Impact of a drug dispensing model at a Community Pharmacy in Goiânia, Goiás, Brazil

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Although dispensing of medication has been addressed by theoretical models, studies that confirm the impact of this service are still needed. The objective was to evaluate the impact of a new model of medicine dispensing system on patients' medication knowledge, adherence to treatment and satisfaction. One hundred and four patients attending the dispensing service of a community pharmacy between 21 January 2013 and 20 April 2013 were included in this intervention study. The impact of the service on patients' medication knowledge, adherence to treatment and satisfaction was assessed by using validated questionnaires at two time points: at the moment of medication dispensing and 30 days thereafter by telephone contact. Statistical analysis was performed by McNemar's test, and a $p<0.05$ was set as statistically significant. The number of patients showing insufficient knowledge about medications decreased by 50% ($p < 0.05$), and the number of those showing sufficient knowledge was three times greater ($p < 0.05$) after medicine dispensing. A high level of satisfaction was observed. Improvement of medication adherence, however, was not observed. The proposed system model for drug dispensing improved patients' knowledge about medication and satisfaction.

Keywords: Community Pharmacy Services. Outcome Assessment (Health Care). Pharmacies. Patient Medication Knowledge. Patient Satisfaction. Brazil.

INTRODUCTION

In Brazil, similarly to European countries, medicine dispensing is a pharmaceutical practice that comprises dispensing of medication and counseling of patients (Brasil, 1998).

The main objective of drug dispensing practices is to promote an appropriate use of medications and to achieve the expected therapeutic success. They should consider cognitive aspects involved of prescription interpretation and provide the patients with individual guidance. (Angonesi, 2008; Foro de Atención Farmacéutica, 2007).

Several authors from Brazil and countries such as Portugal and Spain have proposed system models for drug dispensing that include both technical and cognitive approaches (Angonesi, Rennó, 2011; Cardoso *et al.*, 2015; Foro de Atención Farmacéutica, 2007; Foro de Atención Farmacéutica, 2008; Soares *et al.*, 2013). However, studies on medication dispensing have mostly focused on facility conditions and processes (Becker *et al.*, 2007; Buurma *et al.*, 2001; Chatsisvili *et al.*, 2010; Indermitte *et al.*, 2007; Sánchez, 2013), and further studies that investigate the impact of drug dispensing and proposed models are still needed.

According to Farris and Kirking (1993), the assessment of pharmaceutical care services, including drug dispensing, should be based on aspects other than clinical outcomes, since the role of the pharmacist in patient's care encompasses more than clinical aspects. In addition to relieving symptoms and improving clinical parameters, the authors emphasize the importance of enhancing patients' awareness about the therapy, adherence and satisfaction with health services.

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Considering the need for understanding the impact of pharmaceutical care provided during medication dispensing on patients, this study evaluated the results of a model proposed for drug dispensing in a community pharmacy in Brazil using three outcome measures: patients' knowledge about medication, adherence to treatment and satisfaction with pharmaceutical services.

METHOD

This was an intervention study performed at the University Pharmacy of the Federal University of Goias. This study was approved by the Research Ethics Committee of the Federal University of Goias (approval number 222/2012) and participants gave written informed consent before taking part.

Subjects

Patients attending the Division of drug dispensing of the University Pharmacy of the Federal University of Goias between 21 January 2013 and 20 April 2013 were considered eligible for the study. The follow-up period was defined based on therapeutical and epidemiological data of patients, who were composed mostly of chronic disease patients, who received their medication from the University Pharmacy for a 90-day treatment period.

Inclusion criteria were attendance at the drug dispensing services, age greater than or equal to 18 years and participants' consent. Exclusion criteria were communication impairment, medication dispensed to individuals other than the patients or their caregivers, missing data in at least one evaluation time point, lack of informed consent.

Setting characteristics

In Brazil, University/Campus Pharmacies are pharmaceutical faciles aimed at drug dispensing and education, run by Pharmacy Schools (Conselho Federal de Farmácia, 2008).

Drug dispensing processes at the University Pharmacy of the Federal University of Goias (Cardoso *et al.*, 2015; Ferreira *et al.*, 2016) are conducted in continuing steps throughout patients receive personal and drug therapy information (Figure 1). This dispensing system model has been implemented in January 2012 in accordance with the National Policy of Pharmaceutical Assistance (Brasil, 2004), previous publications (Angonesi, Rennó, 2011; Foro de Atención Farmacéutica, 2007; Iglésias-Ferreira, 2009; Soares *et al.*, 2013) and current legislation (Brasil, 1973; 2009; Conselho Federal de Farmácia, 2001). After implementation of the system model, standard operating procedures were established.

It is worth pointing out that, since compounding drugs are also dispensed by the pharmacy, not all steps illustrated in Figure 1 are performed in the presence of the patient. Interpretation of prescription, for example, is generally conducted in the interval between the compounding drug order and its dispensing.

Medications were dispensed to patients or their caregivers. Drug prescription was carefully examined for its comformity to Brazilian regulations (Brasil, 1973). Then, the patient was interviewed by a pharmacist regarding personal and therapy-related data: age, sex, height, weight, occupation, allergies and other chronic diseases, use of medications, smoking and drinking habits, pregnancy and lactation. Also, the pharmacist asked whether the patient was aware of the aim of the therapy, how to take the medications, and verified whether expected results of the therapy were being achieved as well as the occurrence of adverse effects. All data were stored in a dedicated software for pharmaceutical data management, Pharmacie (Pharmasoftware, 2013). Finally, the pharmacist interpreted the prescription according to the guideline proposed by the Grupo de Investigação em Cuidados Farmacêuticos da Universidade Lusófona, Portugal, (GICUF) (Iglésias-Ferreira, 2009) (Figure 2).
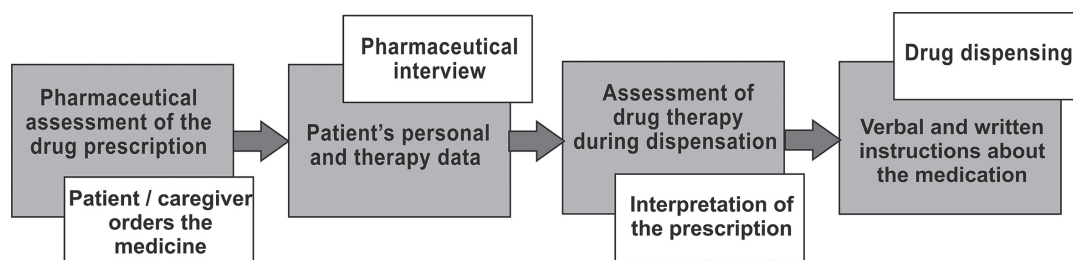
Cardoso *et al.*, 2015

FIGURE 1 – Flowchart of drug dispensing processes routinely conducted at the University Pharmacy of the Federal University of Goias.
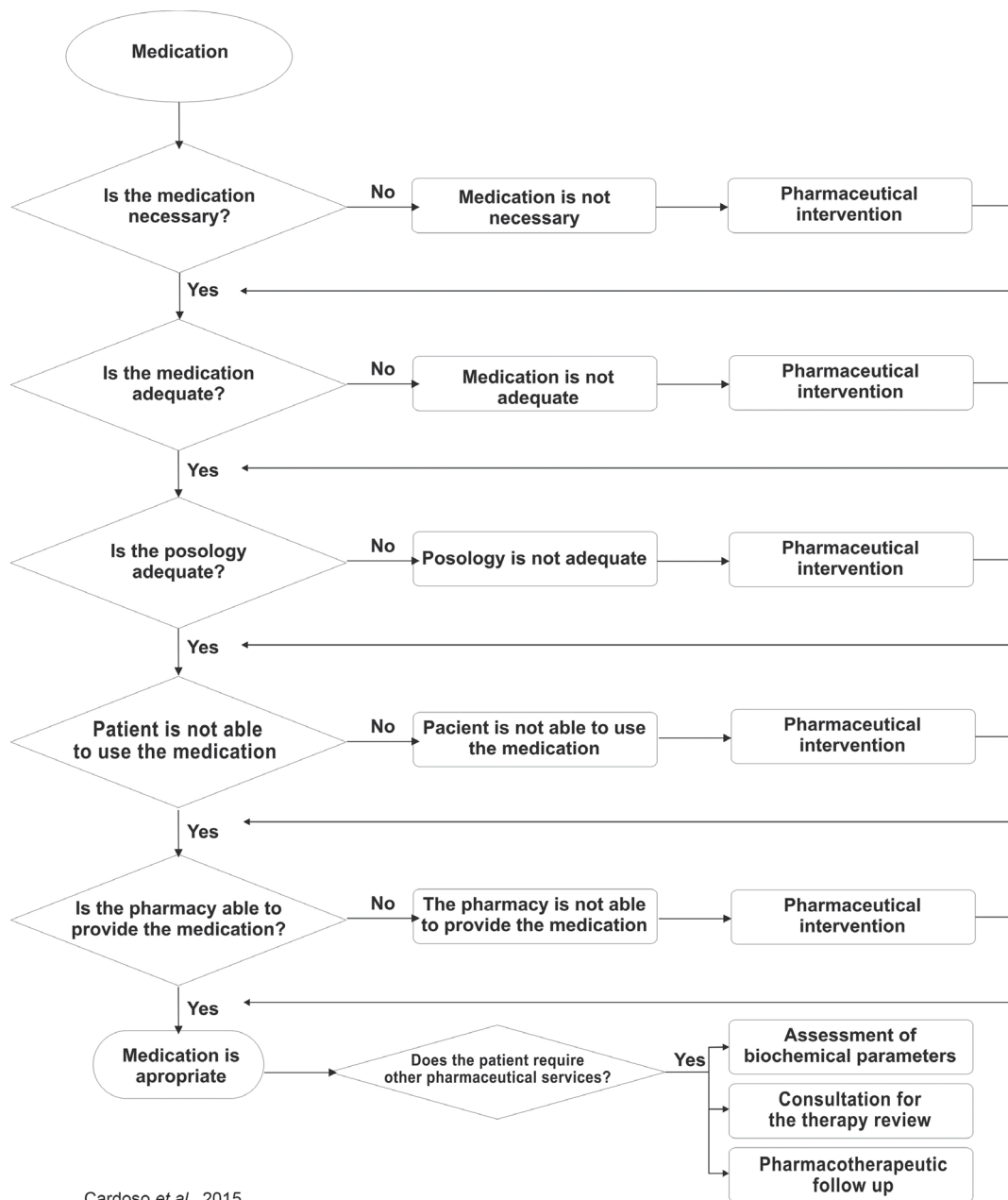
Cardoso *et al.*, 2015

**FIGURE 2** – Flowchart of the pharmacotherapy analysis at the Campus Pharmacy.

In this pharmacotherapy assessment tool, the five questions showed in the flowchart were sequentially answered regarding each medication. When a drug-related problem was identified (i.e. when the answer to any of these questions was no"), the assessment process was discontinued and the problem-solving process was initiated. According to the pharmacist's discretion, each drug-related problem led to pharmaceutical interventions, followed by the reassessment of the therapy. These steps were successively repeated until the answers to all the questions were "yes". Interventions could be addressed to the person who made the prescription, the patient or the drug in use, in accordance with the Pharmaceutical Care Network Europe classification of drug-related problem (Version 6.2) (PCNE, 2010). At the end of the pharmacotherapy analysis, the pharmacist evaluated whether the patient required other pharmaceutical services and referred the patient when deemed necessary. All drug- related problems identified and pharmaceutical services performed were registered in appropriate registration form.

Medication was then dispensed and directions of the use were provided by the pharmacist as recommended by the International Pharmaceutical Federation (2009). Medication information was delivered orally or written.

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Data collection

Patients' profile was characterized by sex, age, marital status, type of health service attended (public or private), and complexity of pharmacotherapy, obtained from the university pharmacy database (Pharmasoftware, 2013). Complexity of pharmacotherapy was calculated using the Medication Regimen Complexity Index (Melchiors *et al.*, 2007) and dichotomized into low (< 7 points) and high (≥ 7 points) (Fröhlich, Pizzol, Mengue, 2010). Patient's knowledge about medication prescription and adherence behavior was assessed by appropriate questionnaires before and after the dispensing of medications, in a pretest-posttest design (Figure 3).
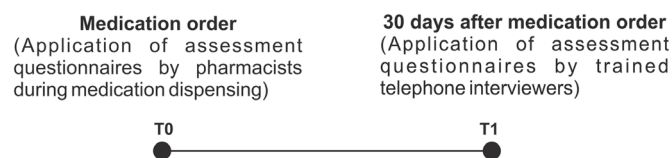
FIGURE 3 – Evaluation time points for assessing the drug dispensing service at the university pharmacy.

Thirty days after dispensing of drugs, assessment questionnaires were administered by trained interviewers (and not by the same pharmacists at T0) to prevent interviewers' bias. The most suitable time for the interview at T1 was scheduled at patients' convenience. If the patient did not answer the first telephone call, two additional attempts were made on the two following days. When the third call was not answered, the patient was excluded from the study.

Adherence behavior was assessed by the Morisky scale questionnaire (Morisky, Green, Levine, 1986), and classified as adherence or non-adherence. Non-adherence was further divided by intentional and unintentional non-adherence (Sewitch *et al.*, 2003).

A validated questionnaire (Fröhlich, Pizzol, Mengue, 2010) was used to assess patients' knowledge about medication. When more than one medication was dispensed, the questionnaire was asked regarding the first medication listed on the prescription. The first question ("What's the name of the drug prescribed?") was excluded from the evaluation, since the interviewer had to state which medicine the patient would be asked about. Final classification score was hence adapted and appropriately corrected to this exclusion. Patients' knowledge about medication was classified in: (1) <7 points: *insufficient* (the patient cannot use medicines safely); (2) 7~9 points: *moderate* (the patient can use medicines safely in the absence of complications); (3) ≥ 10 points: good (the

patient can use medicines safely in any circumstances).

Patients' satisfaction with the drug dispensing service was assessed by an appropriate instrument validated in English (Larson, Rovers, MacKeigan, 2002) and translated into Portuguese (Correr *et al.*, 2009). Patients were asked to fill in a Likert-type scale questionnaire concerning their satisfaction with the service (as 'excellent', 'very good', 'good', 'fair' or 'poor').

Data analysis

Data storage and analysis were performed using Epi Info 3.5.4 (Centers for Disease Control and Prevention, 2012) and STATA Version 12 for Windows (StataCorp, 2011). For statistical analyses, all variables were studied descriptively, by means of absolute and relative frequency calculations. Continuous variables were expressed as mean and standard deviation.

Knowledge about drug prescription and adherence was assessed before and after drug dispensing by McNemar's test. Knowledge about medication prescription was also assessed individually by chi-square and Fisher's exact test. A p-value <0.05 was considered to be statistically significant.

RESULTS

A total of 170 patients were included in the study. Forty-eight patients did not fill in the assessment instrument at T1, 16 patients did not return to the pharmacy for their ordered medication, and for two patients, the medication was not delivered due to issues related to the drug compounding process. A total of 104 completed the study.

A high percentage of female patients with low complexity of pharmacotherapy were observed (Table I).

Compared with T0, adherence behavior was not significantly different, however the number of non-adherent patients significantly (P=0.03) decreased at T1 (Table II).

Knowledge about drug prescription improved significantly, with a 55% reduction in the number of patients with insufficient knowledge on medications. The number of patients with good knowledge on medication was more than three times greater at T1 compared with T0 (Table III).

Comparative analyses of each parameter regarding knowledge revealed significant differences between T0 and T1 (Table IV).

Patients reported a high level of satisfaction towards the dispensing service. All categories were rated as

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TABLE I – Characteristics of patients attending the medication dispensation division at the University Pharmacy of the Federal University of Goias, 2013 (n=104)

Variables	n (%)
Sex	
Female	84 (80.8)
Male	20 (19.2)
Age[1]	
18 - 40 years	29 (29.9)
41 - 60 years	35 (36.1)
> 60 years	33 (34.0)
Marital status[2]	
Single	39 (42.9)
Married	32 (35.2)
Divorced	9 (9.9)
Widow/er	11 (12.0)
Type of health service[3]	
Public	47 (54.0)
Private	40 (46.0)
Attendance at the division of drug dispensation of the Pharmacy for the first time	
Yes	38 (36.5)
No	66 (63.5)
Complexity of the drug therapy	
High	20 (19.2)
Low	84 (80.8)

1.n = 97; 2.n = 91; 3.n=87

excellent or very good by more than 70% of the patients, and the lowest mean rate, in a 5-point scale, was 4.3 (Table V).

DISCUSSION

This study showed that the model for drug dispensation developed and used at the University Pharmacy of the Federal University of Goias increased the knowledge about safe use of medication in the absence of treatment-related complications in nearly 80% of patients that completed the study.

Our results are in line with previous studies conducted in Brazil and India (Oenning, Oliveira, Blatt, 2011; Ponnusankar et al., 2004; Silva, Schenkel, Mengue, 2000), showing increased knowledge about medications after dispensation. In comparison with other studies in Brazil (Oenning, Oliveira, Blatt, 2011; Silva, Schenkel, Mengue, 2000), a relatively greater percentage of patients with "good" knowledge on medication after drug dispensing were found in our study, however, similarly to their findings, we did not observe increased knowledge about adverse effects, skipping of doses or mode of drug administration.

The lack of patients' awareness of drug side effects has been discussed in previous studies (Oenning, Oliveira, Blatt, 2011; Silva, Schenkel, Mengue, 2000), which tend to conclude that it may be due to the lack of evaluation by the professionals responsible for drug prescription and dispensing, and also by the patients. Drug prescribers and pharmacists tend to omit information about drug adverse effects from the patients, in attempt to prevent non-adherence to treatment or symptoms caused by autosuggestion.

Further studies describing determining factors of patients' knowledge, concerning skipping doses and mode of administration of the drugs, after receiving pharmacist's instructions are still needed. According to Margonato, Thomson and Paoliello (2008), only 23.5% of victims of unintentional drug poisoning received instructions on the correct use of medication at dispensation, as registered by a poison control center in Brazil. Lack of knowledge on medication may result in poor adherence, drug therapy failures, increased incidence of adverse effects, and aggravation of clinical conditions (Fernandes, Pires, Gouvêa, 2002; Margonato, Thomson, Paoliello, 2008; Oenning, Oliveira, Blatt, 2011). On the other

TABLE II – Patients adherence to drug therapy assessed by the Morisky scale questionnaire (Morisky< green, Levine, 1986) before and after the dispensation at the University Pharmacy of the Federal University of Goiás, 2013 (n = 104)

Levels of adherence	Before (T0)	After (T1)	p*
	n (%)	n (%)	
High level of adherence	17 (16.4)	18 (17.3)	0.81
Low level of adherence	87 (83.6)	86 (82.7)	
Low unintentional adherence	18 (20.7)	25 (29.1)	0.18
Low intentional adherence	14 (16.1)	17 (19.8)	0.40
Intentional and Unintentional adherence	55 (63.2)	44 (51.1)	0.03

* McNemar's Test

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TABLE III – Level of knowledge about medication before (T0) and after (T1) drug dispensation at the University Pharmacy of the Federal University of Goias, 2013 (n=104)

Level of knowledge	Before (T0) n (%)	After (T1) n (%)	p*
Insufficient	43 (41.3)	23 (22.1)	0.00
Moderate	52 (50.0)	51 (49.0)	0.87
Good	9 (8.7)	30 (28.9)	0.00

*McNemar's Test

hand, knowledge about medication is a key component of therapy success, as reported by Angelini *et al.* (2009) in a study demonstrating that improvement of patients' knowledge on the management of inhaled corticosteroid during an education program was associated with patients' clinical progress.

In this study, although we have not found an increase in adherence to treatment, intentional and unintentional non-adherence behavior has reduced. This finding suggests that dispensing of medication may not enhance adherence to treatment, but may induce a change in the non-adherence behavior, although this change was not statistically significant in our study.

Also, according to a review by Haynes *et al.* (2013), few dispensation-related interventions have been able to enhance adherence to pharmacotherapy. Additionally, although it is the mostly used indirect instrument to assess adherence, the Morisky scale also used in this study tends to overestimate non-adherence behavior, due to its strict criteria to classify the patient as 'non-adherent' (Leite, Vasconcellos, 2003).

Future studies using different methods for assessing adherence behavior and using a repeated measure design would be of great help in the understanding of the influence of dispensing service on adherence.

Our dispensing system model promoted a high level of satisfaction by patients, which corroborates the findings reported in a similar study conducted in Spain (Guillén *et al.*, 2012).

Studies measuring patient satisfaction with pharmacy services have shown that the human aspects of the services are the most influencing factor on patient satisfaction (Panvelkar, Saini, Armour, 2009). An implication of this finding is that, similarly to other studies in this field, satisfaction may be overestimated in our study, particularly taking into account that the patients interviewed were frequent users of the University Pharmacy.

Results of studies assessing patients' satisfaction with health services should be seen with caution. Meeting or failing to meet patients' expectation of care is an important predictor of patient satisfaction with the service (McKinley *et al.*, 2002). In fact, the high level of satisfaction with medicine dispensing services might be resultant not from their good quality, but from a low expectation by the patients. This is reinforced by a study (Oenning, Oliveira, Blatt, 2011) showing that more than 85% of patients were highly satisfied with dispensing of medications, even without receiving any information about the correct use of medicines.

Patients' satisfaction with pharmaceutical services is fundamental for the analysis of results, and correlates with the effectiveness of the activities performed. With respect to dispensing services, patients' satisfaction can influence adherence to treatment and patient loyalty to the pharmacy, as highlighted by Guillén *et al.* (2012).

TABLE IV – Comparison of level of knowledge before (T0) and after (T1) drug dispensation at the University Pharmacy of the Federal University of Goias, 2013 (n=104)

Questions about the drug prescribed	Correct aswers		Incorrect answers		Did not know		p*
	T0 n (%)	T1 n (%)	T0 n (%)	T1 n (%)	T0 n (%)	T1 n (%)	
Therapeutic indication	91 (87.5)	96 (92.3)	7 (6.7)	5 (4.8)	6 (5.8)	3 (2.9)	0.00**
Dosage	45 (43.3)	71 (68.3)	13 (12.5)	16 (15.4)	46 (44.2)	17 (16.3)	0.00
Times of administration	68 (65.4)	90 (86.6)	12 (11.5)	12 (11.5)	24 (23.1)	2 (1.9)	0.01**
Duration of treatment	70 (67.3)	80 (76.9)	9 (8.7)	5 (4.8)	25 (24.0)	19 (18.3)	0.01
Mode of administration	83 (79.9)	75 (73.1)	15 (14.4)	9 (8.6)	5 (4.8)	19 (18.3)	0.04
Skipping doses	79 (76.0)	62 (59.7)	9 (8.6)	7 (6.7)	16 (15.4)	35 (33.6)	0.02
Interactions	29 (27.9)	60 (57.7)	15 (14.4)	15 (14.4)	60 (57.7)	29 (27.9)	0.01
Adverse effects	31 (29.8)	49 (47.1)	15 (14.4)	23 (22.1)	58 (55.8)	32 (30.8)	0.21

* Chi-squared Test, ** Exact Fisher's Test

TABLE V – Patient satisfaction with the drug dispensing service at the University Pharmacy of the Federal University of Goias, 2013

Questionnaire items	Excellent/Very good (%)	Good (%)	Fair/Poor (%)	Mean	SD
1. Appearance of the Pharmacy*	79.8	18.3	1.9	4.39	0.82
2. Promptness of the pharmacist to answer your questions*	92.2	6.8	1.0	4.67	0.65
3. The pharmacist's relationship with you*	91.3	7.7	1.0	4.71	0.60
4. The pharmacist's ability to advise you about problems that you might have with your medication*	77.9	18.3	3.8	4.33	0.98
5. Promptness of drug prescription service**	87.2	10.8	2.0	4.52	0.80
6. Professionalism of the pharmacy staff**	94.1	4.9	1.0	4.68	0.62
7. How well the pharmacist explains what your medication do**	90.2	6.8	3.0	4.57	0.86
8. The pharmacist's interest in your health **	84.3	11.8	3.9	4.46	0.89
9. How well the pharmacist helps you to manage your medications*	85.4	13.6	1.0	4.48	0.76
10. The pharmacist's efforts to solve problems that you have with your medications ***	89.1	9.9	1.0	4.55	0.71
11. The responsability taken by the pharmacist for your drug therapy ***	85.1	10.9	4.0	4.46	0.84
12. How well the pharmacist instructs you about how to take your medications ***	85.1	13.9	1.0	4.54	0.77
13. Your pharmacy services overall**	87.2	11.8	1.0	4.47	0.74
14. How well the pharmacist answers your questions ****	87.0	12.0	1.0	4.54	0.74
15. The pharmacist's efforts to help you improve your health or stay healthy**	79.4	18.6	2.0	4.41	0.86
16. Courtesy and respect shown by the pharmacy staff**	92.2	7.8	0.00	4.70	0.61
17. Privacy of the conversations between you and the pharmacist **	80.4	14.7	4.9	4.31	0.93
18. The pharmacist's efforts to assure that your medications do what they are supposed to **	82.4	13.7	3.9	4.39	0.87
19. How well the pharmacist explains possible side effects **	76.5	18.6	4.9	4.32	1.03
20. The amount of time the pharmacist offers to spend with you **	80.4	16.7	2.9	4.35	0.86

*n=103; **n=102; ***n=101; ****n=100

Questionnaires are the most frequently used instruments to assess satisfaction (Guillén *et al.*, 2012). Most of them, however, are self-developed, non-validated tools (Panvelkar, Saini, Armour, 2009), limiting the comparison of their results and utilization in other contexts (Panvelkar, Saini, Armour, 2009). In this study, we used a validated instrument, although the satisfaction with pharmacy services in general, rather than with dispensing services in particular was evaluated (Correr *et al.*, 2009).

The understanding of patients' expectations of the dispensing service and whether the services meet these expectatios need to be explored. Also, future studies should investigate how patient's satisfaction with a service influences the choice of the University Pharmacy, as well as the causes of dissatisfaction by the patients.

Assessing the results of a drug dispensing service is a challenging issue, since the estimation of how drug dispensing affects the therapy main outcome, i.e., the clinical features, is considerably difficult

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(Fernández-llimós, 2002). The knowledge about medications, adherence to treatment and satisfaction with pharmaceutical services may be considered surrogate endpoints in the assessment of dispensing practices. Surrogate endpoints can be measured relatively more easily and reflect the effects of the intervention on clinical endpoints (Wannmacher, 2010). They are used in clinical trials when the clinical endpoints are difficult to be assessed, and also to reduce sample size, time of follow-up and costs of the study (Coutinho, 2002).

CONCLUSION

These findings suggest that drug dispensing can enhance patients' knowledge about drugs, by providing conditions for a correct the use of medications, in the absence of clinical complications. Additionally, drug dispensing promotes a high level of satisfaction by the patients, with no improvement of adherence behavior to the therapy though.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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