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Research Article

The Clinical Implications of Pharmacist-Led Medication Reviews for Discharge Patients: Enhancing the Quality of Patient Care

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Abstract

Background: Seamless quality of patient care is important right from the admission to the point of discharge. In the process of patient care, appropriate medication management and use is important for a speedy recovery. Clinical pharmacist a key member among the multidisciplinary health care team plays a vital role in enhancing the quality of care by performing a meticulous medication reviews of discharge patients. Therefore, this study aimed to assess the impact of clinical pharmacist in enhancing the quality of patient care by identifying, discussing and correcting the medication discrepancies by performing a meticulous review, eventually producing an error free discharge summary to the patients at discharge.

Materials and Methods: This study was a simultaneous mixed methods design (intervemtional and quantitive), was conducted at a tertiary health care center, which accommodates the doctors of all multispecialiatity departments. The sample size is discussed in the results section. For quantitative data analysis, relevant and the updated version of Microsoft excel is employed. The pharmaco-therapeutic committee proposed that every discharge summary must be meticulously reviewed by the clinical pharmacist before it goes to hands of the patient. However, the baseline group summaries received conventional review, whereas the experimental group of summaries received clinical pharmacist review. Data was analysed using conventional analysis approach.

Results: In a study of 298 patients, with 155 in the pre-intervention group and 143 in the post-intervention group, significant enhancements in medication management were noted after Clinical Pharmacy (CP) intervention. Patients exhibited co-morbidities such as renal insufficiency, hypothyroidism, diabetes mellitus, hypertension, and cardiovascular diseases. Post-intervention, improvements included the elimination of therapeutic and drug duplications, a reduction in incomplete regimens, and a decrease in medication dose and frequency discrepancies. CP intervention also addressed underreporting of drug allergies in discharge summaries and ensured clearer pharmaceutical instructions, reducing instances from 21 to 4. Additionally, a decrease in emergency visits or re-admissions from 4 to 1 was observed, attributed to comprehensive medication lists provided at discharge. Moreover, fewer instances of medications being inappropriately related to meals were noted, with emphasis placed on clarifying administration instructions, particularly for medications requiring consumption before food. This intervention highlighted the importance of addressing medication-related issues comprehensively to improve patient outcomes and reduce risks associated with medication management.

Conclusion: The results of this study highlight the crucial role of clinical pharmacists in improving medication management leading to good patient outcomes in healthcare. By carefully, reviewing medications, addressing discrepancies and ensuring comprehensive pharmaceutical instructions, clinical pharmacists play a vital role in minimizing risks associated with medication errors. The prominent reductions in therapeutic, drug duplications, incomplete regimens and medication dose discrepancies post-intervention highlight the impact of clinical pharmacist intervention on medication safety and efficacy. Moreover, their efforts in clarifying administration instructions of medications contribute to better patient compliance, eventually patient outcomes. The observed decrease in emergency visits and re-admissions further highlights the importance of clinical pharmacists in reducing healthcare hazards. Overall, this study unleashes the essential role of clinical pharmacists in healthcare teams, advocating for their integration into patient care processes to ensure safer and more effective medication management.

Keywords: Medication adherence; Management of medication; Complex poly pharmacy; Clinical pharmacist

Introduction

Several studies have provided compelling statistical and epidemiological data highlighting the efficacy of pharmacist-led medication reviews in improving patient outcomes during the discharge process. For instance, a meta-analysis by Smith, et al. demonstrated a significant reduction in medication discrepancies and adverse drug events among patients who received pharmacist-led interventions at discharge compared to standard care [1]. Pharmacist-led medication reviews have emerged as a promising intervention to enhance the quality of patient care during the discharge process. It has been less than a decade the popularity of deploying clinical pharmacists is gaining. Tertiary health care centers and hospitals are adopting cp as one of the team member in their centers. A study by Johnson, et al. conducted a randomized controlled trial where clinical pharmacists provided intensive medication review and counseling to discharge patients. Results showed a significant decrease in medication discrepancies and errors compared to the

control group receiving standard care [2,3]. Pharmacist's interventions included medication reconciliation, identification of drug interactions, and tailored patient education, contributing to a notable reduction in medication-related deviations at discharge. A research was conducted by clinical pharmacist visit for all inpatients at the hospital in September 2019-February 2020. The clinical pharmacy department deployed 10 pharmacists where one of the jobs is to provide clinical pharmacy services. The intense medication reconciliation and review is performed right from the patient admission, at transition points and at discharge from the hospital. Statistical analysis used a paired t-test to measure differences in clinical pharmacist before and after [4]. Patients who received intensive medication counseling from clinical pharmacists reported higher satisfaction scores compared to those who did not. Patients appreciated the personalized attention, clear explanations regarding their medications, and opportunities to address concerns, highlighting the positive influence of pharmacist involvement on overall satisfaction with the discharge process. Clinical pharmacists conduct meticulous medication reconciliation to prevent discrepancies between pre-admission, inpatient, and discharge medications, thereby reducing the risk of medication errors and adverse drug events. In addition, they also provide appropriate medication counseling to educate patients on proper medication administration, potential side effects, and the importance of adherence, empowering patients to manage their medications effectively post-discharge. Clinical pharmacists play a crucial role in improving medication compliance and educating patients about the importance of consistent medication usage [4]. By explaining potential drawbacks of missing doses under any circumstances, pharmacists help patients understand the importance of medical adherence that eventually leads to good health. Additionally, pharmacists provide guidance on monitoring some of the key health indicators such as blood sugars and pressures regularly. They educate patients on how to accurately record these readings and stress the importance of sharing them with their physician during follow-up visits [5]. This approach enables treating doctors to make correct decisions and optimize medication regimens based on the patient's individual health status. For instance, if blood sugar or blood pressure readings indicate the need for dose adjustments, the treating physician modifies the current dose which the patient is using thereby minimizing the side effects. Overall, clinical pharmacists contribute to better treatment outcomes and improved overall health for their patients.

This research article aims to explore the clinical implications of pharmacist-led medication reviews for discharge patients, delving into their impact on patient safety, medication adherence. By understanding the existing literature and presenting empirical evidence, this study seeks to elucidate the multifaceted benefits of pharmacist-led interventions in optimizing medication management during the transition from hospital to home. Improving medication management in the post discharge period is likely to reduce hospital readmissions; a key health service target to improve health outcomes and reduce healthcare costs.

Objectives

1. To quantify the impact of a clinical pharmacist-led discharge medication review on patient outcomes.
2. To measure the degree of patient safety by minimizing various medication related discrepancies during the discharge process.

Materials and Methods

Study design and setting

A prospective observational study was designed and conducted at a tertiary health care center. The center accommodates the doctors of all multispecialiatity departments. The discrepancies observed in the summary are analyzed into two categories; *i.e* errors reached the patient and errors that did not reach the patient.

Study participants and sampling

155 participants medical discharge summaries in the pre-intervention group. The total number of documented medications in both groups remained consistent at 775. Participants included patients of greater than 20 years of age in the study, more than 70 percent of the population included in this study had preexisting comorbidites along the present illness. People who suffered from diabetes, hypertension, respiratory ailments and renal insufficiency drugs were mostly included in the study. The exclusion criteria included personal unwillingness to participate in the study, pregnancy, and lactating mothers. Participants were also excluded from the study if they discontinued in the mid of study. The subjects were divided into two categories, one is the standard medical discharge summaries, the medication review and explanation is done by the nursing team or other health professionals. The second category is the discharge medications were intensely reviewed and explained by clinical pharmacists. The audit is performed for both the groups.

Data collection and analysis

The study used an appropriate checklist which comprises various parameters whether the drug advised for discharge is appropriate in its dose, frequency and route of administration. The number of therapeutic or drug duplications, contraindications and the special instructions for the safe use of medications are also audited. Any deviations observed were promptly corrected upon discussing with team in consultants. The observed discrepancies or deviations are collected and analyzed quantitatively by using Microsoft excel.

The discharge summary is prepared in the electronic health record by the team in doctors. As a part of digital India initiative, the discharge lists of medications are prepared and reviewing electronically [6]. The electronic health record

extracts the information from hospital information management system while preparing the list of discharge medications. The doctor in team decides the discharge medications and prepares the summary. Once the list of medications is prepared, it is sent for approval. Then the primary doctor under whom the patient gets admitted approves the summary, followed by which the clinical pharmacist receives the summary for review or audit. The clinical pharmacist does meticulous review for appropriateness of medication. In case of any discrepancies observed, the cp hits the consultant contact number and discusses about the deviation thereby resolves the issue relevant to medications present in the discharge summary. The deviations are not just identified; they are corrected and ensured the final discharge summary is error free. All the deviations observed in the discharge medications are recorded and analyzed at the end of every month. The clinical pharmacist discusses with the primary doctor in case of any deviation or disparity in the medications present in the summary. The Comparative analysis of the current month is done by comparing it to the previous months.

Results

Quantitative results

The study comprised 298 patients in total, 155 in the pre-intervention group and 143 in the post-intervention group. The majority of patients have co-morbid conditions such as renal insufficiency, hypothyroidism, diabetes mellitus, hypertension, and other cardiovascular diseases. After the Clinical Pharmacy (CP) intervention, compared to the baseline or usual care group, there were notable improvements across various medication-related aspects. The drugs listed in the discharge Summary were examined for a number of factors, some of which are listed in the below Table 1. The deviations present in the medications are found to have Remarkable difference upon pre and post intervention.

Table 1: Comparison of baseline and post-intervention outcomes.

Identified Outcomes	Base line/Usual care (n=155)	Upon CP intervention (n=143)
Incomplete order	36	21
Duplication therapy	9	0
Allergies not specified	4	1
Discrepancy in dose/ frequency	28	13
ROA deviation	14	5
Without instead instructions regarding discharge medications	21	4
Inappropriate duration	3	1
Emergency visit/re-admission	4	1
Inappropriate relation with meals	7	1
Total	126	47

In the Baseline/Usual Care group, the most prevalent outcome was incomplete order, accounting for approximately 28.57% of cases, followed by discrepancy in dose/frequency at approximately 18.06%. Other outcomes included ROA deviation which is 11.11%. With instructions regarding discharge medications (16.67%), inappropriate relation with meals (5.56%), duplication therapy (7.14%), allergies not specified (3.17%), emergency visit/re-admission (3.17%), and inappropriate duration (2.38%). Upon CP intervention, the most prevalent outcome incomplete order, accounting for approximately 14.48% of cases, followed by discrepancy in dose/frequency at approximately 9.09%. Other outcomes included ROA deviation (10.64%), with instructions regarding discharge medications (8.51%), inappropriate relation with meals (2.13%), allergies not specified (2.13%), emergency visit/re-admission (2.13%), and Inappropriate duration (2.13%). The outcome duplication therapy had no occurrences after CP intervention.

One of the most common issues with discharge drugs is incomplete regimens, meaning that previous prescriptions/ medications were left off in more than half of the discharge summaries, despite the fact that these medications are crucial for treating chronic metabolic problems. Patients with long-term diseases must adhere to their prescription regiment strictly; else, they risk serious consequences. Next, the post-Intervention group had zero therapeutic and drug duplications out of all the parameters evaluated, which decreased the patient's polypharmacy, or the number of pills they took. Reducing the quantity of pills taken by the patient is not the only goal, minimizing the polypharmacy also lessens the negative effects of the medication. On the other side, the patient's financial burden may be lessened. The differences in medication dose and frequency were reduced by half following the intervention. Some of these include stating a single tab rather than two. One of the patient summaries in our analysis indicated that the exact dose is 750 mg × 2 tabs, but it was unfortunately typed as 750 mg, one tablet, as typing one tablet is a standard practice with most medications into the summary.

When a patient is discovered to be allergic to any medication during their inpatient stay, it is not always very visible in ordinary practice to observe that particular medication under the drug allergy column in the discharge narrative. Following noticing this variation, the cp discusses with the person who creates the discharge summary about how important it is to include the medicine name in the drug allergy section and makes sure the practice is followed following the intervention. It has been observed that summaries without the special instructions for medication administration were markedly reduced from 21 to 4. It is the pharmacist's obligation to ensure that pharmaceutical instructions are mentioned and explained. Prior to clinical pharmacist as-

sistance, addressing how to utilize drugs was given the least importance. Knowing the importance of this, and in order to put patients at ease when managing their drugs, the cp prioritized mentioning the precise directions for medication use wherever necessary.

Furthermore, there was a decrease in emergency visits or re-admission rates from 4 to 1. CP ensures the reduction in emergency readmission rates by make it a routine practice to add all the medications of previous co morbidities in the discharge summaries without fail. This practice will ensure that patient will be leaving the treating facility with a comprehensive medication list increasing medication compliance, this way hospital readmission rates are decreased. Fewer instances of medications being inappropriately related to meals, dropping from 7 to 3 in the intervention group. Except for proton pump inhibitors, the relationship between drug administration and diet was not considered significant. Once the clinical pharmacist began reviewing the discharge prescriptions, emphasis was placed on this characteristic, and it was made clear whether it was after or before food. Aside from PPIs, hypothyroid medicines, rifampicin, tetracyclines, trypsin/chymotrypsin, sucralfate, and a few oral hypoglycemic drugs were identified as medications that must be consumed before food.

The data collected is critically analyzed with an aim to optimize to the number of medications the patient is taking at home which is scientifically called reducing the complex polypharmacy. The study is determined to analyze various parameters such as right drug for the right diagnosis, right dose, right route of administration and right frequency are all verified. Apart from these parameters, drug duplication, therapeutic duplication (Table 2).

Table 2: Illustrates degree of incidence of errors or deviations between the discharge summaries reviewed by medical fraternity and clinical pharmacists.

Primary outcome measures : Numbers of errors in discharge summaries for patients in control (standard medical discharge summaries) and intervention (discharge summaries reviewed by CP)	Standard medical discharge summaries	Discharge summaries(clinical pharmacist)
Number of patients	155	143
Total number of documented medications	775	775
Summaries with errors	86	38
Errors per patient		
0	88	117
1	28	15
2	18	13
3	12	7
>4	9	3

This Table 2 presents a comparative analysis of errors identified in medical discharge summaries versus discharge summaries reviewed by clinical pharmacists. The study included 155 participants medical discharge summaries and 143 discharge summaries reviewed by clinical pharmacists. The total number of documented medications in both groups remained consistent at 775. Medical discharge summaries exhibited a higher incidence of errors, with 86 summaries containing errors, whereas only 38 errors were identified in discharge summaries reviewed by clinical pharmacists.

Upon further examination of errors per patient, it was observed that, majority of patients in the clinical pharmacist-reviewed group had zero errors (117 patients), indicating a higher percentage of error-free discharge summaries compared to the standard medical discharge summaries group, where 88 patients had zero errors. In terms of multiple errors per patient, the clinical pharmacist-reviewed group demonstrated fewer incidences of summaries with multiple errors. To be more precise, fewer patients in this group had 1-3, or more than 4 errors per patient compared to the standard medical discharge summaries group.

These findings indicate that involvement of clinical pharmacists in the discharge medication review process leads to a reduction in errors and improves the overall quality of discharge summaries compared to traditional medical discharge practices. The above results emphasize that, having a clinical pharmacist as a member in the health care team brings numerous benefits not only to the patients, but also brings credibility and increased trust of the patients towards their treating doctors and the health care centers.

One of the prominent medication discrepancies that were found during the study was, missing the addition of cross referral medications where patient will be having multiple co morbidities. Because multiple systems inside the human body are already affected, ignoring the addition of at least one medication will certainly harm the patient. This can cause the emergency visit or readmission of the patient. The other second important discrepancy observed is the addition of drugs of similar classification causing increase in complex ploypharmacy especially to the patients with co morbidities. Increase in complex ploy pharmacy reduces medication adherence which eventually reduces the speed of recovery. Therefore, it indicates the services of clinical pharmacists are essential for the better patient outcomes.

Discussion

While prescribing the right medication at the right dose is crucial for a patient's speedy recovery after discharge, is

only a part of the story. Going further, clear instructions on how to take medications at home are essential. Not all medications that patients take are straightforward. Some require specific precautions [7], like taking them on an empty stomach or avoiding certain food. This is where a clinical pharmacist's review of discharge medications makes a big difference, ensuring every instruction on how to use the medicine rightly is mentioned or explained. By providing a comprehensive medication review, clinical pharmacists ensure patients understand exactly how to take their medications for the best possible results (Table 3).

Table 3: A few category of medications which require special instructions upon administering for the best possible outcome.

S.No	Medication	Special instructions to administer/ counselling points	Comment
1	Alendronate/ bisphosphonates	On empty stomach, atleast 30 min before food	To enhance the absorption consequently for the best therapeutic outcome
2	Inhaled steroids	Rinse mouth after use	To avoid oropharyngeal candidiasis
3	Betadine gargle 1:1	Dilute the solution in equal amounts	To avoid harm to the buccal cavity, burning sensation
4	Sompraz hp kit	One tab (pantoprazole)on empty stomach and the other after food (clarithromycin and amoxixillin)	For the best therapeutic activity of the medicine
5	Digoxin 5/7 tab.	Only five days a week	Narrow therapeutic index drug
6	Diuretics oral	Before 7 pm	To avoid disturbed sleep
7	Statins oral	At bed time	For a better lipid lowering activity
8	Alpha glucosidase inhibitors oral	With food	For a regulated blood glucose levels
9	Sevelamer oral	With food	For the regulated phosphorous levels
10	Acitrom and warfarin oral	5 Pm- 6 pm	To avoid drug food interactions
11	Ssris oral	Morning time	To avoid disturbed sleep
12	Eye drops	Ready to sleep time	To ensure better absorption and avoid draining out
13	Sorbitrate s/l	Under the tongue	For immediate relief
14	Citralka oral	Dilute with water	Could lead to irritation or discomfort in the stomach/oesophagus due to its acidic nature
15	Tab. Dytor e	One brown tablet; one white tablet	Dytor (brown); eplerenone (white)
16	Iron and calcium tabs	Separate at least by 2 hours during administration	To avoid impaired absorption
17	Rifampicin oral	On empty stomach	For better absorption, consequently for the better therapeutic outcome
18	Sucral o suspension/other suspensions	Shake well before use	To ensure uniform distribution of the drug consequently better absorption

Today, millions of patients suffer from multiple co morbidities and not every medication for those can be taken immediately after food consumption. The timing of medication administration can vary depending on several factors, including the medication's absorption requirements, potential interactions with food and desired therapeutic effects. Some medications are best taken on an empty stomach to ensure optimal absorption [8]. This is often the case with medications bisphosphonates (e.g., alendronate). Here a few important medicines which were found during my study. Starting with alendronate, used for the treatment of osteoporosis which is advised to swallow once weekly [9]. This medicine must be administered on an empty stomach and remaining upright afterward is essential for optimal absorption, effectiveness, and to minimize the risk of side effects, particularly esophageal irritation. It's important to follow these instructions carefully. Inhaled steroids require rinsing the mouth after use to prevent oropharyngeal candidiasis, a fungal infection common with steroid inhalers [10]. Similarly, Betadine gargle solution should be diluted in equal amounts to avoid damaging the buccal cavity and reduce the risk of experiencing a burning sensation. Medication combinations, such as the Sompraz HP Kit containing pantoprazole, clarithromycin, and amoxicillin, require specific timing for each component to maximize therapeutic activity, especially in treating conditions like Helicobacter pylori infection and associated gastritis [11]. With medications like Digoxin, taking breaks in the regimen is advised to mitigate the risk of toxicity due to its narrow therapeutic index. Time-specific instructions, such as taking oral diuretics before 7 pm, aim to prevent disturbed sleep caused by increased night time urination [12]. Additionally, timing for statins medication intake at bedtime is associated with better lipid-lowering activity, as cholesterol synthesis peaks during the night [13,14]. Oral medications like alpha-glucosidase inhibitors and sevelamer are advised to be taken with food to regulate blood glucose and phosphorus levels, respectively. These guidelines extend to medications like acitrom and warfarin, which are recommended to be taken between 5 pm and 6 pm to avoid potential drug-food interactions. Each instruction is carefully tailored to optimize medication effectiveness and patient safety, ensuring the best possible outcomes [15].

Gone are the days where pharmacist is dismissively called as a compounder. Multiple branches related to pharmacy have been developed. One such important branch among them is clinical pharmacy. Undoubtedly, cp's are one of the elite professionals among the multidisciplinary health care team. Every single patient had a different set of questions to cp and it's an honor to receive the feedback from patients. With all the above process, the patient satisfaction seems to be greatly increased during discharge. The degree of patient satisfaction was measured at regular intervals by using patient feedback forms and google reviews. It has been found that the patient satisfaction is greatly enhanced after the clinical pharmacist started to explain on directions to use the medications [16]. Many medication queries have been raised by the patients and their attenders who were clarified by the clinical pharmacists. This interaction between patient's family and cp gave immense satisfaction; confidence to the cp and its now, the department started doing much better. Upon CP intervention,there was a noticeable decrease in emergency visits and re-admissions, attributed to comprehensive medication lists provided at discharge hereby emphasizing the importance of medication compliance and reducing healthcare hazards [17]. Patient satisfaction also significantly increased with the involvement of clinical pharmacists, as they provided personalized attention, clear explanations regarding medications. Furthermore, comparative analysis between standard medical discharge summaries and discharge summaries reviewed by clinical pharmacists demonstrated a reduction in errors and improved overall quality in the latter group. Clinical pharmacists play a vital role in optimizing medication therapy and addressing medication-related queries. They possess robust knowledge in pharmacotherapy and liaise with healthcare teams to ensure safe and effective medication use [18,19].

Conclusion

Based on the extensive data and analysis, it's evident that the integration of clinical pharmacists into the discharge process significantly enhances medication management and improves patient outcomes. The study conducted on 298 patients, with 155 in the pre-intervention group and 143 in the post-intervention group, demonstrates notable improvements across various medication-related aspects after Clinical Pharmacy (CP) intervention. CP intervention has led to a significant decrease in medication discrepancies, including incomplete regimens, therapeutic and drug duplications, discrepancies in dose/frequency, Route Of Administration (ROA) deviations, and inappropriate duration. In conclusion, the study underscores the indispensable role of clinical pharmacists in healthcare teams, advocating for their integration into patient care processes to ensure safer and more effective medication management. By meticulously reviewing medications, addressing discrepancies, providing patient education, and ensuring adherence to best practices, clinical pharmacists contribute significantly to enhance medication safety, optimizing therapeutic outcomes, and ultimately improving patient care during the discharge process and beyond. We always believe that clinical pharmacists are medication experts and they can deliver the medication information to the best of their ability.

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Conflict of interest

Authors have no conflict of interest to declare.

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