Xue M, Zhuo L, Qing W, Yafei W, Fei L, Xuelong Su. Drug-related problems identified during pharmacy consultation in outpatient . Pharmacy Practice 2025 Jul-Sep;23(3):3245.

https://doi.org/10.18549/PharmPract.2025.3.3245

Original Research

Drug-related problems identified during pharmacy consultation in outpatient

Xue Mi, Zhuo Li, Qing Wang, Yafei Wen, Fei Liu, Xuelong Su

Received (first version): 01-Oct-2024 Accepted: 16-Jan-2025 Published online: 04-Jul-2025

Abstract

Background: Drug-related problems (DRPs) might lead to adverse drug events, and medication errors have received extensive attention among the public and health care system worldwide. The purpose of this study was to identify common drug-related problems (DRPs) during pharmacy consultation in outpatient pharmacies by implementing a counseling model. **Method:** We conducted a prospective study in the outpatient pharmacy of a tertiary academic hospital for 16 months. A counseling model was implemented by a pharmacy team, and data were collected during pharmacy consultation. Data analysis was performed on identified DRPs, causes and their relationships. Problem-level descriptive analysis and network analysis were conducted using R 3.6.3. **Result:** Pharmacists identified 504 DRPs during pharmacy consultation with primarily adverse drug events (ADEs, 26.98%) and untreated symptoms or indications (16.67%). The most frequent drug classes correlated with DRPs were 'cardiovascular system' drugs (13.39%), followed by 'traditional Chinese medicine' (12.71%) and 'alimentary tract and metabolism' drugs (12.54%). Most DRPs were due to necessary information not provided in dispensing and drug selection. More than 98.25% of advice given by the pharmacist was accepted or taken into consideration, and 97% of patients reported that their medication problems were totally or partially solved. **Conclusion:** Implementation of the counseling model appears to be a means to improve drug use by serving as an important tool to increase the identification and resolution of DRPs, resulting in positive experiences in both pharmacy practitioners and patients.

Keywords: counselling, outpatient pharmacy, pharmacists, drug related problem

INTRODUCTION

A drug-related problem (DRP) is defined as 'an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes'[1]. DRPs might lead to adverse drug events (ADEs), and medication errors (MEs) have received extensive attention among the public and health care system worldwide. One study assessed DRPs in patients with chronic diseases who visited community pharmacies and reported a mean DRP rate of 4.1 per patient, but the majority of DRPs are preventable[2]. In another study in Sweden, DRPs were the primary reason for hospitalization in close to one-third of the patients[3]. DRPs also place an economic burden on patients and the health care system, which costs €2.58 to €111 727.08 per medication error[4]. Given the medical and economic burdens associated with DRPs, it is necessary to act to reduce the consequences of DRPs in patients and the significant burden that DRPs place on our health care system[5,6]. To reduce and prevent DRPs in patients of the interventions that are noticed, pharmaceutical care shows promising improvement in reducing DRPs compared with other interventions[7].

Published literature suggests that clinical pharmacists can play an essential role in promoting the delivery of pharmaceutical care (PC) and improve the overall quality of health care by using their skills and knowledge to make the best use of medications to ensure safe and effective pharmacotherapy and reduce the incidence rate of DRPs [8-10]. However, the development and implementation of PC in the process of outpatient drug use is currently facing challenges. In China, the PC development situation is further complicated by the relatively late introduction of the concept and limited human resources. Imbalances exist in the development of PC among different specialties and various regions, and a mature and complete pharmaceutical care system has not been formed in the process of outpatient medication[11,12].

In outpatient pharmacies, the main focus of PC has been on information to the prescription patient on how to use medication correctly, such as advice on administration, dosage, drug interactions and ADR. Therapeutic drug monitoring has been practiced to a lesser extent. In recent years, with the transformation of PC, there has been a growing emphasis on

Xuelong Su*. Key laboratory of Shaanxi Province for Craniofacial Precision Medicine Research, College of Stomatology, Xi'an Jiaotong University, Xi'an, China, Department of Pediatric Dentistry, stomatological hospital, Xi'an Jiaotong University, Xi'an, China. 1621861362@qq.com.
Fei Liu*. Key laboratory of Shaanxi Province for Craniofacial Precision Medicine Research, College of Stomatology, Xi'an Jiaotong University, Xi'an, China, Department of Pediatric Dentistry, stomatological hospital, Xi'an Jiaotong University, Xi'an, China. liufei6630@mail.xjtu.edu
Xue Mi. College of Pharmacy, Ningxia Medical University, Yinchuan, China.
Zhuo Li. Department of Pharmacy, Shaanxi Provincial People's Hospital, Xi'an, China.
Qing Wang. Department of Pharmacy, The First People's Hospital of Yinchuan, Yinchuan, China.
Yafei Wen. College of Pharmacy, Ningxia Medical University, Yinchuan, China.

https://doi.org/10.18549/PharmPract.2025.3.3245

the identification, resolution and documentation of DRPs in outpatient pharmacy practice in China. However, the extent to which pharmacy practitioners recognize and figure out DRPs has been shown to vary considerably, both in China and in other countries[13-16]. Maybe creation of a counseling model by clinical pharmacists was a good strategy to both improve and standardize the detection and resolution of DRPs in outpatient pharmacies.[17]. However, in China, the development of counseling models among different specialties and various regions exists imbalance, there are no published large-scale studies describing DRPs in outpatient pharmacies. Thus, in order to promote the development of PC in outpatient pharmacies and a standard counseling model is needed, and a discussion on the classifications and incidence of DRPs is necessary to guide future efforts to reduce the incidence of DRPs.

We therefore conducted a prospective study to measure the prevalence of DRPs by using a drug counseling model that was tailored to outpatient pharmacies, including what are the most common DRPs in outpatient pharmacies and what are the causes? Such data could provide a new angle for the development and implementation of PC in the process of outpatient drug use and feed into decision-making pertaining to reducing DRPs.

METHODS

In this research, we embarked on an innovative approach to identify common drug-related problems (DRPs) in outpatient pharmacies. Our study diverges from previous

methodologies by tailoring the pharmacy consultation process to the specific dynamics of a tertiary academic hospital's outpatient setting.

Setting and Study Design

A prospective study was conducted over 16 months in the outpatient pharmacy of two tertiary academic hospitals. This setting provided a unique environment to observe and analyze DRPs, differentiating our study from others that have focused on more controlled or intensive care settings. The DRPs were documented anonymously. The study has been approved by the Ethics Committee of Ningxia Medical University (registration numbers 2022-1762). No personal information regarding the patients, apart from medication information, was documented.

Implementation of Counseling Models

We introduced a custom counseling model, developed specifically for the outpatient context[14]. The counseling models or protocols contained important key questions based on the principles of pharmaceutical care (Figure. 1). This model was designed to engage patients more actively in the consultation process, facilitating a deeper understanding of their medication regimens and potential DRPs.

Data Collection and Analysis

During DRP classification, the Pharmaceutical Care Network Europe (PCNE) Classification system was initially chosen for it considered as a validated system for DRP classification in hospital settings.[18] During the consultation process, the pharmacy team meticulously collected data on identified DRPs. Our analysis focused on understanding the causes of these DRPs and their interrelationships, utilizing a novel analytical approach. We employed R 3.6.3 for problem-level descriptive analysis and network analysis, adapting these tools to our unique dataset and research questions. This analytical strategy allowed us to uncover patterns and correlations specific to the outpatient pharmacy setting.

RESULTS

Basic Information

A total of 448 consultations were received from patients and physicians during the 16-month study period, and 504 DRPs were identified from these consultations (for the flowchart for consultation classification, see Figure 2). Using the Anatomic Therapeutic Chemical (ATC) classification (WHO-ATC)[19] for drugs, the most frequent drug classes correlated to DRPs were 'cardiovascular system' (13.39%), followed by 'Traditional Chinese medicine' (12.71%) and 'Alimentary tract and metabolism' (12.54%). The drug classes that most frequently correlated with DRPs are illustrated in Table 1.

Identified drugrelated problems

Data analysis results of DRPs related to all medications are shown in Table 2. Among 504 DRPs identified from all medications, some problems were unclear problems/ complaints (46.23%). For example, patients consult about the method of taking drugs, usage and dosage, whether there are alternatives to similar drugs, prescription management-related issues, and whether specific drugs can be used for a long time according to their condition. In addition, "Adverse drug event (possibly) occurring" P2.1 was the major type of DRP (26.98%), followed by "treatment effectiveness" P1 (20.64%). In terms of adverse drug reactions (ADRs), such as ADRs of specific drugs; ADRs caused by changes in drug administration method (drug combination), dose, storage conditions, medication sequence, etc. ; drug safety for special populations: drug use for pregnant and lactating women, drug use for women in the menstrual period, drug use for children, etc. ; long-term drug use needs to pay attention to possible ADRs and seek treatment measures after ADRs.

Within the P1 domain, "Untreated symptoms or indication" P1.3 was the major subcategory (16.67%), followed by "Effect of drug treatment not optimal" P1.2 (3.77%). "Problem with cost-effectiveness of the treatment" P3.1 (6.15%) was the third most frequently reported type of DRP. Medication classification results indicated that the most frequent drug classes correlated with DRPs were "cardiovascular system", followed by "traditional Chinese medicine" and "alimentary tract and metabolism.

Causes of drug-related problems identified

A total of 504 DRP causes were identified (Table 3). "Dispensing" C5 was the primary cause of DRPs (58.93%), followed by "Drug

https://doi.org/10.18549/PharmPract.2025.3.3245

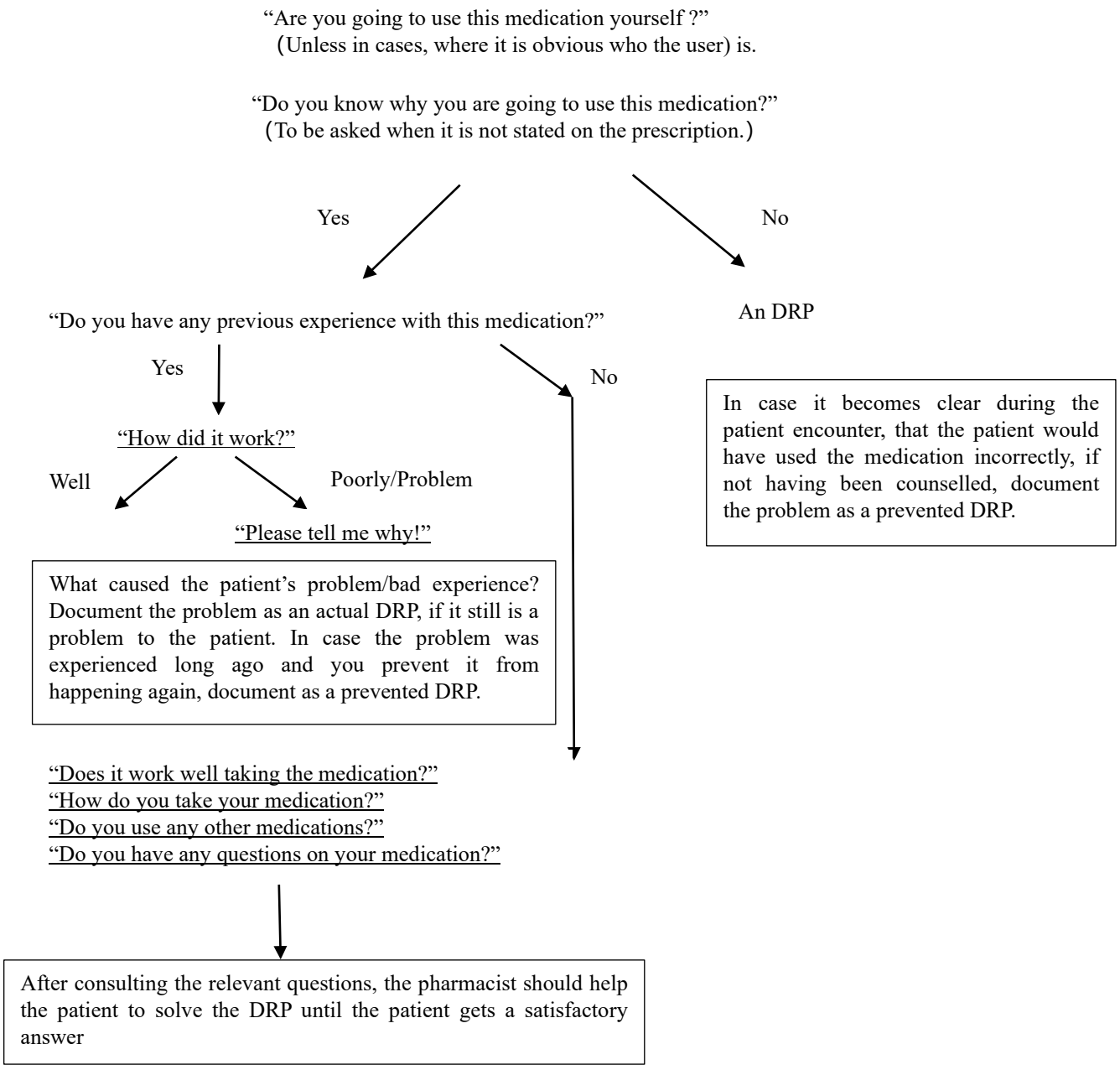

Figure 1. Counselling model used in patients, expected to be detected by the practice of actual key questions

www.pharmacypractice.org (eISSN: 1886-3655 ISSN: 1885-642X)

https://doi.org/10.18549/PharmPract.2025.3.3245

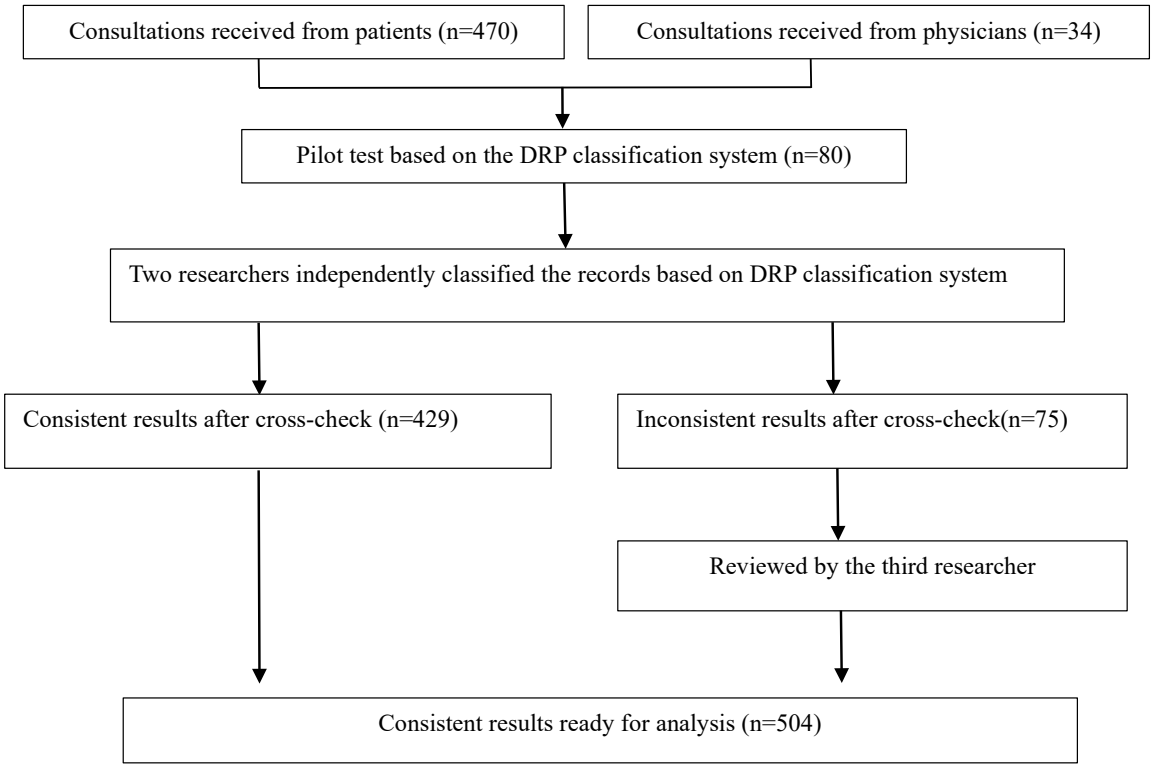

Figure 2. The flowchart for consultation classification

Table 1: The drug classes that ten most frequently correlated to DRPs

WHO-ACT	Overall n= (% of 590*)
Cardiovascular system	79 (13.39)
Traditional Chinese medicine	75 (12.71)
Alimentary tract and metabolism	74 (12.54)
Nervous system	51 (8.64)
Antiinfectives for systemic use	51 (8.64)
Respiratory system	45 (7.63)
Genito urinary system and sex hormones	41(6.95)
Antineoplastic and immunomodulating agents	34(5.76)
Dermatologicals	30(5.08)
Musculo-skeletal system	30(5.08)
*total number of drugs	

Table 2: Identified problems according to the PCNE DRP classification tool V9.0

Code	Problem	Total number= (100%)
P1	Treatment effectiveness	104 (20.64)
P1.1	No effect of drug treatment	1 (0.20)
P1.2	Effect of drug treatment not optimal	19 (3.77)
P1.3	Untreated symptoms or indication	84 (16.67)
P2	Treatment safety	136 (26.98)
P2.1	Adverse drug event (possibly) occurring	136 (26.98)
P3	Other	264 (52.38)
P3.1	Problem with cost-effectiveness of the treatment	31 (6.15)
P3.3	Unclear problem/complaint	233 (46.23)

Table 3: Identified causes according to the PCNE DRP classification tool V9.0

Code	Cause	Total number= (100%)
C1	Drug selection	103 (20.44)
C1.1	Inappropriate drug according to guidelines/formulary	5 (0.99)
C1.2	Inappropriate drug (within guidelines but otherwise contra-indicated)	51 (10.12)
C1.4	Inappropriate combination of drugs, or drugs and herbal medications, or drugs and dietary supplements	12 (2.38)
C1.5	Inappropriate duplication of therapeutic group or active ingredient	2 (0.40)
C1.6	No or incomplete drug treatment in spite of existing indication	33 (6.55)

https://doi.org/10.18549/PharmPract.2025.3.3245

C3	Dose selection	5 (0.10)
C3.1	Drug dose too low	2 (0.40)
C3.2	Drug dose too high	2 (0.40)
C3.4	Dosage regimen too frequent	1 (0.20)
C4	Treatment duration	2 (0.40)
C4.2	Duration of treatment too long	2 (0.40)
C5	Dispensing	297 (58.93)
C5.1	Prescribed drug not available	37 (7.34)
C5.2	Necessary information not provided	255 (50.60)
C5.4	Wrong drug or strength dispensed	5 (0.99)
C6	Drug use process	3 (0.60)
C6.3	Drug over-administered	1 (0.20)
C6.6	Drug administered via wrong route	2 (0.40)
C7	Patient related	8 (1.59)
C7.8	Patient administers/uses the drug in a wrong way	5 (0.99)
C7.9	Patient unable to use drug/form as directed	3 (0.60)
C9	Other	86 (17.07)
C9.2	Other cause; specify	71 (14.09)
C9.3	No obvious cause	15 (2.98)

selection" C1 (20.44%). Within Dispensing C5, "necessary information not provided" C5.2 was the dominant subcategory, followed by "prescribed drug not available" C5.1. "Inappropriate drug (within guidelines but otherwise contraindicated)" C1.2 was the major subcategory in the drug selection domain C1. The cause of the problem is probably related to the limited time of interaction between physicians and patients and patients and dispensing pharmacists. Some patients did not receive relevant guidance regarding specific medication information.

Pharmacist interventions to solve drug-related problems

A total of 504 interventions were suggested (Table 4). Most interventions occurred at "Patient level" I2 (79.37%), followed by "Drug level" I3 (20.24%). At the patient level, "Patient (drug) counseling" I2.1 was the major subcategory, which included providing patients with the usage and dosage of drugs, medication precautions, etc. At the drug level, "Drug changed to … " I3.1 was the major subcategory, followed by "Instructions for use changed to …" I3.4 and "Drug paused or stopped" I3.5. A total of 504 interventions related to drug therapy changes were proposed by pharmacists (including providing drug information for patients and answering medication questions), with an acceptance rate of 98.25%. By on-site question-and-answer and telephone follow-up, 92% of patients reported that their medication problems were totally solved, 5% of patients thought their problems were partially solved, and 3% of patients were lost to follow-up.

Table 4: Proposed interventions according to the PCNE DRP classification tool V9.0

Code	Intervention	Total number= (100%)
I1	At prescriber level	2 (0.40)
I1.4	Intervention discussed with prescriber	2 (0.40)
I2	At patient level	400 (79.37)
I2.1	Patient (drug) counselling	368 (73.02)
I2.3	Patient referred to prescriber	32 (6.35)
I3	At drug level	102 (20.24)
I3.1	Drug changed to …	39 (7.74)
I3.2	Dosage changed to …	10 (1.98)
I3.3	Formulation changed to …	2 (0.40)
I3.4	Instructions for use changed to …	21 (4.17)
I3.5	Drug paused or stopped	19 (3.77)
I3.6	Drug started	11 (2.18)

https://doi.org/10.18549/PharmPract.2025.3.3245

Relationship Between DRPs and Causes

The relationship between the DRPs and causes was analyzed and is shown in Figure 3. During pharmacy consultation, the main cause leading to "P3.3 unclear problem/complaint (including consultation information, usage and dosage of drugs. etc.)" was "C5.2 necessary information not provided" (n=163) and "C5.1 Prescribed drug not available" (n=26). For such problems and the causes, the pharmacist in the process of consulting provides patients with detailed guidelines and suggestions of medication, the acceptance rate of patients was 100%, and all problems were solved. The main causes of "adverse drug event (possibly) occurring P2.1" were "C1.2 inappropriate drug (within guidelines but otherwise contra-indicated)" (n=50) and "C5.2 necessary information not provided" (n=33). For these problems and causes, the pharmacist not only provided necessary information guidance but also adjusted inappropriate drug use at the drug level. Ninety-seven percent of patients accepted the suggestion and fully implemented it, and the problem was solved.

Case

Case 1: The patient consults whether a prescription loxoprofen sodium dispersible tablet can be taken for a long time. The patient was found to have aplastic anemia during consultation. Loxoprofen sodium dispersible tablets are nonsteroidal anti-inflammatory drugs, and the adverse reactions include hemolytic anemia and gastrointestinal bleeding. It is recommended that the patient should not use the medication long-term, and regular routine blood monitoring should be conducted during use. The analysis process is shown in Table 5.

Case 2: Her son had pneumonia after surgery due to congenital esophageal atresia. Doctor prescribes human immunoglobulin injection 50 ml:2.5 g, muscle injection, is it feasible? The child is premature and only 1 month old at present. A 50 ml dose of human immunoglobulin was diluted with 5% GS (glucose solution) and administered by intravenous drip. Muscle injection is wrong. It is recommended to go to the doctor to revise the prescription and follow the doctor's order in the correct way. The analysis process is shown in Table 5.

DISCUSSION

This is a pilot study aimed at evaluating a drug counselling model and identifying Drug - Related Problems (DRPs) in an outpatient pharmacy. It was, in fact, spurred by the actual clinical demand for effective and standardized pharmacy services in the outpatient pharmacy setting. The results of this study can contribute to decision- making processes

Table 5: Discovering and resolving DRPs using Counselling Models during Pharmacy Consultation
Case1
Patient: May I ask whether loxoprofen sodium dispersion tablets can be used for a long time?
Pharmacist: Are you going to use this medication yourself?
Patient: Yes. I suffered from arthritis and intend to use it for a long time.
Pharmacist: Do you have any previous experience with this medication?
Patient: No
Pharmacist: Do you have any medical conditions other than arthritis or take any medications?
Patient: Yes. I also have aplastic anemia. *(An DRP, P2.1"Adverse drug event (possibly) occurring")*
Pharmacist: Loxoprofen sodium dispersible tablets are non-steroidal anti-inflammatory drugs, and the adverse reactions include hemolytic anemia and gastrointestinal bleeding. *(Cause: C1.2 "inappropriate drug (within guidelines but otherwise contra-indicated)")*
Pharmacist: you should not use it for a long-time, and regular blood routine monitoring should be conducted during the use. *(Intervention: At drug level, I3.4 Instructions for use changed to short-term.*
Patient: OK. I accept your suggestion and fully implemented. *Acceptance of the Intervention proposals: A1.1 Intervention accepted and fully implemented.*
Pharmacist: Do you have any questions on your medication?
Patient: No. My problem totally solved. Thanks. *Status of the DRP: O1.1 Problem totally solved.*
Case2
Patient: My son had pneumonia after surgery due to congenital esophageal atresia. Doctor prescribes human immunoglobulin injection 50ml:2.5g, muscle injection, is it feasible?
Pharmacist: No, muscle injection is wrong. *(An DRP, P2.1"Adverse drug event (possibly) occurring"; Cause: C6.6 Drug administered via wrong route)*
Pharmacist: Your child is premature and only 1 month old. A 50ml dose of human immunoglobulin should be diluted with 5%GS (glucose-solution) and administered by intravenous drip.
Pharmacist: You should go to the doctor to revise the prescription and administered drug by intravenous drip. *(Intervention: At patient level, I2.3 Patient referred to prescriber.*
Patient: OK. I accept your suggestion and fully implemented. *Acceptance of the Intervention proposals: A1.1 Intervention accepted and fully implemented.*
(Follow-up to ask the patient whether the problem had been resolved, and the patient indicated that all the problems had been resolved) *Status of the DRP: O1.1 Problem totally solved.*

www.pharmacypractice.org (eISSN: 1886-3655 ISSN: 1885-642X)

https://doi.org/10.18549/PharmPract.2025.3.3245

related to reducing DRPs and offer a novel perspective for the development and implementation of Pharmaceutical Care (PC) during the outpatient drug use process.

The results revealed that, excluding patients' inquiries regarding drug taking methods, usage, dosage, and prescription management-related issues, "Adverse drug event (possibly) occurring" was the most frequently detected DRP in outpatient pharmacies. Most DRPs stemmed from the lack of necessary information in dispensing, drug selection, and dose selection, which aligns with previous reports in China[20]. Notably, more than 98.25% of the advice provided by pharmacists was accepted or taken into account, a figure significantly higher than previously reported in China. This indicates that the drug counseling model implemented by pharmacists in this study is effective in identifying DRPs in outpatient pharmacies. The establishment of such practice models can benefit institutions with limited human resources in identifying the majority of DRPs and averting medication errors.

Before delving into the broader implications and potential improvements of this study, it's important to note the significance of the results we've just presented. The high rate of DRP identification and the remarkable acceptance of pharmacist advice not only demonstrate the immediate effectiveness of the counseling model but also raise several questions. For example, what are the long-term implications of this high acceptance rate on patient outcomes? And how do the identified DRP - causing factors relate to the overall healthcare system? These are the aspects we will explore in the following discussion.

The most frequently encountered DRPs in our study were attributed to the absence of essential information regarding drug use. This high frequency is likely associated with the restricted interaction time between physicians and patients, as well as between patients and dispensing pharmacists[21,22]. In China, given the large patient population and limited medical resources, patients often desire more than just diagnosis and treatment from doctors. They also wish to understand the effects of prescribed drugs, potential adverse reactions, and precautions for use. Patients with multiple diseases, in particular, are concerned about drug - drug interactions. However, due to time constraints and professional boundaries, clinicians are unable to address all these concerns.This situation presents significant opportunities for pharmacists. Pharmacists can thus explore patients' needs and "fill in the knowledge gaps." Most routine patient counseling by pharmacists is not overly time consuming and serves as an intervention to enhance medication adherence, thereby minimizing non compliance-related therapy issues[23,24].

Besides, regarding the high acceptance rate of pharmacist interventions, it has far - reaching positive implications. When patients accept the advice provided by pharmacists, it can directly lead to a reduction in the occurrence of Adverse Drug Events (ADEs). Pharmacists, with their in - depth knowledge of drugs, can guide patients on proper usage, helping patients avoid incorrect dosing, inappropriate combinations, and other factors that may trigger ADEs. For example, by providing clear instructions on drug - taking intervals, potential food - drug interactions, and warning signs of adverse reactions, patients are better equipped to use medications safely. Moreover, the reduction in ADEs can, in turn, lead to a decrease in hospitalizations. Many ADEs, if not properly managed, can result in patients having to be admitted to the hospital for treatment. By effectively intervening and providing accurate information, pharmacists can prevent such situations. A lower hospitalization rate not only benefits patients in terms of reduced health risks and costs but also eases the burden on the entire healthcare system.

Fully evaluating pharmacy consultation services will offer more evidence to ensure the success and benefits of establishing drug consultation clinics in reducing DRPs and improving patient health outcomes. Pharmacy consultations are designed to serve specific populations and their medication therapies, guiding patients' drug use within the constraints of limited hospital resources. Therefore, effective methods are required to identify more actual and potential DRPs, which has spurred the further development of counseling models. These models can improve and standardize the quality of counseling, acting as an important tool for enhancing the identification and resolution of DRPs. In this study, the drug counseling model was customized for outpatient pharmacies and mainly consists of key questions commonly covered in the dialog between pharmacy practitioners and patients[25]. The results showed that 97% of DRPs could be partially or completely resolved in the pharmacy. These results validate the effectiveness of the counseling model in promoting the detection and resolution of DRPs in patients' daily lives. To ensure effective communication tailored to patients' understanding levels, the consultants in this study were clinical pharmacists with extensive experience and clinical - pharmacy training, who had obtained clinical - pharmacy training certificates from the Chinese Ministry of Health. This emphasizes the pivotal role of clinical pharmacists in counseling patients on their medications, monitoring drug use, identifying DRPs, and intervening when necessary to ensure safe, appropriate, and effective medication use.

We used a drug counseling model at an outpatient pharmacy, and found 504 DRPs under the model developed by an experienced pharmacist team. According to the results, it may be generally applied to other hospitals. However, the study also has some limitations. Firstly, the data collection was predominantly carried out by the lead pharmacist. This singular data - collection approach may introduce information bias, potentially leading to an underestimation of the DRP incidence. To mitigate this bias, three researchers cross - participated in the DRP classification and review. In future studies, one possible strategy to address this issue could be to involve a more diverse team of data collectors, including pharmacists from different backgrounds and levels of experience. This would not only reduce the potential for bias but also provide a more comprehensive view of DRP occurrences. Secondly, pharmacy consultations rely on patients' initiative to consult.

As a result, some patients may choose not to approach pharmacists, raising concerns about the representativeness of

the study participants within the broader patient population. To overcome this limitation in future research, efforts could be made to actively encourage patient participation in pharmacy consultations. For example, educational campaigns could be launched to inform patients about the benefits of such consultations, thereby increasing the likelihood of a more representative sample. Additionally, future studies could consider alternative methods of data collection, such as surveys that target patients who did not participate in consultations to understand their reasons and perspectives. Furthermore, the number of units included in this study is limited and does not comprehensively represent the overall situation in China. In future work, expanding the sample size by including more units from different regions across the country is crucial. This would enhance the geographical representation and improve the generalizability of the findings. Moreover, longitudinal studies could be designed to track DRP trends over time in different settings, providing a more in - depth understanding of the issues. Despite these limitations, the results and methods of this study can offer valuable insights for establishing pharmacy consultation processes. These processes can be tailored to local characteristics by adjusting and elaborating on general guidelines.

CONCLUSION

This study revealed the most common DRPs in the outpatient pharmacy setting of a Chinese comprehensive tertiary hospital during pharmacy consultations. Our results indicate that counseling models appear to be a means to improve drug use by serving as an important tool to increase the identification and resolution of DRPs, resulting in positive experiences for both pharmacy practitioners and patients.

COMPETING INTERESTS

The author(s) declared no potential conflicts of interest with respect to the research.

FUND

The authors received a grant from Scientific research project of higher education institutions of Ningxia High Education Scientific Research Project" with the project number NYG2024133

References

1. Pharmaceutical Care Network Europe. Drug related problem classification. https://www.pcne.org/working-groups/2/drug-related-problem-classification. Accessed June 26, 2022
2. Basheti IA, Qunaibi EA, Bulatova NR, Samara S, AbuRuz S.Treatment related problems for outpatients with chronic diseases in Jordan: the value of home medication reviews. Int J Clin Pharm. 2013; 35(1): 92–100. https://doi.org/10.1007/s11096-012-9713-4
3. Fryckstedt J, Askerhagelberg C. Drug-related problems common in the emergency department of internal medicine. The cause of admission in almost every third patient according to quality follow-up. Lkartidningen. 2008;105(12-13):894. https://doi.org/10.1109/2013.6743814.
4. Walsh EK, Hansen CR, Sahm LJ, Kearney PM, Doherty E. Economic impact of medication error: a systematic review. Pharmacoepidemiol Drug Saf. 2017;26 (5):481–497. https://doi.org/10.1002/pds.4188
5. Weiss MC, Sutton J. The changing nature of prescribing: pharmacists as prescribers and challenges to medical dominance. Sociol Health Illn. 2009; Apr.31(3):406-21. https://doi.org/10.1111/j.1467-9566.2008.01142.x
6. Viktil KK, Blix HS. The Impact of Clinical Pharmacists on Drug-Related Problems and Clinical Outcomes. Basic Clin Pharmacol Toxicol. 2008;Mar.102(3):275-80. https://doi.org/10.1111/j.1742-7843.2007.00206.x
7. Mi X, Zeng LN,Zhang LL.Systematic review of the prevalence and nature of drug-related problems in paediatric patients. J Clin Pharm Ther. 2022; 00:1–7. https://doi.org/10.1111/jcpt.13606
8. Tasaka Y, Tanaka A, Yasunaga D, Asakawa T, Araki H, Tanaka M. Potential drug-related problems detected by routine pharmaceutical interventions: safety and economic contributions made by hospital pharmacists in Japan. J. Pharm. Health Care Sci. 2018;4,33.https://doi.org/10.1186/s40780-018-0125-z
9. Lee H, Ryu, Sohn Y, Kim J, Suh GY, and Kim E. Impact on Patient Outcomes of Pharmacist Participation in Multidisciplinary Critical Care Teams: A Systematic Review and Meta-Analysis. Crit. Care Med. 2019;47 (9):1243–1250. https://doi.org/10.1097/CCM.0000000000003830
10. Reinau D, Furrer C, Stampfli D, Bornand D, and Meier CR. Evaluation of drug-related problems and subsequent clinical pharmacists' interventions at a Swiss university hospital. J Clin Pharm Ther. 2019;44 (6): 924–931. https://doi.org/10.1111/jcpt.13017
11. Jiang JH, Liu Y, Wang YJ, et al. Clinical pharmacy education in China. American Journal of Pharmaceutical Education.2011; 75(3):57c. https://doi.org/10.5688/ajpe75357ac.
12. Burki T. China faces challenges to fix its pharmaceutical system. Lancet. 2017;389(10067):353. https://doi.org/10.1016/S0140-6736(16)32138-9
13. Al-Azzam, Sayer I, Alzoubi, et al. Evaluation of the types and frequency of drug-related problems and the association with gender in patients with chronic diseases attending a primary health care center in Jordan. International Health. 2016;1876-

3413. https://doi.org/10.1093/inthealth/ihw026
14. Ax F, Branstad JO, Westerlund T. Pharmacy counselling models: a means to improve drug use. Journal of Clinical Pharmacy and Therapeutics. 2010;35(4):439-451.https://doi.org/10.1111/j.1365-2710.2009.01138.x
15. Eickhoff C, Hamerlein A, Griese N, et al. Nature and frequency of drug-related problems in self-medication (over-the-counter drugs) in daily community pharmacy practice in Germany. Pharmacoepidemiol Drug Saf. 2012; 21(3):254-260. https://doi.org/10.1002/pds.2241
16. Can Q, Long M, Ning W, et al. Identify and categorize drug-related problems in hospitalized surgical patients in China. International journal of clinical pharmacy. 2019;1(1):13-17. https://doi.org/ 10.1007/s11096-018-0777-7
17. Qingmin Z, Yang L. Establishment and Standardized Management of Outpatient Medication Consultation Center in Our Hospital. China Pharmacy. 2016; 27(4):4.
18. Qu C, Meng L, Wang N, et al. Identify and categorize drug-related problems in hospitalized surgical patients in China. Int J Clin Pharm. 2019;41 (1):13–17. https://doi.org/10.1007/s11096-018-0777-7
19. WHO Anatomic Therapeutic Chemical Classification. http://www.whocc.no/atc_ddd_index/.accessed August 2022
20. Yin WJ, Su KJ, Lu GH. Common questions and analysis of drug consultation in outpatient pharmacy. Chinese contemporary medicine. 2022;(014):029
21. Liu J, Li Z, Qin W. Analysis of the drug consultation records in outpatient department and thinking on pharmaceutical care. Pharmaceutical Care and Research. 2012;12(4):312-314
22. Stuurman-Bieze AG, Hiddink EG, van Boven JF, et al. Proactive pharmaceutical care interventions improve patients' adherence to lipid-lowering medication. Ann Pharmacother. 2013;47:1448–56. https://doi.org/10.1177/1060028013501146
23. Faulkner MA, Wadibia EC, Lucas BD, et al. Impact of pharmacy counseling on compliance and effectiveness of combination lipid lowering therapy in patients undergoing coronary artery revascu larization: a randomized, controlled trial. Phamacotherapy. 2000;20(4):410-416
24. Roebuck MC, Liberman JN, Gemmill-Toyama M, et al. Medication adherence leads to lower health care use and costs despite increased drug spending. Health Affair. 2011;30(1):91-99. https://doi.org/10.1377/hlthaff.2009.1087
25. Westerlund T, Allebeck P, Marklund B, Andersson I-L, et al. Evaluation of a model for counseling patients with dyspepsia in Swedish community pharmacies. American Journal of Health-System Pharmacy. 2003;60,1336–1341. https://doi.org/10.1093/ajhp/60.13.1336