The prevention of medication errors in the home care setting: a scoping review

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Abstract

Background. *The changes in health, social and demographic needs impose new approaches to cures and care without giving up patients' safety. Although several studies analysed the patient safety approach and strategies, the literature considering the home care setting seems still scarce. The analysis of the phenomenon of medication errors in the primary care setting highlights the necessity of exploring the specific variables to understand how to prevent or reduce the occurrence of a medication error in the home context. This review investigates the main preventive strategies implemented at the patient's home to prevent and/or limit the possibility of a medication error.*

Design. *The scoping review was conducted under the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) statement and based on the guidelines of the Joanna Briggs Institute.*

Methods. *No time or language limit was set to obtain the most comprehensive results possible. The following databases were queried: PubMed, Cochrane, CINAHL, ERIC and PsycINFO via EBSCO. All literature published up to 31 December 2022 was considered for data collection.*

Results. *The main preventive strategies implemented in the patient's home to prevent a medication error are: Multidisciplinary teams, therapeutic reconciliation and computerised systems that improve information sharing. As evidenced by all of the included studies, no educational intervention or preventive strategy individually reduces the risk of making a medication error.*

Conclusions. *It would be desirable for healthcare professionals to be constantly updated about their knowledge and understand the importance of introducing the aforementioned preventive strategies to guarantee safe care that protects the person from medication errors even at the patient's home.*

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1. Introduction

If it is true that to err is considered human, as suggested by the title of - To err is human - one of the international scientific literature milestones (1), it is nevertheless true that it remains necessary to implement every possible strategy of errors prevention, especially when concern people's lives and health. As Reason stated, if human error cannot be completely eliminated, it is essential to put in place actions that make it hard to make mistakes (2).

The scientific literature is rich in studies that investigate the phenomenon of medication errors (3,4), analysing their typology and prevalence (5,6) and also providing numerous strategies that healthcare professionals can concretely implement to reduce events, ensure patient safety and consequently decrease the extent of complications that can derive from such errors (7,8). However, most of the studies seem to focus on the hospital setting, returning a lower scientific production regarding the primary care setting and specifically home care (8,9).

Even in the home care setting, medication errors can be made, mainly due to the nature of the setting and the dynamics of caring for people at home. In fact, the errors that can be made are linked to the main causes of errors such as the lack of pharmacological reconciliation, the difficult communication between the different actors caring for the person, which is reflected in the process of prescribing and administering therapy (10-12). If, to date, territorial assistance still needs to be explored, this happens because health assistance is almost always associated exclusively with hospitals (13).

Although many risks and adverse events exist in hospital and home settings, the latter is characterised by different variables and often requires unique and specific solutions (14). This means that the risks that may arise in the various characteristic settings of primary care, including people's homes, and the solutions needed to mitigate them may differ from those in the hospital setting (15). Just think of the very nature of the hospital system in the event of a possible therapeutic error and the possibility to act specific strategies and tools to prevent or manage it. And to the possibility of implementing specific procedures can drastically reduce the probability that an error reaches the patient or has severe adverse effects (16,17).

Therefore, identifying and applying such strategies during home health care would allow not only patients not to experience adverse events that can compromise their safety and health but also health professionals to provide these patients with the best services and clinical care.

1.1. Aim and research question

This scoping review aims to identify the primary strategies aimed at reducing and/or preventing medication errors in the home care setting. Specifically, it intends to map the main characteristics of the possible preventive strategies and investigate which are the most involved professionals.

The PCC (Population, Concept, Context) approach developed by Peters and colleagues was (18) used to elaborate the research question and the inclusion and exclusion criteria. The PCC framework used was "medication errors in home care settings" (Population), "strategies for preventing medication errors" (Concept), and "home care setting" (Context). The questions that this scoping review aims to answer are the following:

What are the main strategies to prevent or reduce medication errors in treating adult patients in the home care setting?

What are the main characteristics of the preventive interventions and strategies implemented at the patient's home to prevent medication errors?

1.2. Key Explanations

Below are the definitions chosen in the following scoping review to identify medication errors and care provided at home. The definitions do not constitute an inclusion criterion for the studies but are rather reported as there is no unambiguous definition of these terms in the literature. The definitions are therefore given below to provide a better understanding of the definitions that guided the scoping review.

Medication errors

Medication error is defined as "*any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing; order communication; product labelling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use*" (10).

Home care setting

For the definition of home care setting, reference is made to that provided by Meyer-Massetti and

colleagues, according to whom "*assistance to patients living at home with the support of health professionals (mainly nurses) engaged by a professional home care organization*" (8).

2. Methods

This scoping review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) statement (19) and based on the guidelines of the Joanna Briggs Institute (20).

2.1. Inclusion criteria
2.1.1. Type of participants
All studies whose study population was represented by healthcare professionals responsible for the therapy management process in the home care setting (nurses, medical doctors, pharmacists) were included.

2.1.2. Type of interventions
All primary studies in which strategies for the prevention of medication errors in the user's home were specified and evaluated were considered relevant.

2.1.3. Setting
All primary studies that analysed implementing preventive strategies in the home setting were evaluated as eligible. Furthermore, studies focused on *transitional care* were also considered suitable, as this phase is crucial for a possible harmful event.

2.1.4. Evidence sources tipology
All the primary studies, quantitative (experimental and observational studies), qualitative (phenomenological, ethnographic, grounded theory and focus group studies) that were conducted to reduce the incidence of medication errors that occur at the patient's home thanks to the intervention of the healthcare personnel responsible for managing the therapy.

2.2. Exclusion criteria
2.2.1. Types of participants
Studies involving students and/or trainees of any healthcare discipline and those conducted in the pediatric field were not considered eligible. Student-focused studies were not considered eligible as, during training, the level of responsibility in managing therapy may differ from that of professionals. Furthermore, the pediatric population was not considered eligible as it is characterised by variables and approaches different from those for adults and, therefore, worthy of a separate analysis.

2.2.2. Setting
On the other hand, the analysis did not include all the studies that implied prevention interventions for medication errors within hospital settings, healthcare facilities (such as rest homes, residential care homes, etc.) and other places that were not the patient's home.

2.2.3. Evidence sources tipology
Studies involving students and/or trainees of any healthcare discipline and those conducted in the pediatric field were excluded. Student-focused studies were not included because the level of responsibility for managing therapy during training may differ from that of professionals. The pediatric population was excluded as characterised by variables and approaches different from those for adults and, therefore, worthy of a separate analysis.

2.3. Data sources and research strategy
For the search string elaboration, a previous search of the principal terms used in the literature was conducted, and the main synonyms of the following terms were chosen: medication errors also inserting the synonyms of the terms that indicate the phase of therapy management; home care setting and strategy or intervention. The keywords identified were combined using the Boolean operators "OR" and "AND", adapting each search string to the corresponding database (Tables 1,2,3). The databases consulted were: PubMed, Cochrane, CINAHL, ERIC and PsycINFO via EBSCO. No temporal or linguistic limit was set to obtain the most exhaustive results possible, and all the literature published up to 31 December 2022 was considered. Two independent researchers (SD, EDS) conducted the screening phase, assessing the relevance of the studies by reading the title and abstract. The articles deemed pertinent were subjected to eligibility through the reading of the entire text to confirm their pertinence concerning the criteria for inclusion and satisfaction of the research objective. Equivocal studies were evaluated by a third reviewer independently (NG).

2.4. Data extraction
The information in the studies deemed relevant will be described in aggregate according to the type

Table 1 - Search strategy on PubMed

#1	"medication error" ti/ab
#2	"medication errors" ti/ab
#3	"Medication errors" [MeSh Term]
#4	"drug error*" ti/ab
#5	"medication incident*" ti/ab
#6	#1 OR #2 OR #3 OR #4 OR #5
#7	"adverse drug reaction*" ti/ab
#8	"adverse drug event*" ti/ab
#9	"adverse event*" ti/ab
#10	#7 OR #8 OR #9
#11	"drug-related problem*" ti/ab
#12	"medication related problem*" ti/ab
#13	"drug related adverse event*" ti /ab
#14	"preventable adverse drug event*" ti/ab
#15	"preventable adverse event*" ti/ab
#16	#11 OR #12 OR #13 OR #14 OR #15
#17	"near miss" ti /ab
#18	"medication safety" ti/ab
#19	"drug safety" ti/ab
#20	#17 OR #18 OR #19
#21	"prescribing error*" ti/ab
#22	"administration error*" ti/ab
#23	"dispensing error*" ti/ab
#24	"transcription error*" ti/ab
#25	"medication prescribing error*" ti/ab
#26	"medication transcription error*" ti/ab
#27	"medication administration error*" ti/ab
#28	"medication dispensing error*" ti/ab
#29	#21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28
#30	#6 OR #10 OR #16 OR #20 OR #29
#31	"intervention" ti/ab
#32	"interventions" ti/ab
#33	"strategy" ti/ab
#34	"strategies" ti/ab
#35	"system" ti/ab
#36	#31 OR #32 OR #33 OR #34 OR #35
#37	"home care" ti/ab
#38	"home health care" ti/ab
#39	"home care servic*" ti/ab
#40	#37 OR #38 OR #39
#41	#30 AND #36 AND #40

Table 2 - Search strategy on Cochrane

#1	("medication error"):ti,ab,kw OR ("medication errors"):ti,ab,kw
#2	("adverse drug reaction*"):ti,ab,kw OR ("adverse drug event*"):ti,ab,kw OR ("adverse event*"):ti,ab,kw
#3	("drug related prblem*"):ti,ab,kw OR ("medication related problem*"):ti,ab,kw OR ("drug related adverse event*"):ti,ab,kw OR ("preventable adverse drug event*"):ti,ab,kw OR ("preventable adverse event*"):ti,ab,kw
#4	("drug error*"):ti,ab,kw OR ("medication incident*"):ti,ab,kw
#5	("prescribing error*"):ti,ab,kw OR ("administration error*"):ti,ab,kw OR ("dispensing error*"):ti,ab,kw OR ("transcription error*"):ti,ab,kw
#6	("medication prescribing error*"):ti,ab,kw OR ("medication administration error*"):ti,ab,kw OR ("medication dispensing error*"):ti,ab,kw OR ("medication transcription error*"):ti,ab,kw
#7	("near miss"):ti,ab,kw OR ("medication safety"):ti,ab,kw OR ("drug safety"):ti,ab,kw
#8	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7
#9	("intervention"):ti,ab,kw OR ("interventions"):ti,ab,kw OR ("strategy"):ti,ab,kw OR ("strategies"):ti,ab,kw OR ("system"):ti,ab,kw
#10	("home care"):ti,ab,kw OR ("home health care"):ti,ab,kw OR ("home care servic*"):ti,ab,kw OR ("home assistance"):ti,ab,kw
#11	#8 AND #9 AND #10

Table 3 - Search strategy on EBSCO

S1	TI "medication error" ORAB "medication error"OR TI medication errors"OR AB "medicationerrors"
S2	TI "drug error*" OR AB"drug error*"
S3	TI "medication incident*"OR AB "medicationincident*"
S4	TI "adverse drugreaction*" OR AB"adverse drug reaction*"OR TI "adverse drugevent*" OR AB "adversedrug event*" OR TI"adverse event*" OR AB"adverse event*"
S5	TI "drug-relatedproblem*" OR AB "drug-related problem*" OR TI"medication relatedproblem*" OR AB"medication relatedproblem*" OR TI "drugrelated adverse event*"OR AB "drug relatedadverse event*" OR TI"preventable adversedrug event*" OR AB "preventable adversedrug event*" OR TI"preventable adverseevent*" OR AB"preventable adverseevent*"
S6	TI "near miss" OR AB"near miss"
S7	TI "medication safety"OR AB "medicationsafety"
S8	TI "drug safety" OR AB"drug safety"
S9	TI "prescribing error*" OR AB "prescribingerror*" OR TI"administration error*"OR AB "administrationerror*" OR TI "dispensingerror*" OR AB"dispensing error*" OR TI"transcription error*" ORAB "transcription error*"OR TI "medicationprescribing error*" ORAB "medicationprescribing error*" OR TI"medication transcriptionerror*" OR AB"medication transcriptionerror*"
S10	TI "medicationadministration error*" ORAB "medicationadministration error*" ORTI "medicationdispensing error*" ORAB "medicationdispensing error*"
S11	S1 OR S2 OR S3 OR S4OR S5 OR S6 OR S7OR S8 OR S9 OR S10
S12	TI "intervention" OR AB"intervention" OR TI"interventions" OR AB"interventions" OR TI"strategy" OR AB"strategy" OR TI"strategies" OR AB"strategies" OR TI"system" OR AB"system"
S13	TI "home care" OR AB"home care" OR TI"home health care" ORAB "home health care"OR TI "home careservic*" OR AB "homecare servic*" OR TI"home assistance" ORAB "home assistance"
S14	S11 AND S12 AND S13

of intervention or strategy used to reduce or prevent medication errors.

In this regard, the following information will be extracted for each study:

the name of the author(s) and the year of publication of the study, as bibliographic reference;

the aim of the study;

the study type;

the intervention/preventive strategy description;

the sample under analysis and relative reference population;

the health professional[s] involved;

the main results;

limitations of the study (where present)

the examined strategies' practice implications.

The data extraction chart has organised and reported this information (Table 4).

3. Results

The present scoping review included ten studies reporting strategies for facing medication errors in the home care setting.

Totally 488 articles were found. All identified bibliographic sources were imported into the bibliographic management software, Mendeley®. After the deletion of duplicates (n=97), 391 articles were obtained. In the first screening phase, all those articles were considered irrelevant or not pertinent based on reading the title and the abstract, and the inclusion and exclusion criteria were eliminated. 331 articles were eliminated; the remaining 39 articles considered adequate or doubtful were analysed in full text. In conclusion, 10 articles were selected. Figure 1 shows the article selection process.

It is important to point out that many of the studies included proposed different strategies but that, by integrating synergistically, met the objective described by the authors and allowed to obtain excellent results after the practical application of the strategies themselves.

To be able to summarise the results of the review more clearly, three main categories of interest were identified considering the main preventive strategy used to reduce the possibility of a medication error occurring. The three main categories identified were: the first concerning the multi-professional team, the second referring to the support of the pharmacist, and the third concerning the use of computerised systems. The organisation in different categories was carried out, considering the primary implemented

Table 4 - Summary of the main findings of the studies included in the review

Authors and year	Aim	Study type	Intervention	Study population	Healthcare professionals	Main results	Limitation of the study	Implications for clinical practice
Auvinen et al., 2021	Investigate whether multi-professional therapy assessment may affect the quality of care (and therapeutic) for elderly patients at home.	Randomized controlled trial	The FIMA method provides multi-professional assistance with a team formed by a doctor, a nurse and a pharmacist to perform an accurate therapeutic reconciliation. The intervention using the FIMA method was evaluated in the experimental group, while the control group received standard care.	512 patients. Inclusion criteria were: patients over 65, suffering from vertigo or orthostatic hypotension, or having had a recent fall episode, or taking more than 6 medications per day.	Nurses, doctors and pharmacists	The use of the FIMA methodology in the patients enrolled in the study who took more than 15 drugs each per day had excellent results. Specifically, a reduction in impairment of renal function, a reduction in the risk of bleeding, a decrease in anticholinergic effects, a decrease in constipation and, in a more general sense, a decrease in the probability for patients to take potentially inappropriate drugs were found.	The study reports the following limitations: the lack of risk analysis based on drug doses or the number of drugs affecting risk loads. and the complete implementation of the FIMA procedure.	FIMA's intervention has improved the quality of pharmacological therapy of patients assisted at home, confirming the importance of a multidisciplinary approach and the role of therapeutic reconciliation.
Brito et al., 2017	Evaluate how the integration of the pharmacist in the home care team affects the reduction of medication errors and patient safety.	Observational study	The pharmacist performs the medication review, evaluates medication regimen information, and develops medication schedules in collaboration with the doctor and nurse.	199 patients	A multidisciplinary team composed of doctor, nurse, social worker, nutritionist and pharmacist	The drug reconciliation performed by the pharmacist included in the multi-professional team is a way to avoid involuntary therapeutic discrepancies, especially in setting transitions.	The study reports as a limitation the difficulty in implementing new services in different healthcare systems and thus the limitation of extrapolating the results to other countries.	The pharmacist's intervention's importance is fundamental in improving the patient's health and reducing the risk of error.
Clark et al., 2019	To analyze the long-term impact of a pharmacist consultation service on home health care services.	Retrospective study	The pharmacist manages the therapeutic plan through telephone calls, home visits, and communication with the doctors of the home health agency.	1263 patients	A multidisciplinary team that also involves the pharmacist and the prescriber.	Identify the reason for the referral, the possible resolution methods, the number and type of drug-related problems, and the response rate of the attending physician. The pharmacy team resolved them by seeing 421 patients, calling 261 patients, and collaborating with the clinical team on 323 patients; a further 265 interventions have been planned by the patient's doctors and home care doctors.	The authors report as a limitation of the study the reliance of documentation on those involved in the practice rather than designated researchers. Although training was provided, the rotation of residents and students in a teaching service introduces the possibility of inconsistencies in the documentation of some items.	Home care is an appropriate setting for the participation of pharmacists in multi-professional teams.
Johansson et al., 2010	Evaluate the use of the drug barcode reading system as a tool to reduce medication errors.	Observational study	PDA (digital personal assistant) tool scans drug packaging, LIFE-reader® obtains drug profiles and information, and checks drug interactions and therapeutic duplications.	15 nurses, 67 patients	The professionals involved are home nurses, while the instrument used is LIFE-reader®.	Through a digital personal assistant, the LIFE-reader®, the medical decision support system provides information on drug-drug interactions, therapeutic duplications and warning systems for assisted persons with inappropriate drugs. Support identified 11 therapeutic duplications and 125 reports for inappropriate medications.	The need for LIFE-reader® to increase the intervention time and all functions should be available for use in order to optimise use and acceptability is highlighted as a limitation. Furthermore, in order to increase user involvement, participants should keep the PDA for further use in their work after the study. For further research, randomised controlled trials and larger sample sizes should be sought.	Regular scanning of patients' medications in their homes can support nurses and physicians in reducing inappropriate medication use and the risk of medication error.
Slugget et al., 2019	Apply a multidimensional intervention to simplify treatment regimens for people receiving community-based home care.	Observational study	Pharmacist performs medication reconciliation to streamline patient regimens; the multi-professional team provides health education to patients.	N.A.; 50 patients	Drug review; pharmacists, nurses and geriatricians	Evaluate the feasibility of the study and patients' benefit from applying this system, and improve therapeutic adherence, quality of life, patient satisfaction, and therapeutic errors.	The authors point out as a limitation of the study the fact that self-efficacy and medication adherence is self-reported by the sampled users.	Improving the drug administration to elderly people cared for at home, providing information strategies to improve the management of medicines in this care setting.

Study	Aim	Design	Intervention	Sample	Professionals involved	Results	Limitations	Conclusions
Sorensen et al., 2004	Examine the effectiveness of multidisciplinary care that provides a pharmacological review to patients most at risk of committing or receiving MEs in the home setting.	Randomized controlled trial	Therapeutic education performed by the general practitioner; visits to the patient's home; drug review by the pharmacist; team conferences with representatives of primary care services.	N.A.; 400 patients	Multi-professional teams; general practitioner and pharmacist	54.4% of the health recommendations were implemented, and 23.9% of them were implemented in practice with all the specific recommendations indicated by the pharmacological review. 92% of the interventions implemented by doctors improved home care, reduced adverse drug events, reduction of disease severity and also an improvement in costs, follow-up visits had a good impact on health.	The authors report the following limitations: the sponsor's priority of demonstrating efficacy within a certain time period precluded conducting a classic clinical trial; a longer follow-up period could have shown a greater difference in outcome measures and confirmed reported trends.	This pharmacological review model has been successfully tested; the participants stated they had excellent satisfaction levels.
Toivo et al., 2019	Coordinate the health care provided to the elderly about managing pharmacological risk in the home setting. A care coordination intervention would reduce the number of risks among medications.	Randomized controlled trial	Education for nurses on home pharmacological risk; sending the information from the nurse to the pharmacist to evaluate the interventions undertaken with the multidisciplinary team.	N.A.; 129 patients	Pharmacist drug review with an automated system to detect drug-related problems, drug interactions and patients at risk; resolution of issues with the team doctor.	Outcomes were measured as changes in the use of potentially inappropriate and psychotropic medications on the anticholinergic and serotonergic load and drug interactions. Half of the participants did not implement the suggestions received; 45.5% had no DRP; of the remainder, 29.6% needed a prescription review, 63% a pharmacological review, and 7.4% a comprehensive review of the treatment plan.	The authors report the relatively small sample size as a major limitation, which may have influenced the low effectiveness of the intervention. Furthermore, half of the eligible residents did not provide written consent for participation. The high workload of the recruiting nursing staff and the fragile and multi-morbid clients of the home care were evaluated as limiting factors especially with regard to the drop-out rate of the study.	More studies are needed on correctly managing therapeutic regimens to reduce the MEs that older people experience in home care.
Wang et al., 2019	Evaluate the reduction in the number of medications/drug interactions experienced by ICU patients after pharmacists' home consultations and evaluate the intervention's effectiveness.	Randomized controlled trial	The pharmacist performs the drug review with the "PharmaCloud System" to record the drugs the patient takes at home, view his previous drug prescriptions and report drug-related problems.	N.A.; 469 patients	The number of kinds of drugs taken by the patient decreased by 1.89 times (p < 0.001), the number of drugs decreased by 61.6%, and the incidence of drug interaction decreased by 0.6-fold (p < 0.001).	Thanks to the intervention, there was a significant reduction in DRP and drug interactions, consequently reducing the number of drugs the patient takes at home. Home pharmaceutical assistance can improve drug safety thanks to the intervention of therapeutic reconciliation.	The main limitation of this study is that the population examined consisted of patients with high healthcare utilisation and excessive polypharmacy, and the characteristics of the drug interaction in this group may not be applicable to other groups.	Applying such a system to deliver home care services can improve patient outcomes.
Nauton et al., 2003	To evaluate pharmacist-conducted follow-up at home of high-risk elderly patients discharged from hospital	Randomized controlled trial	Patients in the intervention group were visited at home by a pharmacist five days after discharge. The pharmacist educated patients on their medication, encouraged compliance, assessed for drug-related problems, intervened when appropriate and communicated all relevant findings to community health professionals.	121 patients	Nurses, and pharmacists	The study results showed 90 days after the follow-up visit: a decrease in issues related to drug therapy and increased patient adherence to treatment	The study has the following limitations: the pharmacist (who was not blinded to patient assignment) assessed DRPs in the intervention group and in the control group at 90 days, introducing a possible bias towards the intervention group in the identification of possible DRPs; the question asked about compliance may have overestimated actual compliance; finally, the relatively small sample limited some of the interpretations and made it impossible to determine exactly which patients could benefit most from the home visit.	A pharmacist-conducted follow-up at home of high-risk elderly patients discharged from hospital is valuable in identifying and addressing drug-related problems and reducing the risk of readmission to hospital.

Authors and year	Aim	Study type	Intervention	Study population	Healthcare professionals	Main results	Limitation of the study	Implications for clinical practice
Josendal et al., 2021	Investigate whether an electronically Shared Medication List (eSML) reduced discrepancies between medication lists in primary care.	Controlled pre-post study	The eSML System allows direct input into the HER System by the general prescription and the possibility of communication between the different profesionals (doctor, nurse, pharmacist). The intervention provided for the reconciliation of the doctor, pharmacist and/or home care before generating the eSML.	267 patients	Multi-professional teams; general practitioner nurse and pharmacist	The intervention group had on average 3.9 discrepancies in their medication lists before the intervention, while the control group had 5.9. For both groups, when comparing the GP and the home care service list, the most frequent types of discrepancies were that medication was lacking or that different dosages were listed. Discrepancies in the intervention group were significantly reduced after the implementation of eSML.	The authors report the way the eSML was implemented as the main limitation. In fact, when the eSML was implemented, the GPs in the intervention groups were recommended to perform a medication reconciliation. GPs enrolled in the control group were given no such recommendation. It is therefore difficult to separate the effect of reconciliation from that of the presence of an eSML. However, previous studies have shown that even after reconciliations, discrepancies remain or recur rapidly, and reconciliations must be repeated regularly to keep drug lists up-to-date	The transition from the paper-based to the electronic system can thus lead to unintended changes in the patient's medication treatment if these discrepancies are not resolved before implementation.

strategy. Finally, a critical appraisal of the individual sources of evidence was not conducted, as this was not appropriate for the purpose of the scoping review, as defined in the PRISMA-ScR checklist (19).

3.1. Preventive strategies related to the multi-professional team

Auvinen and colleagues, in their study, support the importance of the multi-professional evaluation of therapeutic plans by doctors, nurses, and pharmacists to implement a synergy to improve the management of the therapeutic process, ensuring patient safety (21). The intervention chosen to evaluate the proposed strategy is the Finnish Interprofessional Medication Assessment (FIMA), based on multi-professional collaboration and designed to optimise the number of drugs the patient takes. Thanks to this intervention, it was possible to appreciate the reduction of various side effects and the decrease in the probability of patients taking potentially inappropriate drugs. The study by Sorensen and colleagues also obtained very encouraging data following the intervention of the multi-professional home care team (22). Through the collaboration with the nurses responsible for home care, the multi-professional team performed therapeutic reconciliation alongside therapeutic education interventions for patients and caregivers. The data testify that 92% of the interventions implemented have improved the assistance provided to the patient, with a reduction in adverse drug events and an improvement in the management of the therapeutic regimen. Finally, in support of what has been stated, the study by Toivo and colleagues (23) shows that implementing a multi-professional team in evaluating the therapeutic plan can contribute to reducing the number of drugs taken by the patient and the risk of error. The study involved 129 patients divided into two groups. The experimental group received an initial evaluation of the therapeutic plan by the nurse responsible for the patient's home care, who shared any problems with the multi-professional team [doctors and pharmacists] to identify the best intervention. The results showed that: in 45.5% of cases, no drug-related risks were identified which would require a review of the treatment plan; 29.6% of the patients required a revision of the therapeutic prescriptions; 63% required adequate treatment reconciliation, and 7.4% needed a complete review of the treatment plan. Finally, in the intervention group, following the multi-professional evaluation, the number of drugs decreased from 14.1 to 13.5, while in the control group, it increased from 12.7 to 13.
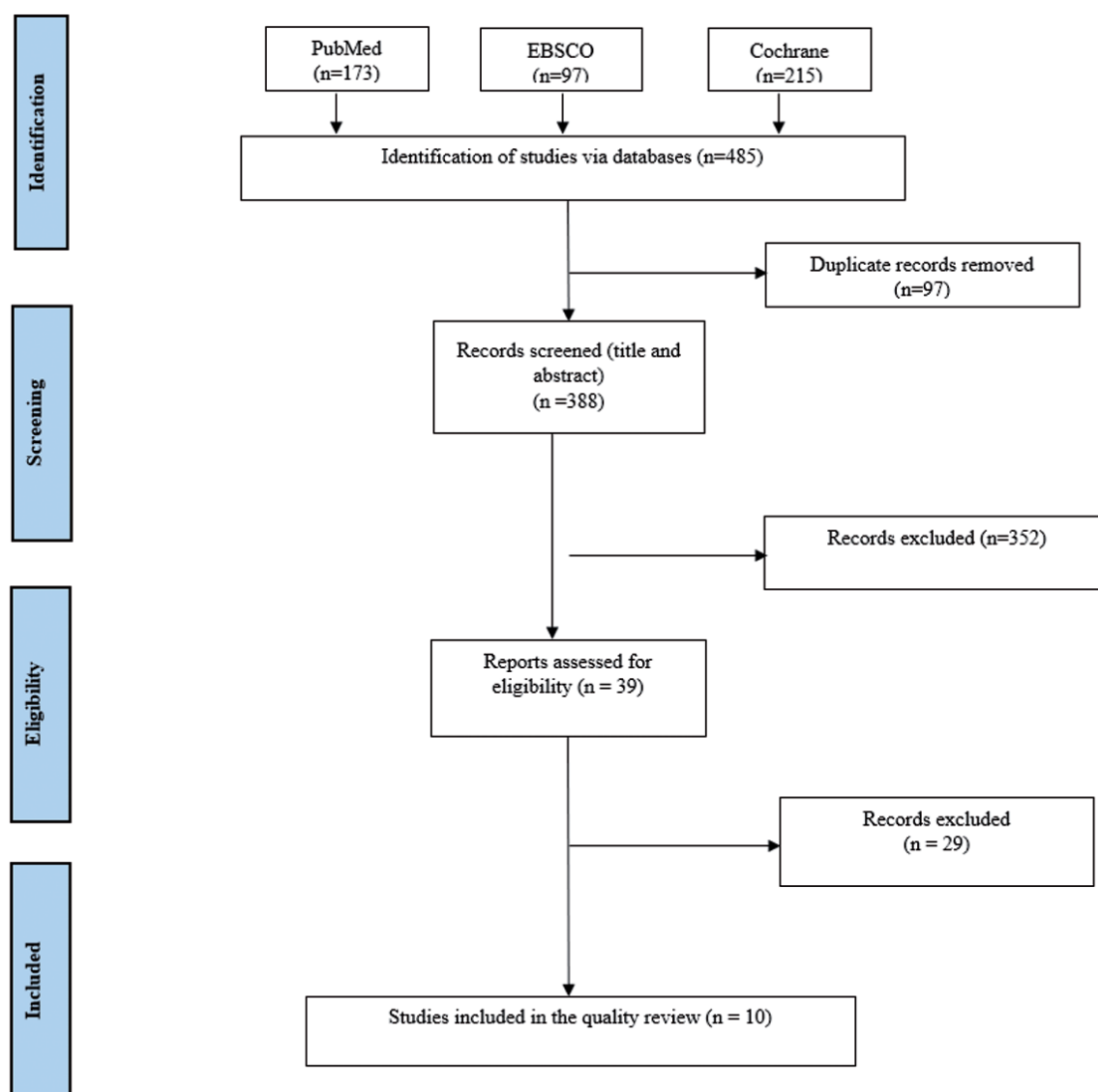
Figure 1 - PRISMA Flow diagram

3.2. Preventive strategies related to the pharmacist intervention

Within the multi-professional team, the importance of the role played by the pharmacist in evaluating the therapy is the object of interest of the studies by Brito (24) e and Clark and colleagues (25). The latter has estimated that the pharmacological reconciliation implemented by the multi-professional team, with the support of the pharmacist, reduces medication errors in the home care setting. Out of 1,263 reports of problems associated with drug therapy, the team solved: 421 through visits to patients' homes, 261 through telephone interventions with the patient and 323 by collaborating with the multi-professional team (26).

The study by Slugget and colleagues emphasises the importance of the pharmacist's contribution to drug reconciliation, evaluating the patient's therapeutic history, thanks to the information obtained from the home care nurses and the general practitioner (26). In the specifics of the intervention, the authors include, in addition to the pharmacist's role, the assessment of each patient's ability to self-manage their therapeutic regimen to adapt a plan aligned with the person's health literacy level.

Even Naunton & Peterson, in their study, argue that to reduce home medication errors of elderly patients, the presence of the pharmacist in the multi-professional team is essential (27). The study evaluated

the impact of home follow-up visits by nurses and pharmacists. These visits were aimed at educating patients on the characteristics of the drugs, supporting their therapeutic compliance and evaluating all patient problems related to drug therapy. The study results showed that 90 days after the follow-up visit, there was a decrease in issues related to drug therapy and increased patient adherence to treatment.

3.3. Preventive strategies related to the use of computerised systems

The use of computerised systems as an error prevention strategy was investigated by 3 of the studies deemed pertinent.

In 2010, Johansson and colleagues conducted an observational study recruiting 15 home care nurses to evaluate the implementation of a *medical decision support system* (MDSS), the LIFE-reader® consisting of a barcode reader of therapy (28). This tool implements a genuine automated therapeutic reconciliation, showing the patient's therapeutic profiles, reporting possible interactions between drugs, therapeutic duplications and alert messages for unsuitable medications for the patient's clinical situation. Thanks to the LIFE-reader® tool, nurses have identified 11 therapeutic duplications, received 125 reports of inappropriate medications and intercepted 58 drug interactions.

The study conducted in 2019 by Wang and colleagues provided therapeutic reconciliation by the pharmacist through the computerised tool "*PharmaCloud System*" (29). Postoperatively, the number of medications the patient took decreased 1.89 times ($p < 0.001$), with a 19.9% reduction in drug interactions. These data testify to the good impact that a technological system can have on the safety of care and patients.

Finally, the study by Josendal and colleagues evaluates the effect of the eSML (*electronically shared medication list*), i.e. the electronic updating of therapeutic prescriptions (30). Specifically, this list, which shows the drugs used by the patient, is visible to the various professionals (in charge of the user) but can be modified and used for prescription only after the general practitioner has approved the treatment plan. Therefore, the eSML is a list of the therapy that the patient assumes, a complete and shared tool between the various actors. Use in the pre-post study demonstrated the reduction of therapeutic discrepancies, reducing them from 383 to 122 ($p < 0.001$).

4. Discussion and conclusions

Considering therapeutic discrepancies, drug interactions and the inadequacy of particular categories of drugs that patients have to take at home, one of the main error prevention strategies shared in most of the studies is therapeutic reconciliation (21,22,24-27). The nurse and pharmacist can conduct this process together, using computerised supports, which allow information to be obtained in real-time regarding the patient's clinical history, therapeutic plans and patient diagnostic profiles, getting answers and comprehensive solutions that improve continuity of care and patient safety (30).

A further and fundamental preventive strategy identified concerns the evaluation of the patient's drug therapy by the multi-professional team. Specifically, this affects the implementation of care teams involving figures such as general practitioners, pharmacists, nurses, physiotherapists, geriatricians, speech therapists and other health professionals. Several authors have followed this line (21,23-26). The *quid* behind the importance of this strategy is the possibility of implementing global patient management, carrying out detailed assessments from every medical, specialist and assistance point of view, and implementing synergistic interventions aimed at all for the same purpose: the patient's safety.

Health education interventions are another essential strategy for preventing medication errors in the home setting. In particular, the study by Sluggett emphasises the importance of calibrating one's therapeutic intervention based on the person's ability to understand (26). Therefore, if the healthcare professional involved in the assessment of the patient's cognitive levels assumes that this parameter does not reach a value sufficiently adequate, he can autonomously decide to involve the formal or informal caregiver who takes charge of daily health assistance to protect the health and safety of the patient himself about taking medicines (31).

The primary objective to be achieved, therefore, within this particular healthcare delivery system, such as the home one, is certainly to improve the safety of the care that the patient receives and to reduce the incidence with which medication errors tend to register themselves in the homes of the assisted persons (32).

The authors are conscious of the limits of this review. First of all, the setting analyzed in conducting this research. The home care setting is still under-studied for patient safety approaches and strategies by

experts. Furthermore, to our knowledge, it is possible to find only a few systematic reviews or primary studies specific to this context. All of these reasons contribute to the necessity of analyzing the efficacy of the strategies elevated in this research.

Although the international literature exploring the prevention of *medication errors* is rich in studies conducted within hospital settings, with particular attention to intensive settings (17,33), the literature shows a probable change of trend, shifting the attention of researchers in primary care and home care settings. As evidenced by the studies included, no univocal educational intervention or preventive strategy reduces the risk of making a medication error. It would therefore be desirable that health professionals not only were constantly updated concerning their knowledge but also understood the importance of introducing the aforementioned preventive strategies to guarantee, even at the patient's home, safe assistance that protects the person from therapy failure (34).

Finally, new studies that assess the outcomes from the practical application of specific preventive strategies and educational interventions, would contribute to evaluate efficiency, offering new ideas for research and analysis to achieve the main objective of every health action, i.e., the protection of the health and safety of patients.

Riassunto

La prevenzione degli errori terapeutici in ambito domiciliare: una scoping review

Background. I cambiamenti nei bisogni sanitari, sociali e demografici impongono nuovi approcci alle cure e all'assistenza senza rinunciare alla sicurezza dei pazienti. Sebbene diversi studi abbiano analizzato l'approccio e le strategie per la sicurezza del paziente, la letteratura che considera l'ambito dell'assistenza domiciliare sembra essere ancora scarsa. L'analisi del fenomeno degli errori terapeutici in ambito di cure primarie evidenzia la necessità di esplorare le variabili specifiche per comprendere come prevenire o ridurre il verificarsi di un errore terapeutico, nel contesto domiciliare. Questa revisione indaga le principali strategie preventive attuate a domicilio del paziente per prevenire e/o limitare la possibilità di un errore terapeutico.

Disegno dello studio. La scoping review è stata condotta secondo la dichiarazione PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) e sulla base delle linee guida del Joanna Briggs Institute.

Metodi Al fine di ottenere risultati quanto più complete, non è stato fissato alcun limite di tempo o di lingua. Sono stati interrogati i seguenti database: PubMed, Cochrane, CINAHL, ERIC e PsycINFO tramite EBSCO. Tutta la letteratura pubblicata fino al 31 dicembre 2022 è stata considerata per la raccolta e l'analisi dei dati.

Risultati. Le principali strategie preventive attuate a domicilio del paziente per prevenire un errore terapeutico sono: team multidisciplinari, riconciliazione terapeutica e sistemi computerizzati che migliorano la condivisione delle informazioni. Come evidenziato da tutti gli studi inclusi, nessun intervento educativo o strategia preventiva riduce individualmente il rischio di commettere un errore terapeutico.

Conclusioni. Sarebbe auspicabile che gli operatori sanitari fossero costantemente aggiornati in merito alle proprie conoscenze e comprendessero l'importanza di introdurre le suddette strategie preventive per garantire un'assistenza sicura che tuteli la persona da errori terapeutici anche a domicilio.

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