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Impact of Pharmaceutical Care Model on Rational Use of Antibiotics in Ophthalmology Perioperative Period

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Abstract: *Objective*: To analyze the positive impact of pharmaceutical care in the ophthalmology perioperative period on the rational use of antibiotics. *Methods*: A total of 115 patients who underwent ophthalmological surgery between March and June 2023 were selected as the control group, receiving routine medication management. Another 115 patients who underwent ophthalmological surgery between July and October 2023 were selected as the observation group, receiving pharmaceutical care. The rationality of medication use, mastery of medication knowledge, medication compliance, and adverse reaction rates were compared between the two groups. *Results*: The observation group had higher rationality of medication use, higher scores for mastery of medication knowledge, higher medication compliance, and a lower adverse reaction rate compared to the control group ($P < 0.05$). *Conclusion*: The combination of antibiotic therapy and pharmaceutical care in the ophthalmology perioperative period can improve the rationality of medication use, enhance patients' mastery of medication knowledge, increase their medication compliance, and prevent adverse reactions to antibiotics.

Keywords: Ophthalmology; Perioperative period; Pharmaceutical care model; Antibiotics; Rational use

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1. Introduction

Ophthalmic diseases are complex, including retinal detachment, ocular trauma, and cataracts, and their primary treatment method is surgery [1]. Most ophthalmic surgical patients have type I incisions, and the surgical procedures are relatively complicated. Due to the high sensitivity of the eyes, postoperative infections can easily occur under the invasive influence of surgery. Therefore, it is necessary to use antibiotics rationally during the ophthalmology perioperative period to prevent infections to the fullest extent. However, improper medication use during antibiotic therapy can lead to an imbalance of the ocular flora or bacterial resistance, which can prolong the patient's treatment cycle and affect the overall efficiency of the surgery [2]. Pharmaceutical care is a new intervention method in the ophthalmology perioperative period that provides professional medication guidance tailored to the

specific situation of the patient, thereby effectively preventing adverse drug reactions. Based on this, the present study selected 230 ophthalmic surgical patients to evaluate the positive impact of pharmaceutical care on the rationality of medication use.

2. Materials and methods

2.1. General information

The ophthalmic surgery period for the control group was from March to June 2023, including 115 patients. Among them, 53 were male and 62 were female; the age ranged from 8 to 60 years, with a mean of (66.30 ± 12.36) years old. The ophthalmic surgery period for the observation group was from July to October 2023, also including 115 patients. Among them, 50 were male and 65 were female; the age ranged from 7 to 60 years, with a mean of (67.28 ± 11.75) years old. There was no difference in the data between the two groups ($P > 0.05$).

Inclusion criteria: meet the surgical treatment indications; have normal communication skills; meet the indications for antibacterial drug use; have complete clinical data; and are highly informed about the study. Exclusion criteria: presence of mental disorders; preoperative infectious diseases; combined blood or immune system diseases; history of antibacterial drug allergies; and withdrawal from the study.

2.2. Methods

The control group received routine medication management: ophthalmologists reasonably selected the types of antibacterial drugs based on the patient's surgery type, physical condition, and medication history. They provided oral education on medication knowledge, focusing on self-identification and response methods for adverse reactions, to ensure the rationality of antibacterial drug use during the perioperative period.

The observation group received pharmaceutical services:

(1) Establishment of a pharmaceutical service team: The team was led by a pharmacist and included ophthalmic healthcare workers as members. The pharmacist provided professional training to all team members, covering the necessity of using antibacterial drugs during the perioperative period, the mechanism of antibacterial drugs, drug compatibility principles, contraindications for medication, etc. This ensured that all team members were proficient in medication knowledge before starting their duties. Weekly team meetings were organized to discuss the correct methods and precautions for administering antibacterial therapy during the ophthalmic perioperative period, enabling team members to continuously learn new knowledge.

(2) Pharmacist assessment: The pharmacist participated in the patient's admission assessment process to comprehensively understand their eye disease type, surgery name, history of antibacterial drug use, and other information, screening for medication risk factors.

(3) Medication guidance: When dispensing antibacterial drugs to patients, the pharmacist explained storage conditions, usage and dosage, timing of administration, and common adverse reactions. They inquired about the patient's understanding of relevant matters, provided targeted answers to medication questions, and ensured that the patient fully grasped the medication knowledge. Emphasis was placed on explaining precautions during medication use, such as the need to clean hands before applying viscous eye ointment to avoid infection caused by dirty hands touching the eyes.

(4) Review of medication regimens: The pharmacist participated in the entire process when ophthalmologists

prescribed antibacterial drugs, reviewing the formulation and dosage of the antibacterial drugs in the prescription to prevent misprescription due to similar formulations or dosages of different drugs.

(5) Ward rounds service: The pharmacist and clinician conducted ward rounds together, 1-2 times per week, to assess the patient's current status of antibacterial drug use on-site and provide pharmaceutical knowledge education to healthcare workers and patients. Graphic manuals or video playbacks were used to explain relevant knowledge, ensuring that both healthcare workers and patients clearly understood the key points.

(6) Prescription review: A prescription review activity was conducted weekly, focusing on the indications, timing of administration, and duration of use of antibacterial drugs. Prescription issues were pointed out, and doctors were guided to correct the prescription content on-site. Simultaneously, the prescription review results were incorporated into the monthly assessment system, using a reward and punishment mechanism to enhance doctors' sense of responsibility.

(7) Information intervention: The ophthalmology department introduced an information system to develop real-time statistical reports for type I incisions. These reports included common types of antibacterial drugs, frequency of use, intensity of use, consumption and frequency of medication use, and the probability of combination therapy, providing detailed records of antibacterial drug usage. Guided by common treatment plans for antibacterial drugs, selective assessment indicators were included. For irrational drug prescriptions, the prescriber was identified and handled through measures such as notification and punishment to enhance their awareness of rational drug use.

2.3. Observation indicators

(1) Rationality of medication use: Evaluate the indications for medication use, timing of administration, selection of medication types, usage and dosage, and the rationality of the treatment course.

(2) Medication knowledge mastery: Develop a self-made medication knowledge mastery scale, including items such as medication frequency, administration time, and precautions. Each item is scored out of 100, with higher scores indicating better mastery.

(3) Medication compliance: Develop a self-made medication compliance survey questionnaire with a score range of 0 to 100. Scores above 80 indicate high compliance, scores between 59 and 80 indicate basic compliance, and scores below 59 indicate non-compliance.

(4) Adverse reaction rate: Observe the incidence of adverse reactions such as red eyes, decreased vision, and eye pain.

2.4. Statistical analysis

Data processing software is SPSS 28.0. Count data is expressed as (n/%) and tested using chi-square test. Measurement data is tested for normal distribution using the Kolmogorov-Smirnov (K-S) test, expressed as mean ± standard deviation (SD), and compared between groups using independent sample t-tests. Paired t-tests are used for within-group comparisons. Differences are considered statistically significant at $P < 0.05$.

3. Results

3.1. Comparison of medication rationality between the two groups

The medication rationality of the observation group was higher than that of the control group ($P < 0.05$).

Table 1. Comparison of medication rationality between the two groups (*n*/%)

Group	Cases	Indication accuracy	Timing accuracy	Drug selection	Dosage accuracy	Treatment duration
Observation	115	95 (82.61%)	110 (95.65%)	96 (83.48%)	115 (100.00%)	82 (71.30%)
Control	115	65 (56.52%)	89 (77.39%)	78 (67.83%)	109 (94.78%)	61 (53.04%)
χ^2		18.482	16.442	7.648	6.161	8.153
p-value		< 0.001	< 0.001	0.006	0.013	0.004

3.2. Comparison of medication knowledge mastery between the two groups

The medication knowledge mastery score of the observation group was higher than that of the control group ($P < 0.05$).

Table 2. Comparison of medication knowledge mastery between the two groups (mean ± SD, points)

Group	Cases	Administration frequency	Administration timing	Precautions compliance
Observation	115	95.43 ± 4.55	90.88 ± 4.35	96.52 ± 3.24
Control	115	80.63 ± 7.31	79.86 ± 6.32	81.24 ± 8.75
t-value		18.433	15.403	17.562
p-value		< 0.001	< 0.001	< 0.001

3.3. Comparison of medication compliance between the two groups

The medication compliance of the observation group was higher than that of the control group ($P < 0.05$).

Table 3. Comparison of medication compliance between the two groups (*n*/%)

Group	Cases	Full compliance	Partial compliance	Non-compliance	Total compliance rate
Observation	115	75 (65.22%)	37 (32.17%)	3 (2.61%)	97.39% (112/115)
Control	115	60 (52.17%)	40 (34.78%)	15 (13.04%)	86.95% (100/115)
χ^2					8.679
p-value					0.003

3.4. Comparison of adverse reaction rates between the two groups

The adverse reaction rate of the observation group was lower than that of the control group ($P < 0.05$).

Table 4. Comparison of adverse reaction rates between the two groups (*n*/%)

Group	Cases	Eye redness	Vision decline	eye pain	Total incidence
Observation	115	1 (0.87%)	1 (0.87%)	1 (0.87%)	2.61% (3/115)
Control	115	3 (2.61%)	3 (2.61%)	4 (3.48%)	8.70% (10/115)
χ^2					3.995
p-value					0.046

4. Discussion

Ophthalmologic surgeries are highly specialized procedures. The intraocular tissues, such as aqueous humor or cornea, possess a natural blood-ocular barrier. However, this barrier can be significantly disrupted by the invasive interference of surgical operations, potentially leading to undesirable consequences like ocular infections. Additionally, ophthalmic surgeries often require extended operating times, leaving the incision exposed to the external environment for prolonged periods, which increases the risk of bacterial infections [3,4]. Therefore, antimicrobial agents are commonly administered during the perioperative period in ophthalmology to effectively prevent complications such as postoperative infections. Nevertheless, there are instances of irrational use of antimicrobial drugs during this process. For instance, prolonged use or overuse of these drugs can lead to the development of multiple drug-resistant strains, affecting the efficacy of the medication and even inducing adverse drug reactions. Furthermore, ophthalmic surgeries often require adjuvant therapy with eye drops, and some patients fail to grasp the correct administration technique, leading to improper usage and reduced efficacy of the eye drops [5]. Previous studies have revealed that ophthalmologic surgery patients often have inadequate knowledge about medications, influenced by factors like education level and awareness of surgical procedures. Patients may lack understanding of the therapeutic mechanisms, administration methods, and precautions of antimicrobial agents, potentially leading them to alter the dosage of antimicrobial drugs postoperatively, thereby affecting the long-term surgical outcomes [6]. Hence, there is a need for pharmaceutical services during the perioperative period in ophthalmology to ensure rational use of antimicrobial agents.

Pharmaceutical care is an intervention led by pharmacists, which can fully utilize pharmacists' professional knowledge of antibacterial drugs, provide rational medication guidance based on the disease conditions and surgical plans of ophthalmic surgery patients, and thereby actively prevent adverse drug reactions and improve the rationality of perioperative medication [7]. The results indicate that the observation group exhibited superior medication rationality, higher scores for medication knowledge mastery, and better medication compliance compared to the control group, with a lower adverse reaction rate ($P < 0.05$). This can be attributed to the comprehensive medication guidance provided by the pharmaceutical services team. The pharmacists, who undergo professional training, ensure that all team members have a clear understanding of antimicrobial drugs. Regular team meetings provide a platform for learning, allowing members to stay updated on the latest knowledge regarding antimicrobial agents [8]. By conducting a comprehensive assessment of patients' basic conditions, pharmacists can identify risk factors during antimicrobial therapy, thereby determining the direction of pharmaceutical intervention. Within the specific pharmaceutical services, medication guidance offers systematic education on antimicrobial drugs to patients and promptly addresses their individual queries. This enhances patients' understanding of medication usage and precautions, facilitating improved mastery of medication knowledge [9].

Additionally, medication guidance corrects patients' misconceptions about antimicrobial drug use, encouraging them to follow medical advice and improve medication compliance. Pharmacist review of antimicrobial prescriptions promptly identifies irregularities, maximizing medication rationality [10]. Ward rounds and prescription reviews are common components of pharmaceutical services. Regular pharmacist visits provide insights into patients' current antimicrobial drug use and offer targeted guidance, further enhancing patients' knowledge. Prescription reviews raise awareness among doctors about the reasonableness of prescriptions, reducing adverse reactions to antimicrobial agents. Information-based interventions, a novel approach in pharmaceutical services, utilize information systems to comprehensively summarize antimicrobial drug usage. This allows for the selection of appropriate assessment indicators and the integration of reward and punishment mechanisms to avoid irrational drug use [11].

5. Conclusion

In summary, the integration of pharmaceutical services into the use of antimicrobial agents during the perioperative period in ophthalmology not only ensures medication rationality but also improves patients' mastery of medication knowledge and medication compliance. Furthermore, it prevents adverse reactions, demonstrating significant intervention effects.

Disclosure statement

The authors declare no conflict of interest.

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