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Medication errors committed by patients assisted by pharmaceutical care in health care units in Curitiba

Erros de medicação cometidos por pacientes assistidos por consultas farmacêuticas em unidade de saúde de Curitiba

Errores de medicación cometidos por pacientes asistidos por consultas farmacéuticas en una unidad de salud de Curitiba

Paulo Henrique Gouveia[1], Linda Tieko Kakitani Morishita[2], Amélia Luza[3], Caroline Fournier Testoni[3], Cristiane da Silva Paula de Oliveira[3], Gisele Dutra da Silva[2], Yanna Dantas Rattmann[3].

ABSTRACT

Objective: To investigate medication errors committed by users of Primary Health Care in Curitiba, Paraná. **Methods:** This was a descriptive and retrospective observational study. Data were collected from electronic medical records and pharmaceutical consultation forms of patients seen at three Health Units between July and December 2021. The variables of interest were the number of patients assisted, sociodemographic profile, treated diseases, frequency of medication errors, and types of errors committed. **Results:** Among the 116 patients assisted, the majority were female (54.3%), aged between 61 and 70 years (34.5%), white (77.6%), with complete secondary education (26.7%), and undergoing treatment for type 2 Diabetes Mellitus (98%). Of this total, 83% committed some type of medication error. The most frequent errors were dose omission (45%), improper storage (32%), and incorrect administration frequency (17%). **Conclusion:** Most of the errors involve poor pharmacotherapy management by the users, highlighting the need to intensify health team actions in providing guidance to patients regarding medications. The development of strategies to support patients in managing their pharmacotherapies is proposed, along with the recognition of the pharmacist as a key professional in the management of users' pharmacotherapeutic care.

Keywords: Medication errors, Pharmacotherapy, Medication management, Primary health care.

RESUMO

Objetivo: Investigar erros de medicação cometidos por usuários da Atenção Primária de Saúde de Curitiba, Paraná. **Métodos:** Deu-se através de estudo observacional descritivo e retrospectivo. Dados foram coletados de prontuários eletrônicos e formulários de consultas farmacêuticas de pacientes atendidos em três Unidades de Saúde, entre os meses de julho e dezembro de 2021. As variáveis de interesse foram o número de pacientes atendidos, perfil sociodemográfico, doenças tratadas, frequência de erros de medicação e tipos de erros cometidos. **Resultados:** Dentre os 116 pacientes atendidos predominou-se o sexo feminino (54,3%), com idades entre 61 e 70 anos (34,5%), brancos (77,6%), com ensino médio completo (26,7%) e em tratamento contra o Diabetes Mellitus tipo 2 (98%). Deste total, 83% cometeram algum erro de medicação.

[1] Centro Universitário Internacional (UNINTER), Curitiba - PR.
[2] Secretaria Municipal de Saúde de Curitiba (SMS - Curitiba), Curitiba - PR.
[3] Universidade Federal do Paraná (UFPR), Curitiba - PR.

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Os erros mais frequentes foram omissão de doses (45%), armazenamento incorreto (32%) e frequência de administração incorreta (17%). **Conclusão:** A maioria dos erros envolve a má gestão da farmacoterapia pelos usuários, necessitando-se intensificação das ações da equipe de saúde no repasse de orientações aos pacientes com relação aos medicamentos. Propõe-se o desenvolvimento de estratégias que auxiliem os pacientes no gerenciamento de suas farmacoterapias, além da valorização do farmacêutico como profissional chave no gerenciamento do cuidado desta farmacoterapia dos usuários.

Palavras-chave: Erros de medicação, Farmacoterapia, Gestão da medicação, Atenção primária a saúde.

RESUMEN

Objetivo: Investigar errores de medicación cometidos por usuarios de la Atención Primaria de Salud de Curitiba, Paraná. **Métodos:** Se trató de un estudio observacional descriptivo y retrospectivo. Datos fueron recolectados de historias clínicas electrónicas y formularios de consultas farmacéuticas de pacientes atendidos en tres Unidades de Salud, entre los meses de julio y diciembre de 2021. Las variables de interés fueron el número de pacientes atendidos, perfil sociodemográfico, enfermedades tratadas, frecuencia de errores de medicación y tipos de errores cometidos. **Resultados:** Entre los 116 pacientes atendidos predominó el sexo femenino (54,3%), con edades entre 61 y 70 años (34,5%), personas blancas (77,6%), con enseñanza secundaria completa (26,7%) y en tratamiento para la Diabetes Mellitus tipo 2 (98%). De este total, el 83% cometió algún error de medicación. Los errores más frecuentes fueron omisión de dosis (45%), almacenamiento incorrecto (32%) y frecuencia de administración incorrecta (17%). **Conclusión:** La mayoría de los errores involucra una mala gestión de la farmacoterapia por parte de los usuarios, siendo necesaria la intensificación de las acciones del equipo de salud en la transmisión de orientaciones a los pacientes con relación a los medicamentos. Se propone el desarrollo de estrategias que ayuden a los pacientes en la gestión de sus farmacoterapias, además de la valorización del farmacéutico como profesional clave en la gestión del cuidado de dicha farmacoterapia de los usuarios.

Palabras clave: Errores de medicación, Farmacoterapia, Gestión de la medicación, Atención primaria de salud.

INTRODUCTION

According to Kastner M, et al. (2018), chronic non-communicable diseases show a high level of management difficulty by patients and their caregivers. They are multi-factorial diseases that represent a huge challenge for health systems, given their great economic cost and their high chances of resulting in disabilities and deaths. Studies developed by Santschi V, et al. (2012) and Rotta, I et al. (2015) demonstrate an improved adherence to pharmacotherapy among patients who underwent pharmaceutical consultations and monitoring, with significant reductions in blood pressure, glycemia, total cholesterol and body mass index.

Pharmaceutical consultations have been greatly encouraged in Primary Health Care, due to the need to collaborate with the longitudinality of care for users, especially those with chronic diseases and polymedicated. In this sense, it is important to highlight that the Strategic Action Plan for Confronting Chronic Diseases and Non-Communicable Injuries 2021-2030, of Brazil's Ministry of Health, in its Comprehensive Health Care Axis, proposes, among other measures, [to]:

> *Promote the qualification and expansion of the clinical-care performance of health professionals, with an emphasis on doctors, nurses and pharmacists, through the development, enactment and implementation of care lines, guidelines and clinical protocols for Chronic Non-Communicable Diseases (NCDs) - Arterial Hypertension, Diabetes Mellitus, obesity, Cervical Cancer and Breast Cancer (BRZIL'SMINISTRY OF HEALTH, 2020).*

As cited by Mekonnen AB, et al. (2016), it is possible to recognize that pharmacists, alongside other professionals, share the responsibility for caring for the health of users. As professionals who are involved with medications, they can collaborate to provide the most effective, safe and rational treatment at an affordable cost to the patient, with lower risks of medication errors, fewer drug interactions and better management of

adverse reactions that discourage adherence to the therapy prescribed by doctors. In the Basic Health Units (referred to as UBS, in Portuguese) of the city of Curitiba, in the state of Paraná, Brazil, the work of the pharmacist occurs through their insertion into the health teams called Expanded Family Health Centers (NASF, in Portuguese), created by Brazil's Ministry of Health in 2008 with the goal of supporting the consolidation of basic care in the country (Ministry of Health, 2008).

According to the Ministry of Health itself (2017), in this team, the pharmacist contributes to all stages involving the medication, from its selection to the analysis of its use by an individual and the community. In Curitiba, the pharmacist is considered a professional who provides strategic support to PHC and their priority is the coordination and support of care for patients with chronic health conditions, among other services and care provided to the population.

According to the World Health Organization (WHO). (2017), medication errors include any preventable event that, in fact or potentially, can lead to the inappropriate use of medication, regardless of whether the medication is under the control of health professionals or the patient at the time of its administration. In addition, the Organization also points out that medication errors are among the main causes of preventable harm to health. These errors can result in very serious harm and death and can cause high costs to health systems around the world.

According to Borba AKOT, et al. (2019), these medication errors can occur at various stages involving professional practice and the use of medications, including prescription, preparation, labeling, packaging, dispensing, administration, patient education, monitoring, and use of medications. An important strategy to ensure the safety of medication use involves observing five factors: the use of the right medication, for the right patient, in the right dosage, in the right route of administration, and at the right time.

Therefore, identifying and reducing medication errors are relevant strategies for Primary Health Care (PHC), since, as pointed out by Kastner M, et al. (2018), this action enables better therapeutic results and a consequent reduction in hospitalizations and early deaths of chronic patients. However, Moreira TA, et al. (2020) and Santos ACS, et al. (2021) indicate that studies at this level of care are still scarce, being of extreme importance to implement knowledge about the rational use of medication, in order to meet the clinical needs of the individual without causing any harm. In view of this perspective, it is necessary to investigate medication errors committed by PHC users in Curitiba in order to indicate interventions and strategies that result in minimizing these errors and achieving successful therapy.

METHODS

This is an observational, descriptive, retrospective study with a quantitative approach. Data were collected from electronic medical records in the electronic system used by the Municipal Secretariat of Curitiba (E-saúde) and from pharmaceutical consultation forms. These forms contain information relevant to pharmaceutical consultations, including medication errors committed by users treated at Health Units in the city of Curitiba. These users are people who are treating chronic diseases and were referred for pharmaceutical consultations by other health professionals or whosought said service on their own.

This study is retrospective and includes secondary data from pharmaceutical consultations that occurred between July 1st and December 31st, 2021, carried out in three Health Units of the Boa Vista Health District in Curitiba, chosen for convenience. The variables of interest for the study refer to the total number of patients seen in consultations during the determined period of time, the socio-demographic profile of patients, the diseases treated, the number of users who committed a medication error, and the errors identified. It is important to highlight that the data regarding socio-demographic characteristics (sex, age, skin color, and education) were tabulated taking into account categorical groups that already existed in the municipality's electronic medical record system.

Medication errors were distributed into the following categories, as available in the standardized Pharmaceutical Consultation Form in the local PHC: Omission of doses (underdosage) by the patient; Addition of doses (overdosage) by the patient; Incorrect administration technique by the patient; Incorrect

homogenization and application of insulin; Incorrect pharmaceutical form or route of administration; Incorrect frequency or time of administration; Incorrect duration of treatment followed by the patient; Inappropriate discontinuation of the medication by the patient; Inappropriate continuation of the medication by the patient; Abrupt reduction of dose by the patient; Failure to initiate treatment; Abusive use of medication; Improper self-medication; Other administration or adherence problems; or no error committed.

The collected data were tabulated and processed using the Excel® program. Descriptive statistics tools, such as absolute and relative frequencies, were used for comparisons. The study was approved by the Research Ethics Committee of the Federal University of Paraná - Health Sciences Sector - opinion number 5.091.570 (CAAE: 50953621.0.0000.0102), and by the Research Ethics Committee of the Municipal Health Department of Curitiba - Municipal Government of Curitiba, opinion number 5.421.462 (CAAE: 0953621.0.3001.0101).

RESULTS

A total of 116 patients were seen in pharmaceutical consultations in the three Health Units during this study's period. The socio-demographic characterization of this population showed a predominance of females in the consultations (54.3%). The predominant age group was between 61 and 70 years of age (34.5%). The lowest number of consultations was recorded among the age groups of 81 to 90 (3.4%) and 30 to 40 years (2.6%), as shown in (**Table 1**). Regarding skin color, 77.6% identified themselves as white, 7.8% as mixed race, 4.3% as Asian, and 2.6% as black. It was observed that for 7.8% of the patients, there was no record of their skin color. Regarding education level, most patients completed high school (26.7%) or elementary school (25%) (**Table 1**).

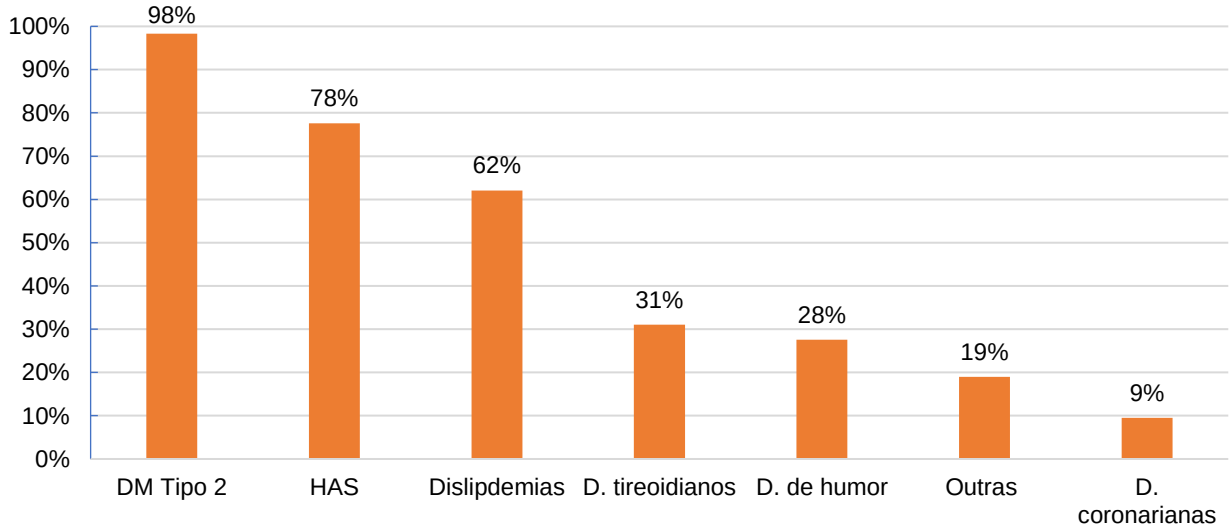
Table 1 - Socio-demographic characterization of patients seen in pharmaceutical consultations at the three Health Units of the Boa Vista Health District in Curitiba between July and December 2022.

Characteristic	N	%
Sexo		
Female	63	54,3%
Male	53	45,7%
Total	116	100%
Age (in years)		
30 to 40	3	2,6%
41 to 50	23	19,8%
51 to 60	23	19,8%
61 to 70	40	34,5%
71 to 80	23	19,8%
81 to 90	4	3,4%
Total	116	100%
Skin color		
White	90	77,6%
Mixed race	9	7,8%
Asian	5	4,3%
Black	3	2,6%
N.I.	9	7,8%
Total	116	100%
Education		
Illiterate	5	4,3%
Incomplete E.S.	23	19,8%
Complete E.S.	29	25%
Incomplete H.S.	12	10,3%
Complete H.S.	31	26,7%
Incomplete H.E.	6	5,2%
Complete H.E.	7	6%
N.I.	3	2,6%
Total	116	100%

Note: that: E.S. = Elementary School; H.S. = High School; H.E. = Higher Education; N.I.= Not informed. **Source:** Gouveia PH, et al., 2025.

The most prevalent clinical condition among patients who underwent pharmaceutical consultations was type 2 Diabetes Mellitus (98%), followed by Systemic Arterial Hypertension (SAH) in 78% of cases, and dyslipidemia in 62%. Thyroid disorders, mood disorders (e.g. depression and anxiety), coronary disorders, among others, appear in a smaller proportion (**Figure 1**).

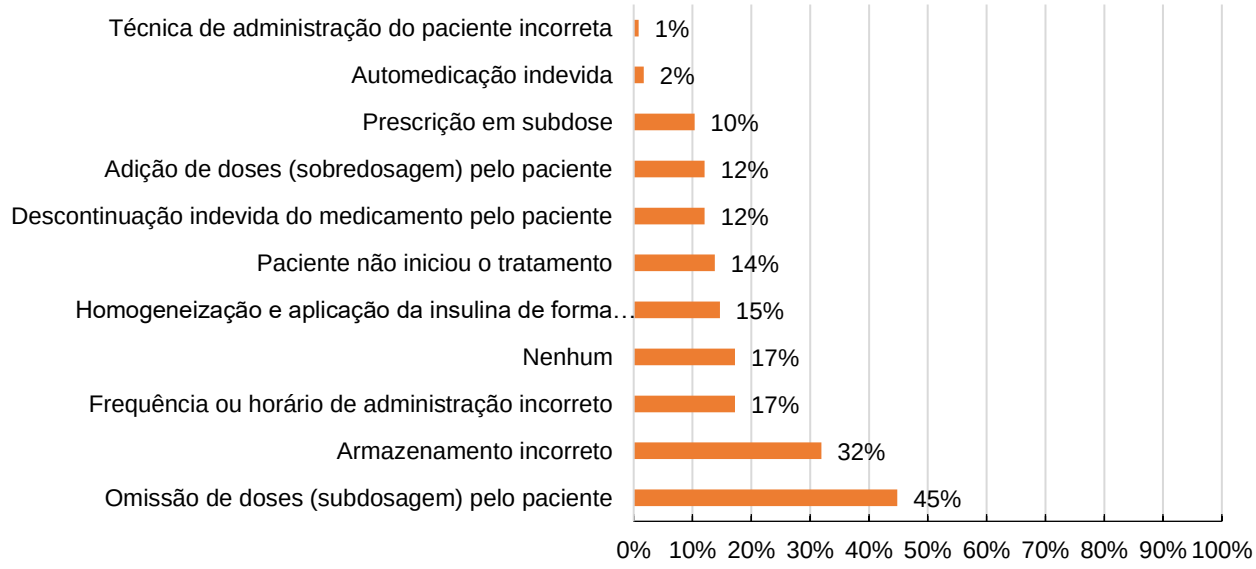
Figure 1 - Prevalence of diseases being treated by patients seen in pharmaceutical consultations at the three Health Units of the Boa Vista Health District in Curitiba between July and December 2022.



Source: Gouveia PH, et al., 2025.

Regarding the errors committed by patients, of the sixteen types of total errors investigated, eleven were committed by the study population (**Figure 2**).

Figure 2 - Medication errors committed by patients seen in pharmaceutical consultations at three Health Units in the Boa Vista Health District in Curitiba between July and December 2022.



Note: Seventh line = Incorrect homogenization and application of insulin. **Source:** Gouveia PH, et al., 2025.

DISCUSSION

The most frequent error among patients was omission of doses (45%). The causes vary, with insufficient knowledge of the disease, difficulties in handling medications and low level of education standing out, with

49.1% of the users treated having at most elementary education, including those with incomplete elementary education and illiterate. Such data found are in line with the work of Silva (2019), showing that all these reasons can be exacerbated when associated with polypharmacy therapies, in which polymedicated patients are not able to adequately manage their own medications, leading to the omission of doses during treatment. Other errors identified, such as incorrect frequency or times of administration (17%) and the addition of doses (12%) can also be correlated with the causes previously mentioned, and may be enhanced by the vulnerability of lack of education or polymedication.

A study by Gerlack LF. (2016) showed that 10.2% of Primary Health Care patients in a city in the Brazilian Midwest reported difficulty in recognizing different tablets, especially when dealing with medications with the same shape and color. This can compromise the therapeutic self-management of the medication, leading to confusion about the times and frequency of taking the medication, resulting in forgetfulness or even incorrect management of the dosage of the doses - under or overdosage - and incorrect timing. In regards to the storage of the medications, 32% of the patients presented errors in this process.

In 15% of the cases, the incorrect storage involved insulin. Such data corroborate what was proposed by Gerlack LF. (2019) and can imply in the loss of effectiveness and safety of the medications, which compromises the treatments and causes harm to the health of the users. It is noteworthy that, in some cases, this information is not passed on to the patients or is provided incorrectly, either at the time of prescribing or even at dispensing. It is important to involve the entire healthcare team in providing information regarding storage and technique for taking and/or applying medication correctly, ensuring the patient fully understands the process. Failure to initiate treatment and inappropriate discontinuation of treatment were highlighted in the current study, as they were committed by 14% and 12% of patients, respectively.

According to Silva MAL (2019), the fact that a patient does not initiate the pharmacological treatment prescribed to them, or even abandons it after starting it, may indicate three different situations: a) the patient's disbelief in the benefits of the prescribed treatment, b) the belief that the medications are unnecessary and/or harmful, and c) a certain degree of concern or exposure to the side effects of the medications. For all these arguments, it is necessary to invest time during the prescription and/or dispensing process to reinforce information regarding the safety and efficacy of the medication treatment and to solve any doubts patients may have regarding their pharmacotherapy.

Empowering patients to be aware of their clinical conditions and pharmacotherapy management can contribute to reducing these two errors. In addition, it is also important to adapt the pharmacotherapy to the patients' conditions of access to the medications. Prescriptions should always be based on medications that can be provided by components of the Pharmaceutical Assistance in SUS (Brazil's Unified Health System) or taking into account the social conditions, purchasing power and financial situation of patients to increase the level of adherence, encouraging both the initiation and maintenance of pharmacotherapy.

Self-medication was recorded in 2% of cases. This is a relatively low value when compared to the study by Gerlack (2016), which found 42.1% of records with some report of improper self-medication. Among other factors, the practice of improper self-medication according to Gerlack, LF (2016), Santos, ACS (2018) and Portela, AS et al. (2012) has been related to the risk of exposure to ineffective and unsafe treatments, and with an increased chance of potentially harmful drug interactions. Underdose prescriptions appeared in 10% of cases. Although this is not a specific patient error, its occurrence puts the rational use of medications by users at risk. Medical prescription is one of the fundamentals that must be taken care of in order to achieve rational use.

Portela AS, et al. (2012) and Zanetti MOB, et al. (2012) state that the national drug policy considers prescription problems as major obstacles to the safe and rational use of drugs, since the lack of important information in the prescription can favor the emergence of ineffective treatments and therapeutic harm. Encouraging prescriptions with a lower degree of errors is something that must be constantly carried out with the prescribing professionals of the health team. Considering all the errors identified and analyzed, it is interesting to mention two strategies that can be practiced by health teams to optimize the use of medications.

These strategies involve specific protocols and are presented in the studies by Silva MAL. (2019) and Campos RTO, et al. (2014): Autonomous Medication Management (also known as GAM) and the Million Hearts Program, with GAM being used for mental health services and Million Hearts for Medication Services involving Arterial Hypertension. According to Campos RTO, et al. (2014), GAM is a strategy for changing power relations to ensure that users effectively participate in decisions regarding their treatments, which presupposes that dialogue and exchange between the actors involved in mental health care are fundamental. With the support of printed material (GAM Guide), the proposal is that users have access to information about their treatments and thus can claim their rights, discussing the place that medications and other practices occupy in their lives, reflecting on their social networks and quality of life.

Furthermore, it is based on the principle that the decision regarding the best treatment is made through a combination of the knowledge of the user and the reference team, in a shared management of care, and that the exercise of co-management engenders processes of patient autonomy. In this sense, it seems promising that discussions could be proposed about the role of medications in the lives of all patients who follow drug therapies, not only in mental health cases. A greater understanding on the part of health teams and users themselves about medication management and the impact it can have on their lives can contribute to greater adherence and rational use of medication through patient empowerment and self-management.

According to Silva MAL. (2019), the Million Hearts Program reports that high adherence to antihypertensive medication leads to greater chances of controlling blood pressure, while non-adherence to medication increases the patient's risk of death from 50% to 80% in this context. For the Program, it is important to help improve medication adherence among its patients, encouraging them to use adherence tools, such as a) pill boxes for the day of the week or mobile applications; b) combining medications with the patient's daily routine; c) knowledge of prescription instructions and d) provision of booklets on websites for reading and additional information. These suggestions can change patients' behavior, being a positive reinforcement for the proposed adherence.

It would be possible to extrapolate these strategies for adherence to pharmacotherapy to at least all medications for chronic conditions, and not only for cases of arterial hypertension. The strategies mentioned can be adapted and encouraged by health teams alongside their patients with chronic diseases to increase safe adherence to pharmacotherapy. At the heart of the discussion regarding the use of medication, we have the pharmaceutical professional as a key player in the articulation of the team and users of the Health System. According to Brazil's Ministry of Health (2014), one of the goals of the National Pharmaceutical Assistance Policy pinpointsthe need to prevent and control the adverse effects of frequent consumption of medications.

As pointed out by Prada YLC. (2019) and Melo DO., and Castro LLC, (2017), programs and services providing guidance on the rational use of medications for SUS users are essential to fulfilling the state's duty to guarantee the health of the population. Moreover, according to the same authors, in Curitiba, specifically, the pharmaceutical clinic service was established in 2014 and, since then, has demonstrated the importance of the pharmaceutical professional in managing and supporting users of the health system in self-managing the use of medication. This professional contributes to the rational and safe use of medications by providing a complete review of the user's pharmacotherapy, managing possible medication errors committed, carrying out surveys, interventions and monitoring corrective actions with patients.

Prada, YLC (2019), however, also presents weaknesses that the pharmaceutical clinic service in the city faces and that compromise assistance to users of the health system. Among these, the following stand out: a) problems in the interaction between pharmacists and other professionals in the health team, b) lack of qualified human resources in pharmaceutical care, c) reduced number of professional pharmacists working in the municipality, without the adequate replacement of professionals since the implementation of the service in 2014 and d) difficulty in reconciling assistance activities and the logistics cycle of the medication, both concomitantly performed by the pharmacist in the PHC.

A paradigm shift is needed regarding the role of the pharmacist within the team, as well as areplenishment of the insufficient number of professionals within the health system. Thus, it is believed that the combination

of user empowerment regarding their pharmacological treatment, the promotion and transfer of correct and reliable information by health teams and the pharmacist as a key professional in the organization and management of all these actions can lead to a significant improvement in the indicators of medication errors committed by patients in PHC.

For the purpose of comparing the results obtained in the current study, searches were carried out in the MEDline, Embase, Scielo and CAPES Periodical Portal databases to obtain national publications from 2017 to 2022. However, no articles were found in this field. Therefore, there was a lack of studies on medication errors committed by patients, involving their own pharmacotherapy management. Only studies on medication errors committed by health professionals when administering medications to patients within health services were found.

It is known that the vast majority of chronic patients manage their pharmacotherapy outside of health services, that is, within their daily routines, far from the reach and direct observation of these services. Therefore, it is important to conduct further research to analyze how this medication management is performed by the patients themselves, analyzing the most frequent errors that occur. In this way, it will be possible to minimize these errors and propose and develop health education strategies alongside health teams to improve the self-management of pharmacotherapy by these patients, within or outside the health services.

CONCLUSION

Based on the results obtained, it was possible to identify that the vast majority of errors involved poor management of pharmacotherapy by patients, raising the issue of the need for greater action by the health team, including pharmacists, to promote and pass on correct and safe information to patients regarding medications.A strategy to achieve this goal could be to adapt existing protocols for all patients who depend on the use of medications. These would be the Autonomous Medication Management (GAM) and the Million Hearts Program, which, taken as a basis, can contribute to improving health education actions carried out by teams with their patients. In addition, the pharmacist is highlighted in the health system as the reference professional in the care and attention to users in the correct management of pharmacotherapy. Promoting actions that better articulate the interaction of this professional with the team, as well as maintaining sufficient staff to meet the system's demand, contribute to reinforcing the importance of the pharmacist's role in the health system as a professional also responsible for promoting care within the health team.Finally, this research contributes with knowledge about medication errors committed by patients and their self-management of medication. This approach has been rare, since the vast majority of recently published studies involve medication errors committed by health teams towards patients. It is important to study how medication management is carried out by patients themselves outside of health services so that, in this way, actions are promoted in order to give users autonomy, care and safety, in addition to the desired therapeutic success.

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