

# The role of hospital pharmacists in clinical practice of hospital pharmaceutical care: a review

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## Abstract

With the changes of the times and the growth of public demand for medical services, the service objects, service contents and service approaches of hospital pharmacists are also changing and increasing. By summarizing the changes of hospital pharmacists' practice in hospitals and their contributions to the improvement of hospital service quality in the practice of hospital pharmaceutical care, this paper hopes that more doctors, nurses and patients can have a more in-depth understanding of the specific work of pharmacists, which, at the same time, will also provide some reference for pharmacists at home and abroad to optimize the level of pharmaceutical care. Compared with doctors and nurses, hospital pharmacists have a much more systematic and professional drug knowledge system and service concept, which can guarantee that they can undertake the responsibilities of rational use of drugs, control of medical expenditure, guarantee of efficacy, reduction of medical risks, reduction of doctors' workload, improvement of national health and so on. After years of practice and research, pharmacists have gradually realized their own value and established professional needs through hospital pharmaceutical care.

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**Key words:** hospital pharmacist; pharmaceutical care; clinical practice; security; effectiveness; economic benefit

## Introduction

With the social and economic progress, pharmaceutical care in hospitals has gradually developed, starting from the initial basic services, like dispensing and standardizing the use of drugs, to the present "patient-centered" comprehensive pharmaceutical professional and technical knowledge service. Therefore, it is necessary to dig deeper into the greatest value of pharmaceutical professionals. From the original basis, the practice scope of pharmacists began to develop in the direction of individual and comprehensive pharmaceutical care, which makes hospital pharmacists have the advantages of talents, location, technical information

and combination of medicine, and enables pharmacists to provide patients with high-quality and efficient pharmaceutical care. In view of the fact that pharmacists have received more and more attention in the medical process, the analysis of the specific role of pharmacists in hospital pharmaceutical care will help to improve the overall level of the whole medical team of doctors, nurses, pharmacists and other professional and technical personnel, and bring high-quality and efficient treatment results for patients [1]. We intend to elaborate on the safety, effectiveness and economy of drugs in the process of clinical use, so as to evaluate whether pharmacists give full play to their professional functions and achieve the purpose of rational clinical use of drugs [2].

## **Changes in the practice of pharmacists in hospitals**

### **Service object**

As providers of professional pharmacy knowledge in the work of hospital pharmacy, there is no doubt that the most basic service object is drugs for pharmacists, which includes all aspects of drug management in the hospital, such as storage, use, recording, evaluation and so on[3]. In the context of social progress, the comprehensive management of drugs is also in line with the times, which is reflected in the use of drug dispensing machines, the examination of electronic prescriptions, the establishment of electronic health records and so on. In addition to being responsible for drugs, the clients of hospital pharmacists are extended to patients, medical staff and other personnel related to the use of drugs[3]: the embodiment of the idea of "people-oriented" in the hospital is to serve the patients, take the patients as the center, and carry out personalized medication to the patients[4], which is also the highlight of using pharmacists to develop hospital pharmaceutical care; when discussing how to provide more intimate and comprehensive services to patients, it is found that when pharmacists provide pharmaceutical expertise to doctors, nurses and other health care staff, they can further ensure the rationality of patients' drug use [1].

### **Service content**

In order to follow perfect hospital pharmaceutical care, hospital pharmacists have gradually walked out of the "pharmacy" and into "ward", "community" and "family". Thus, the duties of hospital pharmacists are reflected not only in the various processes of drug management, but in clinical services, teaching and scientific research. And its specific work includes doctor's order review, patient monitoring and ward rounds, drug restructuring, drug use records, patient drug education and scientific research work involving basic, clinical and management. Among them, clinical pharmaceutical care is the most important and complex work, including the use of pharmacist outpatient or consulting services to guide drug use, drug treatment monitoring (TDM), adverse reaction monitoring, drug evaluation and so on. Currently, there are different understandings of prescription rights in the service content of pharmacists in the world, especially regarding whether pharmacists should have prescription rights and the scope of prescription rights.

Whether the prescription power should be extended to the scope of pharmacist practice, Different organizations or regions have certain research results and opinions. Some studies support the expansion of prescription users: a randomized trial shows that pharmacists prescribe a greater drop in blood pressure in patients with hypertension, indicating that pharmacists can independently prescribe reasonable drug treatment for patients with hypertension [5]; since California pharmacists were approved to prescribe contraceptive, the contraceptive prescription prescribed by pharmacists has provided speed and convenience for many women to use contraceptives[6]; it is also considered that after strict and scientific prescription training, and then guide the prescribers to carry out prescription practice, provide the necessary tools, and then effectively assess the risk of prescription expansion, so that pharmacists can write prescriptions safely and benefit patients to the maximum extent[7]. However, prescription application is an extremely rigorous process, with too much emphasis on the beginning and continued use of drugs and ignoring heterogeneity among different regions, which has great potential risks and is not responsible for patient care and safety [8]. For example, the direct dispensing of naloxone by pharmacists does significantly reduce the fatal overdose, but the non-fatal overdose will increase to a certain extent [9] and affect the patient's accessibility to naloxone use[10].

### **Service approach**

Aiming at the core of hospital pharmaceutical care-patients, the service ways for pharmacists to provide relevant pharmaceutical expertise have been expanded. This approach is not limited to oral or written pharmaceutical orders in the dispensing window, but also includes pharmacists' outpatient clinics and consultations in cooperation with doctors, in the form of face-to-face conversations, lectures on pharmaceutical expertise, drugs promotion PPT, and social third-party applications such as WeChat. The pharmacist clinic, which originated in the United States in the 1950s, is an important part of hospital pharmacy at present. Through clinical practice, pharmacists can directly guide patients to use drugs, and play a positive role in patients' compliance and rationality of drug use. At present, the number of pharmacist clinics is gradually increasing, mainly serving patients with chronic diseases or patients who need long-term medication, providing them with pharmaceutical expertise in antihypertensive drugs, diabetes drugs, anticoagulants, lipid-regulating drugs and immunizations.

It is precisely because of the increasing demand for pharmaceutical care that pharmacists are required to expand their means of care in pharmaceutical practice and enhance their interaction with doctors and other health care professionals[11]. Consequently, it is an inevitable trend for hospital pharmaceutical care to encourage pharmacists and doctors to cooperate and let pharmacists and doctors do what they are best at [1]. In order to prevent medication errors and reduce downstream clinical errors, the scope of cooperation should include every stage of patient care [1]. For instance, from the point of view of improving daily solutions to drug problems and tapping the potential of pharmacists, the National Health Service (NHS) encourages pharmacists to work in the offices of general practitioners, and recommends financial incentives for pharmacists who work closely with doctors [12]. Encouraging pharmacists to actively participate in general practitioner team, and improving the communication between them, will not only give the better play to the role of clinical pharmacy [13], but reduce the workload of general practitioners. Professionally trained pharmacists will also improve doctors' professional satisfaction, for example, by helping doctors improve the effectiveness of influenza vaccination services[14].

## The role in hospital pharmaceutical care

### Security

As important evidence of patients' medication, the rationality of prescription is directly related to the outcome of patients' disease. To ensure the rationality of the prescription, it is necessary to find and correct the inappropriateness of the prescription as far as possible, such as mismatch, inappropriate and unnecessary treatment[15], and possible errors, including serious prescription errors caused by inattention or the prescription's failure to apply the relevant rules[16]. In addition to the rationality of the prescription, monitoring adverse drug events is also the key point affecting the safety of patients' medication, such as the use of computer technology to monitor adverse events of inpatients, which has made a great positive contribution to reducing the occurrence of adverse events of patients[17].

Pharmacists' evaluation and control of prescription rationality, the investment in cost can be said to be negligible [18], but its role is quite valuable. For instance, affected by the aging and pathological changes of physical function, the elderly often uses drugs in combination, and the examination of multi-drug prescriptions requires solid and reliable pharmaceutical professional knowledge [19]. Therefore, the role of pharmacists in dealing with inappropriate prescriptions is particularly prominent in the use of drugs for the elderly[19]: Using pharmacists to evaluate the use of drugs, it was found that the incidence of diseases caused by the combination of drugs in elderly cancer outpatients may be related to inappropriate drug use[20]; a randomized controlled trial of clinical drug review conducted by pharmacists against routine practice shows that pharmacists can effectively recheck repeated prescriptions issued by general practitioners, change the use of drugs in elderly patients, and save medical expenses [21]; in the trial of medication effect on the elderly in Quebec, it was found that pharmacist-led educational intervention could interrupt inappropriate drug use, and the interruption effect was better than that of routine nursing[22]. However, not all studies under the intervention of pharmacists have positive results. For example, in a study on medication errors in patients after discharge, although pharmacists are involved, the results suggest that this intervention does not significantly reduce such errors [23].

On the premise of ensuring the rationality of the prescription, controlling the occurrence of adverse drug events (ADE) is an important issue to ensure the safety of drug use. Pharmacists' reduction in the risk of adverse drug events, such as cardiovascular events [24], has shown a significant impact on public health: The study assessed the physical condition of 723 patients recruited at 3 months and found that cardiovascular risk and measurements of biochemical indicators such as low density lipoprotein cholesterol, systolic blood pressure and glycosylated hemoglobin in the intervention group were significantly lower than those in the routine care group [24]; and with proper education and training, pharmacists can correctly and reasonably evaluate and intervene penicillin allergy and guide the whole process of skin testing[25]. Especially during the treatment of drugs with serious adverse reactions, such as those used in intensive care units. A study assessed the participation of pharmacists in ICU and found that after the intervention, the incidence of adverse drug events (ADE) decreased more significantly, by 66%, and about 99% of the recommendations made by pharmacists related to drug ordering were accepted by doctors [26].

### Effectiveness

Under the premise of drug safety as the cornerstone, high-quality pharmaceutical care needs to pursue the optimization of drug treatment through the intervention of pharmacists [1]. For instance, a randomized controlled trial comparing home blood pressure monitoring, network communication and pharmacist care for hypertension control showed that pharmacist care played the most significant role in reducing patients' diastolic blood pressure [27]; in a 2015 trial to evaluate the 6-month blood pressure of patients with uncontrolled hypertension, pharmacist prescription intervention reduced not only the patient's diastolic blood pressure, but also the participants' systolic blood pressure [28]. The antihypertensive treatment trials under the intervention of these pharmacists all showed the enthusiasm of pharmaceutical clinical service. Consequently, pharmacists trained in cardiovascular care should be encouraged to participate more in the long-term treatment of patients with hypertension [29]. Pharmacist intervention can increase the efficacy not only in cardiovascular disease, but also in depression and hepatitis C virus antiviral therapy: The subjects asked pharmacists to receive psychological intervention training in behavioral activation therapy, and found that pharmacists who had temporary psychosocial intervention were more effective in treating patients with depression for a longer time [30]; a randomized trial led by pharmacists to analyze the antiviral effects of hepatitis C virus patients receiving opioid replacement therapy showed that the participation of pharmacists showed higher detectability and treatability to patients. and improved the success rate of treatment [31].

As an important measure that has been neglected to ensure the curative effect for a long time, medication compliance is directly manifested by the irregularity or even non-use of medication by patients, which is the simplest way to ensure the effectiveness of drug treatment. Medication compliance is a dynamic process, which will decrease with the passage of time, and for patients who need long-term medication or painful medication, low compliance will make patients unwilling to follow the medication regimen. And it will eventually lead to treatment failure, reduction of treatment effect or even inefficacy or rebound, which is very tricky. Thus, if the pharmacist intervenes based on compliance, it will have a non-negligible impact on the overall quality of treatment [32], especially cardiovascular diseases, asthma [33] vaccination [34]: As early as in a research trial in 1973, a research group used pharmacists to popularize hypertension knowledge to patients, so as to improve patients' mastery of hypertension knowledge, so as to improve drug compliance and achieve the purpose of controlling patients' blood pressure[35]. Similarly, patients with chronic heart failure also improved their quality of life due to interdisciplinary intervention in pharmacies [36]; a similar effect is reflected in the treatment of patients with asthma: A systematic review and meta-analysis of asthma compliance shows that pharmacists can use correct training and knowledge to help patients adhere to the prescription, take medicine regularly, and greatly improve asthma compliance [33]; And from the point of view of improving compliance, cooperation and pre-planning between pharmacists and nurses can make targeted recommendations to make pneumococcal vaccines more available [34].

The risk of death and readmission can reflect the prognosis of patients with curative effect. For diseases or combination drugs that may have a poor prognosis, researchers try to make use of the special technical functions of pharmacists and finally achieve more positive results. For example, in primary care, although

low-intensity cooperative intervention by pharmacists had no positive effect on clinical outcomes in people who received relatively good treatment at the baseline level, it can improve the prognosis of patients with left ventricular systolic dysfunction [37]; Multifaceted pharmacist intervention had a significant impact on reducing the readmission time of 30 days and 180 days for multidrug adults in hospital [38]; Moreover, a recent cohort study demonstrated the positive role of pharmaceutical care in reducing short-term mortality or the risk of readmission in the elderly, and discussed the possible correlation between improved prognosis and changes in drug compliance [39].

### **Economic benefit**

Drug prices remain high due to difficulties in drug research and development and huge investment, which leads to a more and more profound contradiction between the public's willingness to reduce drug prices [40]. In the face of expensive drugs, especially prescription drugs [41], it is difficult to fundamentally reduce drug pricing. Although pharmacists cannot change the drug price, but based on the understanding and comparison of drugs, they can provide patients with a more cost-effective drug regimen and reduce the economic burden of patients, which will directly improve the economic practicability of the treatment scheme. In the current hospital services, especially the treatment with high cost, the intervention of pharmacists can have a beneficial impact on the economic effect. Studies related to nursing in intensive care unit have shown that the addition of pharmacists can optimize the treatment plan and reduce the unnecessary use of drugs, therefore, making it effective in reducing the cost of medication: Pharmacists can reduce the improper use of albumin in the intensive care unit, decrease the amount and cost of albumin, and save about \$355000 a year in ICU [42]; And a study, evaluating the intervention of pharmacists in adult intensive care units, also showed that pharmacists participating in a multidisciplinary ICU team, could provide meaningful intervention advice to the medical team and reduce drug costs, saving the team about \$263000 in one year [43]. Surgery or chronic diseases also cost a lot of medical expenses, and studies have shown that pharmacists can also use professional knowledge and skills to reduce the financial burden of patients: Allowing pharmacists to care for (TJA) patients undergoing total joint replacement optimizes drug treatment throughout the nursing process, which can save the institution a net cost of about \$73000 per year [44]; A systematic review of the effects of pharmacists on nursing care for the prognosis of diabetes shows that such interventions can save about \$80,000 per person per year compared with routine care. Thus, the study strongly recommends that experienced pharmacists should be involved in the work of multidisciplinary diabetes care teams on a long-term basis [45].

### **Conclusion**

To sum up, pharmacists in hospital pharmacy services are still of great significance, even when the emphasis on strengthening professional education of pharmacists[46] and the level of global pharmacy education is still uneven[47]. Pharmacy services provided by pharmacists are free of charge in most areas [48], but they can also help doctors check the rationality of prescriptions, provide patients with guidance on the use of drugs, and optimize drug use plans to ensure the safety of patients' medication and improve the effectiveness of drug treatment, reducing the cost of medication for patients, and even early warning of diseases[49] or other undetectable effects. Therefore, while we support pharmacists to further deepen their participation in medication, we also support certain financial encouragement to pharmacists. It cannot be ignored that although many randomized clinical trials are used as examples of clinical pharmacy service value in the article, there are no completely scientific and unified standards for pharmacist intervention programs, evaluation methods, and quantitative indicators, so they need more systematic design and investigation. Moreover, due to the uncontrollable individual differences in the trial, such as physical specificity, cultural awareness and so on, it is not known whether the power of the results produced by pharmacist intervention is large enough. Thus, there is an urgent need for more and more comprehensive clinical studies to verify the role of pharmacists more strongly in hospital pharmaceutical care.

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