Information Audit of Outpatient and Emergency Prescriptions in Healthcare Institutions

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ABSTRACT Ensuring the rational drug use in healthcare institutions is an important instruction issued by China's National Health Commission (NHC) to strengthen the supervision of health care. The number of prescriptions has increased sharply with the rapid improvement of the healthcare services and the constant expansion of the scale of outpatient and emergency treatment in China. The prescription information audit system based on rational drug use database has become an important tool for pharmaceutical care. Supported by the Branch of Rational Drug Use and Comprehensive Evaluation, Expert Panel of Chinese Pharmacists Association Regional Pharmaceutical Care Promotion Working Committee, Expert Panel of Beijing Pharmaceutical Association Smart Pharmacy and Intelligent Management Professional Committee, and Beijing Pharmacological Society, experts from healthcare institutions work on the expert consensus on the information audit of outpatient and emergency prescriptions in healthcare institutions. This consensus aims to promote the standardization of outpatient and emergency prescription information audit from healthcare institutions at all levels, to help build a standardized prescription information audit system and a rational drug use database with all-around information, to enhance the accuracy of prescription and acceptance by doctors and patients, and to further promote rational drug use and information-based and intelligent pharmaceutical care in China's healthcare institutions.

KEY WORDS Outpatient and emergency department; Prescription information audit; Intelligent pharmacy; Expert consensus

A series of guiding documents, including *Opinions on Accelerating the High-quality Development of Pharmaceutical Services*, *Opinions on Strengthening Pharmaceutical Affairs Management in Medical Institutions and Promoting Rational Drug Use*, *Notice on Further Strengthening Drug Safety Management and Improving the Level of Rational Drug Use*, and *Notice on Printing and Distributing the National Health Informationization Plan during the 14th Five-Year Plan (2021-2025)*[1-4], have been published by NHC to promote the innovation and development of pharmaceutical services via internet, further transform the pharmaceutical service model, and improve the pharmaceutical service.

Accurate prescription audit is the key to promoting rational drug use, improving the quality of medical services and ensuring the safety of patients' drug use[5]. The number of outpatient and emergency prescriptions in healthcare institutions has increased sharply with the improvement of healthcare in China and the constant expansion of the scale of outpatient and emergency treatment, and the traditional manual review can no

longer meet the needs of healthcare institutions for the quality and efficiency of prescription audit. The outpatient and emergency prescription information audit system (hereinafter referred to as the system) based on the rational drug use database is connected with the information systems of the hospital, and the prescription is comprehensively audited in real time after the doctor prescribes the prescription and before the patient pays the fee. System-aided prescription auditing can further improve the quality of doctors' prescriptions, greatly improve the efficiency of prescription audit, and reduce the cost of dealing with problematic prescriptions[6-7].

In recent years, the information audit of prescriptions have gradually been carried out in healthcare institutions at all levels across the country, but there are still problems, including inconsistent forms of audit, different standards for system construction, and the uneven quality of rational drug use databases[8]. In order to promote the high-quality development of prescription information audit in healthcare institutions and ensure the legality, standardization and suitability of prescriptions, this consensus is specially written.

1. Range of application

This consensus is applicable to the information audit of outpatient and emergency prescriptions in healthcare institutions at all levels, including personnel and responsibilities, system operating environment, knowledge and rule bases, system functions, audit process and quality management. Medical institutions can refer to this consensus to carry out information audit of in-patient prescriptions.

2. Personnel and responsibilities

The information audit of prescriptions in healthcare institutions needs to be carried out by the cooperation of pharmaceutical, information, clinical and administrative departments. Each should have a clear division of responsibilities. Healthcare institutions can improve the prescription auditing system according to their own level of informatization, equip a corresponding number of prescription auditors and set up full-time or part-time prescription auditing posts according to the amount of prescriptions to be audited, and their personnel arrangement should at least meet the requirements of the auditors in the relevant regulations on prescription auditing[5]. The pharmacy department should regularly train the prescription auditors.

The management of prescription information audit should follow the relevant provisions of prescription audit[5,9-10], and its quality should be managed by the prescription audit quality management team or full-time (part-time) personnel. Auditors should maintain prescription audit rule base in time, and healthcare institutions should organize multidisciplinary expert groups to review the rule base, and provide guidance for auditing.

3. System operating environment

Healthcare institutions should have a systematic sports environment that conforms to the prescription information audit, including:

(1) Provide a safe and stable network environment, and have a local area network for information transmission and data sharing between departments and posts;

(2) Provide servers and terminals to support the operation of the system;

(3) Provide application software and related databases that meet the actual needs of healthcare institution management;

(4) It can be interconnected with information systems established by healthcare institutions to obtain relevant data of prescription review, including but not limited to: electronic prescriptions, electronic medical records, medical-related examination/test materials, current medical history, past medical history, medication history, allergy history, etc.
(5) The operation and management data and backup data of healthcare institutions involved in the system operation can be safely stored.

4. Knowledge and rule bases

The comprehensive, standardized, scientific knowledge and audit rule bases that can be updated in real time according to the latest progress of drug treatment are the core contents of the system. The purpose is to build a prescription audit rule engine by integrating drug instructions, clinical pathways, diagnosis and treatment guidelines, drug safety (drug allergy, liver and kidney dysfunction) and other medication rules to ensure evidence-based medication. Healthcare institutions should actively participate in and promote the construction of a wider range of knowledge base of prescription audit for rational drug use, gradually form common rules covering administrative regions and even the whole country, and at the same time, formulate more refined and individualized audit rules based on their own advantages in diagnosis and treatment.

The contents and requirements of knowledge and rule bases include:
(1) The sources of clinical medication information should include relevant laws of national drug administration, regulatory documents, drug instructions, national formulary, national and provincial basic medical insurance, industrial injury insurance and maternity insurance drug list, etc.
(2) The Pharmaceutical Affairs Management and Pharmacotherapy Committee of a medical institution may, according to the actual situation of the region or the institution, make a clinical medication specification suitable for the institution on the basis of fully considering the safety, effectiveness, economy, innovation, suitability and accessibility of patients' medication, and referring to the clinical guidelines and over-the-counter medications recognized by professional societies and clinical experts, so as to provide a basis for prescription audit;
(3) Prescription review system built-in review rules should indicate the above-mentioned clear sources of clinical medication basis;
(4) Set the rules of reviewing prescription for different prescription days for outpatient and emergency prescriptions.

5. System functions

The system should have the functions of prescription audit, quality evaluation, knowledge base query, rule maintenance and statistical reports.
5.1. Prescription audit
The prescription audit functions include but are not limited to:
(1) The system can automatically identify prescription dictionary such as drugs, diagnosis, and frequency and route of administration;
(2) It can associate and match the medical dictionary information such as drugs, diagnosis, and frequency and route of administration with the standard dictionary built in the system;
(3) It can be connected to information systems of the hospital, and the rationality of prescriptions can be reviewed according to the patient's age, gender, allergic history, diagnosis, inspection, examination and historical prescriptions.

(4) It should follow the relevant provisions of prescription audit[5], and automatically review the indications, administration routes, single dosage, single-day dosage, administration frequency, age group contraindications, special group contraindications, contraindications, allergy contraindications, interaction, compatibility contraindications, repeated medication and solvent suitability of Chinese and western medicines in combination with the knowledge base;
(5) It can automatically intercept inappropriate or irregular prescriptions, and doctors can modify or send prescriptions to pharmacists for review. The results of pharmacists' review can be fed back to doctors online, and all actions of doctors and pharmacists on prescriptions should be stored in the system and searchable retrospectively;
(6) It should ensure the efficiency of automatic audit to ensure the smooth diagnosis and treatment process and meet the needs of diagnosis and treatment.

5.2. Quality evaluation
The quality evaluation functions include but are not limited to:
(1) The system supports quantitative or total extraction of prescriptions that have been manually reviewed, passed automatically and intercepted by the system;
(2) It supports that the extracted prescription data can be evaluated by one or more people at the same time;
(3) It provides feedback for the quality evaluation results of prescription audit.

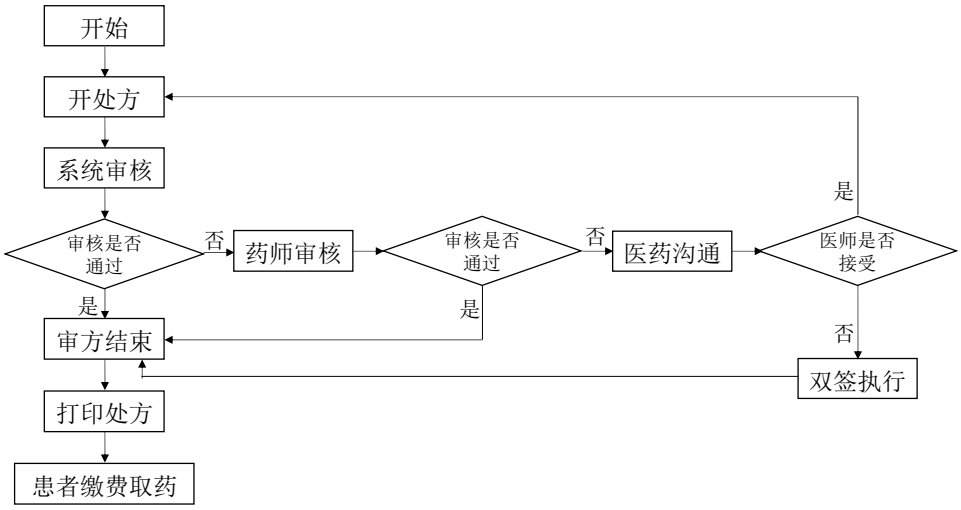
5.3. Knowledge base query and rule maintenance
The knowledge base query and rule maintenance functions include but are not limited to:
(1) The system should have a built-in knowledge base and support viewing at any time;
(2) The built-in rule base of the system should support the submission of revision application of prescription rules, which can provide follow-up review, approval and release functions, and the maintenance history of rules in the system can be completely recorded.

5.4. Statistical report
The statistical report functions include but are not limited to:
(1) The system should be able to make statistics on the total number of prescriptions approved, the number of unreasonable prescriptions, the qualified rate of prescriptions, the number of prescriptions approved by pharmacists, the number of prescriptions not approved by pharmacists, and the number of prescriptions issued by doctors with double signatures, and support viewing at any time;
(2) It can provide corresponding data interfaces for the third-party system to call and view the process information such as the auditor and the audit time and results of the prescription.

5.5.Others
(1) The system can set the access rights of each function and all kinds of statistical data, control the export of prescription, drug and patient data, automatically record the operators, and prevent the leakage of important information;
(2) The data during system operation can be stored in a safe and reliable way and backed up regularly.

6. Audit process
Before the system is officially launched, it needs to carry out system trial operation,

rule maintenance and system operation training. The system assists pharmacists to carry out prescription information audit, and patients can only pay for drugs after the audit is passed. See Figure 1 for the audit process. After the prescription is issued by the emergency doctors, the system will conduct machine audit according to the rule base, and the system will intercept the "forbidden" prescription and force the doctor to change it. The prescription will be printed and handed over to the patient if it is approved in the system, followed by paying for and receiving medicines; The prescriptions will be reviewed manually by pharmacists if they are not approved by the system and are not "banned" and are not approved. If the pharmacist approves the prescription, he/she will electronically sign the electronic prescriptions; If the prescription is not approved by the pharmacist, the online feedback will be sent to the doctor for revision or re-prescription. If the doctor refuses, the next step will be initiated with double signatures of the pharmacist and the doctor. The content of the prescription executed by double signing is included in the prescription review.



开始 Start
开处方 Prescribe
系统审核 System audit
审核是否通过 Passed or not?
是/否 Yes/No
审方结束 End of audit
打印处方 Print
患者缴费取药 The patient pays and receives the medicine
药师审核 Audit by pharmacists
审核是否通过 Passed or not?
医药沟通 Medical communication
药师是否接受 Pharmacists accept or not?
双签执行 Executed by double signing

Fig.1 Flow chart of information audit of outpatient and emergency prescriptions

7. Quality management

Healthcare institutions should regularly (monthly) monitor and evaluate the quality of prescription information audit in institutions, find problems and improve them in time,

and continuously optimize the knowledge base. They should obey the supervision of health administrative departments at all levels to ensure the quality of pharmaceutical services and the safety of patients[10]. The key monitoring indicators mainly include the number of prescriptions audited, the number of unreasonable prescriptions intercepted by the system, the number of prescriptions intervened by pharmacists, the number of prescriptions actively modified by doctors, and the number of unreasonable prescriptions. Medical institutions should determine the process of revision, review and approval of rules, leave traces on the maintenance rules, constantly improve the rules and regulations of the reviewer in practice through regular evaluation and other means, continuously reduce false negative and false positive audit results, avoid warning fatigue, and ensure the efficiency of medical services.

Currently, it is necessary to carry out information-based prescription audit in outpatient and emergency departments to ensure the accuracy and efficiency of prescription audit and promote the information-based and intelligent pharmacy in healthcare institutions. The construction of the audit system relies on the information platform of healthcare institutions with communication and cooperation between multi-departments and professionals. This *Consensus* outlines and standardizes the key points and workflow of prescription information audit system from the aspects of management, technology and service. Healthcare institutions at all levels can refer to this *Consensus* to carry out individualized design and perfection based on their own advantages in diagnosis and treatment and their degree of information. This *Consensus* will be continuously updated with the progress of information construction of healthcare institutions and the change of requirements and concepts related to pharmaceutical affairs management.

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