

## The importance of formal education for the medication dispensing process: a cross-sectional study

A importância da educação formal para a dispensação do medicamento: um estudo transversal

La importancia de la educación formal para el proceso de dispensación de medicamentos: un estudio transversal

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### Abstract

**Background:** The dispensing of medications, if performed by professionals who do not have specific knowledge in relation to legislation, health problems, medications, and patient interaction, can result in damage to health. **Objective:** This study aims to assess knowledge about medication dispensing by pharmacists and in the non-pharmaceutical workforce and to compare according to the different levels of formal education received. **Methods:** This is a cross-sectional study carried out in community pharmacies, and in educational institutions that offer the pharmacy technician course in Brazilian municipalities. In employees of community pharmacies who worked directly with the dispensing of medication (pharmacists, pharmacy technicians, and clerks), and in students who will shortly graduate from the pharmacy technician, a questionnaire titled CDM-51 (Questionnaire for the Assessment of Knowledge about Drug Dispensing) was applied. **Results:** 146 employees answered the questionnaire, and 131 students completing the pharmacy technician course participated in the survey. This study showed that there is evidence that pharmacists had a higher score in the CDM-51 than the other participating professional categories. **Conclusions:** This research presents evidence on the importance of training to carry out the dispensing of medications, as in addition to highlighting the role of the pharmacist in this activity, it also promotes the training of professionals at a technical level to assist in the dispensing of medications, thus contributing to the improvement of services offered by community pharmacies.

**Keywords:** Good dispensing practices; Education, pharmacy; Pharmacy technicians; Community pharmacy services.

### Resumo

**Introdução:** A dispensação de medicamentos se realizada por profissionais que não possuem conhecimento específico em relação à legislação, os problemas de saúde, a farmacoterapia e interação com o paciente, pode acarretar em danos à saúde. **Objetivo:** Avaliar o conhecimento sobre dispensação de medicamentos dos farmacêuticos, técnicos em farmácia e balconistas e comparar de acordo com os diferentes níveis de educação formal recebidos. **Métodos:** Trata-se de um estudo transversal realizado nas farmácias comunitárias e em instituições de ensino que ofertam o curso de técnico em farmácia nas cidades brasileiras. O questionário CDM-51 (Questionário para avaliação do Conhecimento sobre Dipensação de medicamentos) foi aplicado nos funcionários das farmácias comunitárias que trabalham diretamente com o processo de dispensação de medicamentos (farmacêuticos, técnicos em farmácia e balconistas), e para os estudantes concluintes do curso de técnico em farmácia. **Resultados:** 146 funcionários e 131 estudantes concluintes responderam o questionário. Encontrou-se evidências de que os farmacêuticos obtiveram um maior escore no CDM-51 do que os demais participantes. **Conclusão:** Este estudo apresentou evidências da importância da educação formal para a realização da dispensação de medicamentos, evidenciando o protagonismo do farmacêutico nessa atividade, bem como salientando a importância do técnico em farmácia nesse processo, contribuindo dessa maneira, para a promoção da qualidade dos serviços ofertados pelas farmácias comunitárias.

**Palavras-chave:** Boas práticas de dispensação; Educação em farmácia; Técnicos em farmácia; Serviços comunitários em farmacia.

### Resumen

**Introducción:** La dispensación de medicamentos realizada por profesionales que no tienen conocimientos específicos sobre legislación, problemas de salud, farmacoterapia e interacción con el paciente puede causar daños a la salud. **Objetivo:** Evaluar los conocimientos sobre dispensación de medicamentos de farmacéuticos, técnicos y auxiliares de farmacia y compararlos según los diferentes niveles de educación formal recibidos. **Métodos:** Este es un estudio transversal ejecutado en farmacias comunitarias y en instituciones educativas que ofrecen el curso de técnico de farmacia en ciudades brasileñas. Se aplicó el cuestionario CDM-51 (Cuestionario para la evaluación del conocimiento sobre la dispensación de medicamentos) a empleados de farmacias comunitarias que trabajan directamente con el proceso de dispensación de medicamentos (farmacéuticos, técnicos y auxiliares de farmacias), y a estudiantes egresados de la carrera de técnico de farmacia. **Resultados:** 146 empleados y 131 estudiantes graduados respondieron el cuestionario. Se encontró evidencia de que los farmacéuticos obtuvieron puntajes más altos en el CDM-51 que otros participantes. **Conclusión:** Este estudio presentó evidencias de la importancia de la educación formal para la dispensación de medicamentos, destacando el papel del farmacéutico en esta actividad, así como destacando la importancia del técnico de farmacia en este proceso, contribuyendo así a la promoción de la calidad de los servicios que ofrecen las farmacias comunitarias.

**Palabras clave:** Buenas prácticas de dispensación; Educación en farmacia; Técnico de farmacia; Servicios comunitarios de farmacia.

## 1. Introduction

Community pharmacies are characterized by offering health services within the scope of primary health care, and that are easily accessible to the population, and therefore it is important that such services are offered with quality in order to promote the correct use of medications (World Health Organization-WHO, 2019). Medication dispensing stands out as an important service to ensure access to medication and to important information for its correct use (WHO, 2019). In Brazil, medication dispensing is characterized as a private act of the pharmacist who, upon presentation of a prescription issued by an authorized professional, provides the medication or other product for the patient's health while informing and guiding on its use, (*Law n. 13021, 2014*). Such an act must follow the principles recommended by the World Health Organization (WHO) in the Tokyo Declaration, which treats this stage of the process of access to medications as something that cannot be reduced to the act of filling a prescription (Organización Pan-Americana de la Salud-PAHO, 1995).

However, in the daily life of Brazilian pharmacies the neglect of this practice in favor of the simple supply of pharmaceutical products is noticed (Leite et al., 2017; Mota et al., 2020; Reis, Guidoni, et al., 2015). Linked to this, it has been observed both in Brazil and in other developing countries, that dispensing, being one of the primary services among the duties of the pharmacist, is commonly performed by other employees such as clerks, who do not have in some cases, technical training for providing the service (Gokcekus et al., 2012; Barker et al, 2016).

It is important to understand that the exercise of dispensing demands competences - knowledge, skills and attitudes - both for the analysis of cognitive aspects involved in the interpretation of the prescription, and for the individual guidance of patients (Angonesi & Horizonte, 2018; Ferreira et al., 2018). In this context, it should be taken into account that all professionals who may be associated with the execution of this activity must present a satisfactory level of knowledge regarding the topics that are involved (Barker et al., 2016; Kurdi et al, 2020). In several developed countries, such as on the European continent, the pharmacy technician can work under the supervision of the pharmacist in the dispensing of medication, corroborating the excellence of the services provided (WHO, 2019). In contrast, in Brazil there is no obligation to train through formal education the non-pharmaceutical workforce working in community pharmacies, with the pharmacist being responsible for training other professionals working in community pharmacies (Resolution n. 44, 2009).

The dispensing of medications, if performed by professionals who do not have specific knowledge in relation to legislation, health problems, medications, and patient interaction, can result in damage to health (Asghar et al., 2020; Kurdi et al., 2020; Brazilian

Health Ministry, 2020). Thus, seeking an understanding of the relationship between professionals who work in community pharmacies (pharmacist, pharmacy technician, and clerk) with the knowledge to carry out the activity, even under the supervision of the pharmacist, is essential for the service quality to be measured and improved. (Gonçalves et al., 2020)

Thus, in view of this context, the objective of this study is to assess knowledge about medication dispensing by pharmacists and in the non-pharmaceutical workforce and to compare according to the different levels of formal education received. The study's hypothesis is that the pharmacist has more knowledge regarding medication dispensing compared to other professionals who work in community pharmacies.

## 2. Methodology

### 2.1 Study Location

This is a cross-sectional study carried out in community pharmacies in the private sector, and in educational institutions in the public sector that offer the pharmacy technician course in 14 small Brazilian municipalities, located in the northeast region of the state of São Paulo/Brazil. This region has a community pharmacy for every 3,550 inhabitants, and public and private educational institutions, which offer Pharmacy undergraduate and pharmacy technician courses. The authors used the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) (Elm et al., 2008) statement for reporting this study.

The calculation of the number of pharmacies to be visited was performed using the number and data (address) of non-compounding pharmacies (n=105) existing in the selected cities, obtained from the Regional Council of Pharmacy (*Conselho Regional de Farmácia - São Paulo, CRF-SP*). The standard deviation (7) and mean score (33.79) were obtained from participants in a previous study that validated the instrument that was used in this study (Gonçalves et al., 2020):

$$n = \frac{z^2_{\alpha/2} N \sigma^2}{d^2 (N - 1) + z^2_{\alpha/2} \sigma^2}$$

Where:

$\sigma$  = standard deviation

d = absolute error (0.05 was used)

N = population size

$\alpha$  = 5 %

$Z^2_{\alpha/5} = 1.96$

Taking into account that according to the sample calculation above, it was necessary to visit 93 community pharmacies; the number of establishments to be visited in each municipality was calculated as follows:

$N = 100\% * 93/105,$

Where:

N = percentage of pharmacies to be visited by city.

After this calculation, the selection of pharmacies that would be visited in each municipality was randomized by means of a previous draw performed manually using the address list of these pharmacies.

In order to find students who will shortly graduate from the pharmacy technician course, this study was also carried out in the two public sector institutions that offer this type of course in that region, which train about 120 graduates annually.

### 2.2 Study population

The study population consisted of employees of community pharmacies who worked directly with the dispensing of medication (pharmacists, pharmacy technicians, and clerks), and who worked in the visited establishments, of both genders

and over 18 years of age; in addition, those who will shortly graduate from the pharmacy technician course at the educational institutions described above were also invited. The established inclusion criteria were employees directly involved in the medication dispensing process and working in private community pharmacies that offer the service of medication dispensing, and students completing the pharmacy technician course at the selected institutions; the exclusion criteria were individuals who present the questionnaire with deletions and/or any data that interferes with the veracity of the information obtained.

### **2.3 Study design**

In the selected sample, a questionnaire titled CDM-51 (Questionnaire for the Assessment of Knowledge about Drug Dispensing) was applied, which was validated in a previous study (Gonçalves et al., 2020). Data collection was carried out from January to November 2016. The variables of interest defined were age, professional category, length of professional experience, academic background, gender, doubts about medications, and knowledge about the dispensing of medications - the score of which is provided by CDM-51, where the higher the score, the greater the knowledge about this construct.

Pharmacies were visited from Monday to Friday from 8:00 am to 6:00 pm. The researcher explained the conditions of the research to the pharmacy owner or manager, and later, when authorized, the invitation was made to all professionals working in the medication dispensing process: the 'practitioners' or clerks, the pharmacy technicians or pharmacy assistants, and the pharmacists.

Professionals from the same company answered the questionnaires individually, and this was guaranteed by the researcher at the collection site. At the time of delivery from the professional to the researcher, the questionnaires were sealed, preserving the identity of the participants.

The pharmacy was visited once, and the invited participants were those present at the time of the visit. In order to avoid a possible selection bias, when the pharmacy was closed at the time of the visit, a second visit was made to the same pharmacy two hours after the first visit. In addition, if requested by a pharmacy employee, the researcher made a second visit to that establishment to encourage participation in the study.

For the application of the questionnaire to the students completing the pharmacy technician course, it was necessary to obtain authorization from the school board before the invitation to these students. The CDM-51 was applied in the last week of class and students completing the pharmacy technician course from 2015 and 2016 were invited to participate in the survey.

### **2.4 Data analysis**

The data obtained were tabulated using the Microsoft Office Excel® program (Office 2013). For descriptive statistics, absolute and relative frequencies (%) were used for categorical variables; in addition, the mean and standard deviation, or median, minimum and maximum were used for quantitative variables.

The Statistical package for Social Sciences® (SPSS) Inc., version 17.1.0, 2008 program was used to perform the statistical analyses. The Analysis of Variance (ANOVA with one factor) was performed in order to assess whether there is evidence that formal education provides a higher score in the CDM-51, and also the Bonferroni test to assess for which group this difference is found. In addition, the results obtained with the other independent variables collected (socioeconomic characteristics, education, and doubts about medications) were compared with the total CDM-51 score using the Student's t test (for categorical independent variables) and the Pearson correlation coefficient (for quantitative independent variables). Furthermore, a simple linear regression was performed to assess the effect of confounding variables (length of experience and age) on the difference in the mean obtained between the different professional categories.

This work was approved by the Ethics Committee for Research Involving Human Beings of the Faculty of Pharmaceutical Sciences of Ribeirão Preto / Brazil, under CAAE number 34.700.514.300.005.403.

### 3. Results

A total of 116 pharmacies were visited, and 81 (93.96 %) managers authorized the participation of their respective pharmacies; 217 employees of these pharmacies were invited to participate in the survey and 146 (67.47 %) answered the questionnaire. In addition, 131 students completing the pharmacy technician course participated in the survey, totaling 277 completed questionnaires.

Most participants were women, and clerks had the highest average length of professional experience, followed by the pharmacist, pharmacy technician, and students completing the course. Evidence of correlation was found between the mean score obtained in the CDM-51 and the age of the participants ( $r=0.202$ ;  $p=0.001$ ) and the length of professional experience of all participants ( $r=0.215$ ;  $p=0.001$ ).

Of the participating pharmacists, 62.7 % ( $n=47$ ) had postgraduate courses; however there was no evidence of an association between the mean score of the CDM-51 comparing pharmacists with or without a postgraduate degree ( $t=-1.745$ ;  $p=0.085$ ), probably because nine (19.15 %) have postgraduate degrees in the field of dispensing medication. In addition, evidence was found that these pharmacists, with a postgraduate degree in dispensing medication, had a higher mean score than the other professionals in this category ( $t=3.529$ ;  $p\text{-value}=0.001$ ; mean difference: 5.444 (95 % CI): 2.370; 8.519). Regarding the level of education of the clerks, it was found that on average, the professionals who participated in the research had studied for 13.07 years (SD 2.91, median 13, minimum eight and maximum 20) (Table 1).

Of all professionals who answered the CDM-51, 125 (85.6 %) reported having doubts about medications, and the majority (84; 67.82 %) of these consulted the Internet and medication inserts (53, 42.4 %) to resolve such doubts. In this context, evidence was found that not “taking up doubts about medications from books” decreases the score by -4.087 (95 % CI -6.755; -1.419) and not “taking up doubts about medications with other professionals” increases the score by 5.675 (95 % CI 2.368; 8.983); i.e., professionals who claim to research in books have an average score in the CDM-51 higher than the others, and professionals who claim to research with other professionals have an average score in the CDM-51 lower than the other professionals (Table 2).

Pharmacists obtained a mean score of 30.65 (SD: 4.68) in the CDM-51, while clerks had an average score of 25.08 (SD: 5.09), pharmacy technicians 25.25 (SD: 5.90), and students completing the course, 23.48 (SD: 5.53) (Table 3).

The ANOVA test showed evidence that there are differences between the scores obtained between the evaluated groups ( $F: 31.45$ ;  $p: 0.001$ ). Bonferroni's post-test confirmed that there is evidence that pharmacists had a higher score in the CDM-51 than the other participating professional categories; however, among the other professional categories (pharmacy technician, clerk, and students completing the course) there was no evidence of difference in the mean obtained in the CDM-51 score (Table 4). In addition, a multiple linear regression model was adjusted to verify the influence of length of experience ( $F: 46.258$ ;  $p: 0.001$ ) and age ( $F: 46.258$ ;  $p: 0.01$ ) on the difference between the scores obtained by the groups in question, and even after this regression, there is still evidence that pharmacists have a higher mean score in the CDM-51 than the other groups evaluated.

### 4. Discussion

The study carried out evidenced the importance of the pharmacist in dispensing, given the fact that the level of knowledge of this professional in relation to aspects necessary for the practice of this service is significantly higher than that of other categories of employees that community pharmacies have for patient care. Previous studies (Agonesi, Rennó, 2011; Albanese et al., 2010; Alencar et al., 2011; Bernardo & Hoepfner, 2016; Correr & Otuki, 2013) have also pointed to this same

result. However, no other study published in the literature has compared through a validated instrument, the level of knowledge of these professional categories and that of those completing the pharmacy technician course to carry out the dispensing.

As with every clinical service performed by the pharmacist, dispensing has a systematized work process that allows the identification of health needs, including problems related to pharmacotherapy, and from this it is possible to plan interventions/conducts and guidance to be provided to the patient. Without the skills formed during the undergraduate course in Pharmacy, there are no conditions for the work process to be properly carried out, nor to properly identify the health needs, considering the uniqueness of the person and the complexity of the health-disease process. (*National Health Service [NHS] Community Pharmacy services - a summary*, 2013; Asghar et al., 2020; Marques et al., 2020; Reis et al., 2015; Reis, 2020).

This of course does not mean that other professional categories are of lesser importance in the context of community pharmacies. On the contrary, pharmacy technicians and clerks are fundamental collaborators in pharmacies so that all users of this establishment are served with quality and equity, according to the health demands presented. With the advent of the pharmaceutical industry in the mid-twentieth century, and the migration of pharmacists to industrial activity, clerks took over the place left by pharmacists in community pharmacies (Correr & Otuki, 2013; Higby & Urick, 2021). Although this has ensured the maintenance of access to the medication, it compromised the promotion of rational use due to the knowledge gaps of the clerk generated by the lack of formal education in this area. When used inappropriately, medication can cause clinical (Lea et al., 2019), humanistic (Abu Farha et al., 2017), and economic harm to people and health systems (Watanabe et al., 2018). However, when working in collaboration with the pharmacist, pharmacy technicians and clerks significantly contribute to the promotion, protection, and recovery of health in pharmacies.

Thus, it is reaffirmed that the pharmacist is the professional who must be technically responsible for offering the service. Patients who will start a medication treatment, who have questions about the use of medication, or suspected problems in pharmacotherapy should be referred to the pharmacist. The screening of these patients can be performed by technicians in pharmacies, and clerks properly trained by the pharmacist. Pharmacy technicians and clerks can also assist in repeat dispensing situations, as long as there is no suspicion of problems or doubts by the patient about the treatment (*NHS Pharmacy Technician*, 2021; Reis, 2020). As the supply of medication is usually carried out by non-pharmacist professionals (Bernardo & Hoepfner, 2016; Correr & Otuki, 2013; Leite et al., 2017), there is the need to reframe the dispensing and reorganize the work process so that the joint action of pharmacists and other employees is effective in obtaining more satisfactory clinical results and quality of life for the medication user.

It was observed that most of the participants in this study were pharmacists, and this can be justified by the fact that Brazilian legislation requires the presence of the pharmacist during the entire period of operation of the pharmacy, but does not mention the need for other employees (Law n. 13021, 2014). In addition, the decline in the invitation to participate in the research, especially by clerks, may have been motivated by the fear of evaluating their own knowledge, reflecting the insecurity and possible unpreparedness of the invited subjects. It is conjectured that the participants do not recognize the importance of research in raising hypotheses and proposing changes in the reality of the health system, which may also be impacting the habit of seeking information regarding medication from sources with better scientific evidence. The lack of formal education is a factor that also compromises this attitude, leading to reduced social involvement in research. This fact can also be explained by the excessive occupation of people and the loss of cultural and ethical values in scientific production, due to the pressure for the number of publications as an indicator of productivity, which compromises the quality of the work developed (Gao et al., 2015; Lino et al., 2010; Tiago et al., 2015).

Age and length of professional experience were factors that positively influenced knowledge for dispensing. A similar situation was previously observed in a study carried out with pharmacists, showing a greater demand for postgraduate courses for recent graduates than for longer term graduates. (Reis et al., 2015) This shows that formal education, although necessary,

may still not be enough to prepare professionals for the practice of dispensing. In Brazil for example, studies have shown that at least three out of four community pharmacists do not have satisfactory knowledge to perform dispensing (Lucchetta et al., 2010; Reis, Guidoni, et al., 2015; Reis, Rocha, et al., 2015; Rodrigues Da Silva & Vieira, 2004; Tomassi & Ribeiro, 2012). Aiming to solve this problem, a curriculum guideline was published in 2017 requiring that half of the course load of the Pharmacy course be based on the health care axis, in a clear attempt to align training with the demands of the health system (Resolution n. 06, 2017; Frenk et al, 2010). It is known that clinical training requires contemplation of four domains, provided for in the Miller's Pyramid: knowledge (knowing), competence (knowing how), performance (showing how) and behavior (doing) (Miller, 1990). Therefore defining guidelines to guide, coordinate, and standardize training in the area is necessary to improve the quality of formal education, as well as to assess the quality of pharmacy courses in Brazil.

In addition to quality formal education, the practice of continuing education also represents a differential in the performance of professionals. Pharmacists with a postgraduate course in the dispensing area achieved higher scores in the CDM-51. A systematic review showed that continuing education programs are effective in training the pharmacist for clinical activities (Obreli-Neto et al., 2016). However, the offer of disciplines and courses exclusively at a distance, as continuing education strategies usually are, is not capable of making the professional able to practice dispensing (dos Reis et al., 2019). In addition, it is worth noting that the postgraduate courses generally carried out by the population in this study are in areas not related to dispensing, which evidently does not train participants for this service (Reis, Guidoni, et al., 2015; Tiago et al., 2015). The search for qualification in unrelated areas can occur due to the lack of motivation to work with dispensing and the search for new opportunities in areas such as industries and clinical analysis, in which the Brazilian professional has more recognition and social prestige.

It is also important to point out that although no differences were found between the scores obtained between pharmacy technicians and clerks, the length of experience of clerks who participated in the survey is about 2.2 times higher on average than that of pharmacy technicians who participated in this study. In addition, the score obtained in the CDM-51 by the students completing the pharmacy technician course, whose experience time is nil or very small, also did not show differences between the clerks; in this way the importance of access to formal training by other employees of community pharmacies is highlighted, given that the pharmacy technician course in Brazil has a workload of 1200 hours spread over 18 months (Official Catalogue of Technician Courses, 2009). In addition, the pharmacy technician course in Brazil is not recognized by the Federal Board of Pharmacy. In the USA, where the course is regulated, the presence of this professional in pharmacies is encouraged through regulatory agencies and certifications (Albanese et al., 2010).

The sources of information most used by research participants are of low quality (Barros, 2000) and little scientific foundation. This same fact was evidenced in previous studies (Baldon et al, 2006; Benedito de França Filho et al., 2008; Farina et al., 2009; Reis et al., 2015; Reis et al., 2015), which may be related to the limited command of the English language which is used in publications with a high level of scientific evidence, or the lack of preparation to search for information in secure primary sources, and of recognized scientific quality (Reis & Rocha, et al., 2015).

As limitations of the study, it is clarified that it was not possible to calculate the number comprising the study population. In Brazil, the legislation determines that there is at least one pharmacist in the pharmacy during the entire period of operation of the establishment, but does not define the need for there to be clerks or pharmacy technicians. In this way, each pharmacy hires the number of employees it deems necessary. The number of pharmacy technicians who participated in the research can also be understood as a limitation. It is noteworthy however, that as the technical course is not regulated in the country, there is no incentive to train these professionals and to hire them to work in community pharmacies.

Although this study did not directly assess the quality of the drug dispensing service, taking into account the knowledge of information necessary to carry out this practice, which was measured using the CDM-51, the highest score in

this instrument is indicative of better quality of dispensing offered by community pharmacies, with regard to professionals trained to provide information and guidance to patients, with a view to the rational use of medicines which is essential for the control of health problems<sup>1</sup>.

In view of these facts, this study presents evidence on the importance of training to carry out the dispensing of medications, as in addition to highlighting the role of the pharmacist in this activity, it also promotes the training of professionals at a technical level to assist in the dispensing of medications, thus contributing to the improvement of services offered by community pharmacies, with a view to promoting the correct use of medications in this health establishment that is easily accessible to the world population.

## 5. Conclusion

It is concluded that pharmacists had greater knowledge about dispensing compared to other employees working in community pharmacies. Thus, the hypothesis is confirmed, showing that formal education in the form of a graduation in Pharmacy provides better preparation for dispensing medication than technical training or service practice dissociated from formal education. It is important in future works to compare the knowledge and skills of a larger sample number of pharmacy technicians and compare them with the clerks to assess whether the technical level of formal education provides better preparation for working in community pharmacy together with the pharmacist.

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