TM and ISS wrote the protocol and reviewed the search strategy. LM, TM, ISS, MMS and CM reviewed the protocol.

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Competing interests None declared.

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