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Journal of Hospital Pharmacy and Health Services

Original Paper

Open Access

Implementation of post-discharge pharmaceutical consultation for liver transplant patients

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Submitted: 25-02-2025 Resubmitted: 01-12-2025 Accepted: 07-12-2025

Double blind peer review

Abstract

Objective: To describe the implementation process of a pharmaceutical guidance program during the transition of care, conducted by pharmacists at hospital discharge and post-discharge for patients undergoing liver transplantation. **Methods**: A prospective, descriptive, single-group study was conducted in a liver transplant ward of a high-complexity tertiary hospital located in the city of São Paulo, Brazil, from September to November 2024. Liver transplant patients received discharge instructions from trained pharmacists and were reassessed in post-discharge pharmaceutical consultations regarding adherence and the presence of medication-related problems. Post-discharge consultations were conducted in person or via telehealth. Patients who presented with medication-related problems after reassessment were maintained under pharmacotherapeutic follow-up; the others were discharged from pharmaceutical care. **Results:** 17 patients participated in the study. There was a predominance of men (64.71%), a preference for teleconsultation (70.59%), and a good average medication adherence rate (92.48%). The most frequently found medication-related problem (MRP) was convenience, related to access to medicines (37.04%). Five patients were maintained under follow-up in the pharmacy outpatient clinic. **Conclusions**: The implementation of the post-discharge pharmaceutical guidance program proved to be feasible, structured, and capable of identifying medication-related problems early, especially those related to access. The study reinforces the essential role of the pharmacist in the transition and continuity of care, given the complexity of pharmacotherapy for these patients.

Keywords: liver transplantation; outpatients; pharmacists; patient discharge; care transition

Implementação de consulta farmacêutica pós-alta hospitalar para pacientes transplantados hepáticos

Resumo

Objetivo: descrever o processo de implementação de um programa de orientação farmacêutica na transição de cuidado realizado por farmacêuticos na alta e após alta hospitalar para pacientes submetidos ao transplante hepático. **Métodos:** Foi realizado um estudo prospectivo descritivo, de grupo único, em uma enfermaria de transplante hepático hospital terciário de alta complexidade situado no município de São Paulo durante o período de setembro a novembro de 2024. Pacientes transplantados hepáticos foram orientados na alta hospitalar por farmacêuticos treinados e reavaliados em consulta farmacêutica pós-alta hospitalar, quanto à adesão e a presença de problemas relacionados a medicamentos. As consultas após a alta foram realizadas presencialmente ou por teleconsulta. Os pacientes que após a reavaliação apresentaram PRMs foram mantidos em acompanhamento farmacoterapêutico, os demais obtiveram alta do atendimento farmacêutico. **Resultados:** 17 pacientes participaram do estudo. Houve predominância de homens (64,71%), preferência por teleconsulta (70,59%) e uma boa taxa de adesão medicamentosa média (92,48%). O problema relacionado a medicamentos (PRM) mais encontrado foi o de conveniência, relacionado a acesso a medicamentos (37,04%). Cinco pacientes foram mantidos em acompanhamento no ambulatório de farmácia. **Conclusões:** A implementação do programa de orientação farmacêutica pós-alta demonstrou ser viável, estruturada e capaz de identificar precocemente problemas relacionados a medicamentos, especialmente os ligados ao acesso. O estudo reforça o papel essencial do farmacêutico na transição e na continuidade do cuidado, dada a complexidade da farmacoterapia destes pacientes.

Palavras-chave: transplante de fígado; pacientes ambulatoriais; farmacêuticos; alta do paciente; cuidado transicional

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Introduction

According to the Brazilian Transplant Registry of the Brazilian Association of Organ Transplantation, in 2023 a total of 2,365 liver transplants were performed in Brazil, of which 716 took place in the state of São Paulo.[1]

Patients who undergo liver transplantation require treatment with immunosuppressive medications in order to prevent graft rejection, as without such therapy the body recognizes the transplanted organ as a foreign entity. Therefore, adherence to immunosuppressive therapy is one of the essential factors for transplant success. In addition, infectious prophylaxis and medicines for the treatment of associated conditions, such as diabetes mellitus and systemic arterial hypertension, are commonly prescribed in the context of immunosuppression.[2]

Tacrolimus, as an immunosuppressive agent, should be initiated on the first day after transplantation and, based on therapeutic drug monitoring, the dose should be adjusted according to serum levels, with more frequent monitoring during the first months after transplantation. One of the reasons for failure to achieve the expected serum concentration may be poor medicine adherence, including missed doses or incorrect administration.[3,4]

A 2023 review article by Lichvar et al. on the care of solid organ transplant recipients highlights that pharmacists can contribute during care transitions by performing prescription review, implementing interventions to optimize pharmacotherapy, and providing medication counseling, thereby promoting medication adherence and identifying opportunities for improvement to ensure treatment effectiveness.[5]

Thus, the objective of this study was to describe the process of implementing a pharmacist-led medicine counseling program during care transitions at hospital discharge and post-discharge for patients undergoing liver transplantation, as well as to identify drug-related problems detected during this process.

Methods

A prospective, descriptive, single-group study was conducted in a liver transplant ward of a high-complexity tertiary hospital located in the city of São Paulo, Brazil, from September to November 2024.

Patients hospitalized in the ward during the data collection period were invited to participate according to the following inclusion criteria:

- patients aged 18 years or older who underwent liver transplantation during hospitalization;
- those who received pharmacist counseling at the time of hospital discharge, in accordance with institutional procedures;
- those who agreed to participate and attended a follow-up pharmacist consultation after hospital discharge, either in person or via teleconsultation, according to the preference of the patient or caregiver.

Patients were excluded from the study if they:

- were hospitalized in the liver transplant ward for reasons other than undergoing liver transplantation;
- did not receive pharmacist counseling at hospital discharge;
- agreed to participate but did not attend the post-discharge pharmacist consultation; or
- refused to participate in the study.

Considering the limited number of transplants performed during the study period and the importance of medication adherence after the immediate post-transplant period, the eligible sample was defined as all patients who met the above criteria, without performing a specific sample size calculation.

Stages of service implementation

The implementation process comprised the stages of service structuring and patient care. Each of these stages is described in detail below.

Service structuring

Initially, the consultation script for post-hospital discharge patient assessment was adapted by the authors (Appendix 1), based on the pharmaceutical care model adopted by the institution. Two pharmacists who conducted the consultations were trained by the project team to participate in the study. Prior to study initiation, a meeting was held to align procedures with the nursing staff of the liver transplant ward, particularly regarding methods for activating the pharmaceutical team. An Excel database was created for data organization and categorization.

Pharmacist counseling at hospital discharge

The pharmaceutical team worked collaboratively with the clinical teams of the units through multidisciplinary rounds, prescription review, medication reconciliation, and pharmacist counseling at hospital discharge.

During the pharmacist counseling process at hospital discharge, the pharmacist performed a comprehensive review of pharmacotherapy, which included medication reconciliation of discharge prescriptions compared with medications used prior to and during hospitalization, assessment of drug–drug interactions, and evaluation of prescribed doses. Following this assessment, when necessary, pharmaceutical interventions were carried out in collaboration with the medical team to implement appropriate adjustments.

After this step, the pharmacist prepared the pharmacotherapy orientation table (POT) (Appendix 2), in which medications were scheduled according to their administration times, aiming to facilitate patient understanding of the proposed pharmacotherapy. With the POT and the institutional booklet *"Discharge Guidance Guide for Liver Transplant Patients"* (Appendix 3) in hand, the pharmacist counseled the patient and/or caregiver, clarified any questions, and provided guidance regarding medication dispensing and collection from the hospital pharmacy. Finally, the contact telephone number of the Pharmaceutical Care outpatient clinic was provided, should further assistance be required.

At the time of pharmacist counseling at hospital discharge, inclusion and exclusion criteria were assessed and patients were invited to participate in the present study. Those who agreed signed the informed consent form.

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On this occasion, a contact telephone number was also collected, as well as the preferred modality for the post-discharge pharmacist consultation (in person or via teleconsultation). Two contact attempts were made to schedule the consultation.

Post-discharge pharmacist consultation procedure

Seven to ten days after discharge, the pharmacist consultation was conducted using the modality chosen by the patient and/or caregiver (in person or via teleconsultation), with the objectives of reviewing pharmacotherapy, assessing access to medicines through patient self-report and verification in the dispensing records system, and identifying the need for ongoing follow-up in the Pharmaceutical Care outpatient clinic.

The pharmacist consultation was conducted using a standardized post-discharge consultation script. All encounters were documented in the patient's electronic medical record.

Treatment adherence was calculated based on patient self-report during the consultation regarding medicine use,[6] considering all prescribed medicine, using the following formula: (number of daily doses reported by the patient / total number of prescribed doses) × 100.

As in the study by Santa Helena et al.,[6] patients were considered adherent to treatment when the adherence rate ranged from 80% to 120%. Patients whose drug-related problems could be managed and resolved during the follow-up consultation or who did not present problems related to clinical decompensation were discharged from the service.

Patients classified as non-adherent according to the adherence rate or those who presented other drug-related problems requiring professional follow-up or subsequent reassessment remained under follow-up in the Pharmaceutical Care outpatient clinic.

Demographic data were collected from pharmacist consultations and electronic medical records, including patient name, sex, date of birth, and age; time elapsed since transplantation; number of medicines in use; records of medicine dispensing by the outpatient pharmacy; and information obtained during pharmacist consultations, such as pharmaceutical interventions performed, drug-related problems identified, treatment adherence rate, consultation duration, type of consultation performed (in person or via teleconsultation), and medication dispensing. These data were organized in the project database and interpreted and presented using simple descriptive statistics and the Welch's t-test, which accounts for unequal variances, performed in Excel.

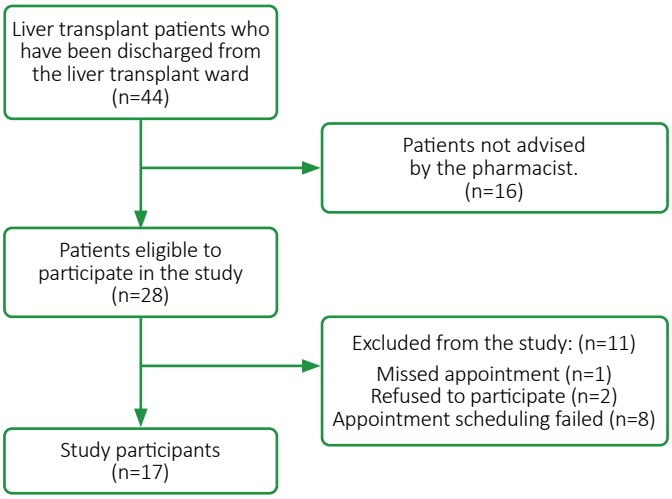
Drug-related problems (DRPs) were classified according to Cipolle, Strand, and Morley (1998)[7] into the following categories: indication, effectiveness, safety, and convenience.

The study was reviewed and approved by the Human Research Ethics Committee of the Hospital das Clínicas, Faculty of Medicine, University of São Paulo (HCFMUSP), and was conducted in accordance with the ethical principles and guidelines established in Resolution No. 466 of December 2012 of the Brazilian National Health Council (CAAE number: 81908324.6.0000.0068; Ethics Committee approval number: 7,024,148).

Results

A total of 28 patients were invited to participate in the study; 26 agreed to participate; however, it was possible to complete all stages of the study with 17 patients, as shown in Figure 1. All results presented below refer to the 17 patients who were followed until the end of the study.

Figure 1. Flowchart of patients included and excluded from the study.



There was a predominance of male patients (64.71%). The most frequent indication for liver transplantation was cirrhosis of alcoholic etiology (23.53%). Pharmacist counseling was provided to 14 recently transplanted patients (82.35%), defined as those within 0–3 months after transplantation. Demographic characteristics and clinical features of the 17 patients are summarized in Table 1.

Teleconsultation was the preferred modality for 70.59% of patients, who, when asked about their preference, highlighted the convenience of not having to travel from their homes. Patients who opted for in-person consultations cited a perceived sense of distance between the professional and the patient during teleconsultations. Table 2 presents the number of in-person and teleconsultations performed, consultation duration, and the number of days elapsed from hospital discharge to the consultation. A trend toward shorter duration of teleconsultations was observed.

Table 3 shows that most patients were using between 5 and 10 medicines, and the mean medicine adherence rate based on the discharge prescription was 92.48%. All patients who received pharmacist counseling attended the outpatient pharmacy to obtain their medicines.

Regarding the overall adherence rate to the prescribed therapy, two patients presented adherence below 80% and were therefore advised to remain under follow-up in the Pharmaceutical Care outpatient clinic. Fourteen patients (82.35%) presented at least one DRP during the reassessment consultation, with a total of 27 DRPs identified. Table 4 presents the identified DRPs according to classification.

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Table 1. Demographic aspects and clinical characteristics (n = 17)

Category	Variables	Value	Percentage (%)
Sex			
	Male	11	64.71%
	Female	6	35.29%
Age (years)			
	18–29	4	23.53%
	30–49	5	29.41%
	50–59	3	17.65%
	> 60	5	29.41%
Time elapsed from transplantation to pharmacist consultation			
	0–3 months	14	82.35%
	4–6 months	2	11.76%
	> 6 months	1	5.88%
Indication for liver transplantation			
	Alcoholic cirrhosis	4	23.53%
	Autoimmune hepatitis–related cirrhosis	3	17.65%
	Cryptogenic cirrhosis	3	17.65%
	Nonalcoholic fatty liver disease–related cirrhosis	2	11.76%
	Retransplantation	2	11.76%
	Fulminant hepatitis B	1	5.88%
	Hepatitis B–related cirrhosis	1	5.88%
	Secondary biliary cirrhosis	1	5.88%

Table 2. Consultation modality, consultation duration, and days elapsed from discharge to consultation (n = 17)

Variables	Modalidade da consulta	
	In-person	Teleconsultation
Patients attended	**5 (29.41%)**	**12 (70.59%)**
Consultation duration		
0–15 minutes	1 (5.88%)	7 (41.18%)
16–30 minutes	2 (11.76%)	4 (23.53%)
31–59 minutes	1 (5.88%)	1 (5.88%)
More than 1 hour	1 (5.88%)	0 (0%)
Mean ± SD of consultation duration	**38 ± 35.25 minutes**	**15.83 ± 7.12 minutes**
Days elapsed from discharge to consultation		
Less than 7 days	2 (11.76%)	1 (5.88%)
7–10 days	2 (11.76%)	10 (58.82%)
More than 10 days	1 (5.88%)	1 (5.88%)
Mean ± SD of days elapsed from discharge to consultation	**10 ± 5.5 days**	**8 ± 1.5 days**

Table 3. Number of medicines in use, rate of adherence to prescribed medicines (n = 17)

Category	Variables	Value	Percentage (%)
Number of medicines in use: 10 ± 3 medications			
	5- 10	12	70.59%
	11- 15	3	17.65%
	> 15	2	11.76%
Medicaines adherence rate: 92.48 ± 9.34%			
	100%	8	47.06%
	80- 99%	7	41.18%
	< 80%	2	11.76%

*Adherence rate calculated using the following formula: (number of doses reported by the patient ÷ number of prescribed doses) × 100

Among the identified DRPs, those related to convenience were the most frequent, with 70.00% of these problems associated with lack of access to medicines. In these cases, a total of 30 interventions were performed with patients, including medication use counseling (14; 46.67%), health education (5; 16.67%), insulin use counseling (4; 13.33%), provision of the pharmacotherapy orientation table (4; 13.33%), promotion of self-care (2; 6.67%), and guidance regarding access to medicines (1; 3.33%).

After the pharmacist consultation, three interventions with the medical team were carried out to include additional medicines in the pharmacotherapy. Regarding continuity of follow-up within the service, twelve patients were discharged from pharmaceutical care after the follow-up pharmacist consultation, while five patients (29.41%) remained under pharmacotherapeutic follow-up: two due to non-adherence to treatment, one due to clinical decompensation, and two at the patient's own request, related to concerns about medication safety.

Table 4. Drug-related problems (DRPs) (n = 27) and patient interventions (n = 30)

Category	Value	Percentage (%)
Drug-related problems (DRPs)		
Convenience	10	37.04%
Effectiveness	9	33.33%
Safety	4	14.81%
Indication	3	11.11%
Patient interventions		
Medication use counseling	14	46.67%
Health education	5	16.67%
Insulin use counseling	4	13.33%
Provision of pharmacotherapy orientation table	4	13.33%
Promotion of self-care (home glucose monitoring, HBPM, others)	2	6.67%
Guidance to attend outpatient pharmacy	1	3.33%

*HBPM- home blood pressure monitoring

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Discussion

Hospital discharge is a critical moment for patients, as during the transition from inpatient care to home care, poor medication adherence and/or lack of access to prescribed medicines may occur and may not be identified by the various healthcare professionals involved in this process.[8,9] Continuous pharmacotherapy follow-up is therefore extremely important to minimize barriers and ensure appropriate medicine use, as suggested by Lichvar et al.[5] regarding the expanded role of pharmacists in transitional care.

Failure to successfully contact patients who agreed to participate in the study after hospital discharge was the main reason for exclusion, highlighting the fragility of communication with patients during care transitions. One strategy to minimize this gap may be scheduling the pharmacist consultation at the time of discharge counseling, thereby reducing the risk of loss to follow-up and ensuring continuity of care.

The predominance of male participants (64.71%) and alcoholic liver cirrhosis as the main indication for transplantation (23.53%) observed in this study is consistent with findings reported by Nascimento et al.[10], who also associated the higher prevalence among men with greater alcohol consumption and lower utilization of healthcare services.[10]

In the present study, participants showed a preference for teleconsultations, similar to the findings reported by Rocha[11], who identified convenience related to reduced travel as one of the advantages of teleconsultation. Among patients who opted for in-person consultations, concerns regarding the quality of remote care and the potential weakening of the professional–patient relationship were also consistent with the findings reported by the same author.[11]

Teleconsultation not only benefits patients by offering greater convenience but also provides advantages for pharmacists, allowing optimization of consultation time, an increased number of daily consultations, and, consequently, the ability to follow a larger number of patients. This was reflected in the observed trend toward shorter teleconsultation durations compared with in-person visits.

The structured stages of implementation—including adaptation of the consultation script, training of pharmacists, alignment with the nursing team, and definition of the counseling and reassessment workflow—were directly related to the observed outcomes. Use of the pharmacotherapy orientation table (POT) contributed to the high adherence rate, while prior coordination with the nursing team facilitated patient identification and referral at the time of discharge. Furthermore, offering both in-person and teleconsultation modalities enabled broader patient reach, which was reflected in the predominance of remote consultations. These elements demonstrate that prior organization of the process was essential for effective implementation.

The World Health Organization defines polypharmacy as the routine use of five or more medicines by a patient. All participants in this study were using at least five medicines and were therefore classified as experiencing polypharmacy. This finding highlights the complexity of pharmacotherapy in transplant recipients and underscores the need for close pharmaceutical care.[5]

The mean medication adherence rate, calculated based on patients' self-reported medicine administration, was 92.48%, suggesting a potential positive impact of pharmacist counseling at the time of hospital discharge.

This hypothesis may be confirmed in future studies with a larger number of patients. Nevertheless, it was possible to identify that some participants did not have access to at least one prescribed medicine.

Difficulties in obtaining full access to prescribed pharmacotherapy hinder treatment success and negatively affect medication adherence, as observed in the present study, and are consistent with the findings of a literature review on treatment adherence in kidney transplant recipients. In that study, limited access to medications was identified as one of the causes of non-adherence, and although management by the Brazilian Unified Health System and national transplant programs can mitigate this risk with regard to immunosuppressive agents, this problem may still occur for other classes of medications.[12]

The most frequently identified drug-related problems (DRPs) suggest that pharmacist counseling during care transitions focused on medication access may be crucial to reducing the impact of lack of access, by guiding patients toward available alternatives, such as free medication dispensing programs within the Brazilian Unified Health System.

The importance of patient knowledge regarding their pharmacotherapy is highlighted in a study concluding that, in addition to the initial consultation, long-term pharmacotherapeutic follow-up is also important, given the tendency for motivation and intensity of care to decline over time.[13]

In light of the above, several process adjustments may enhance the implementation of post-discharge pharmacist consultations during care transitions, including scheduling the consultation at the time of discharge counseling, diversifying patient contact information (e.g., collecting more than one telephone number), and ensuring pharmacist counseling for patients in the immediate post-transplant period. Furthermore, considering that interventions with patients were required in 82% of cases and that 30% of the evaluated group remained under follow-up, expanding the program to include at least one additional pharmacist consultation may be necessary to more effectively assess the resolution of the identified DRPs.

This study has limitations that should be considered when interpreting the results. The sample size was relatively small (n = 17), which may limit the generalizability of the findings to other settings involving liver transplant recipients, as well as the robustness of the statistical analyses. Another limitation is the use of self-report to assess medication adherence, which may introduce bias such as recall bias and social desirability bias, and the absence of a validated questionnaire to assess adherence to immunosuppressive therapy, such as the BAASIS,[14] which could have provided greater precision in the pharmaceutical assessment. Finally, selecting patients in the immediate post-transplant period may have introduced an additional bias, as patients who have recently undergone transplantation may be more engaged in treatment than those in other health conditions.

Overall, the findings of this study demonstrate that the organized implementation of post-discharge pharmacist consultations can strengthen continuity of care for liver transplant recipients by enabling early identification of DRPs and directing resources toward more complex cases. For clinical practice, the tested model offers a feasible, reproducible protocol aligned with the demands of transplant services.

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From a management perspective, the adoption of structured consultations may improve safety indicators, reduce rework, and support decision-making regarding the expansion of teams and care workflows. At a system level, initiatives such as this align with transitional care policies and national patient safety strategies, and may contribute to standardizing pharmaceutical practice within transplant care networks.

Conclusion

The implementation process of the post-discharge pharmacist counseling and consultation service proved to be structured, feasible, and capable of early identification, classification, and management of drug-related problems (DRPs). Adaptation of the consultation script, pharmacist training, and coordination with the nursing team enabled the operationalization of an efficient care transition workflow for liver transplant recipients.

The results suggest that systematic post-discharge pharmacist consultations may improve medication adherence, support access to medications, guide patients with greater clinical complexity, and inform management decisions regarding service expansion. The predominance of teleconsultations indicates potential for resource optimization and broader care coverage.

Although promising, these findings should be interpreted in light of the small sample size and the use of self-report as a method for assessing adherence. Future studies with larger samples, validated assessment tools, and diverse care settings may further elucidate the impact of this intervention and support its consolidation as an institutional care transition strategy.

Funding Source

This research received no funding.

Acknowledgements

The authors thank the patients who participated in the study and the first-year pharmacy residents of the Uniprofessional Residency Program in Hospital and Clinical Pharmaceutical Care of the Pharmacy Division of the Central Institute of HCFMUSP.

Declaration of Conflict of Interest

The authors declare no conflicts of interest.

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