Analysis and improvement measures of telephone drug consultation in a specialized hospital of obstetrics and gynaecology in China

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Abstract

What is known and objective: Drug consultation is an important part of pharmaceutical care offered by clinical pharmacists. We explored the characteristics of telephone drug consultations in an obstetrics and gynaecology specialty hospital to provide a reference as to how to improve drug consultation and pharmaceutical care.

Methods: We retrospectively analysed records of telephone consultations regarding medication use between 2014 and 2019 in our hospital. Any consultation cases with incomplete records were excluded from our analysis. Of the 1353 consultation cases included in our study, we further classified them into different categories based on the content of the consultations, the type of medications being inquired about, and the groups of people who sought medication guidance. Pareto analysis was performed to separate the main issues the callers were concerned about from the more minor concerns.

Results and discussion: The medication issues that prompted the caller to consult with our clinical pharmacists could be divided into 12 categories, among which the main issues concerned usage and dosage, choice of drug variety, drug incompatibility (drug mixture in infusion bag or tube), adjustment of the treatment plan, and skin tests (cumulative percentage 76.3%). The minor issues involved medication use during pregnancy and lactation and adverse reactions. The top three types of drugs that callers asked about were antimicrobials (600 cases, 44.4%), anti-tumour drugs (151 cases, 11.2%) and reproductive system drugs (111 cases, 8.2%). The callers could be divided into four groups as follows: doctors (865 cases, 63.9%), nurses (280 cases, 20.7%), patients (116 cases, 8.6%) and other medical professionals (92 cases, 6.8%).

What is new and conclusion: Usage and dosage, choice of drug variety, drug incompatibility, adjustment of treatment plan and skin tests represented the main issues for telephone drug consultations in our hospital. Doctors and nurses were most likely to consult clinical pharmacists regarding these issues. Improved drug consultation services are needed to allow more patients to have access to advice from pharmacists.
WHAT IS KNOWN AND OBJECTIVE

On 12 July 2017, the National Health and Family Planning Commission of the People’s Republic of China (now called the National Health Commission of the People’s Republic of China) issued a ‘Notice on Strengthening Pharmacy Administration and Changing the Pattern of Pharmaceutical Care’. Subsequently, the focus of the reform of China’s medical and health system has shifted from ‘supply control’ to ‘pharmacists’ contribution to patient care’. It makes clear the role pharmacists play in the responsible provision of medication-related care and lays the foundation for the improvement of pharmaceutical care. This new policy requires pharmacists to work in concert with the patient and the patient’s other healthcare providers to ensure that drug therapies are safe and effective to improve patient quality of life.1,2

1.1 | The importance of drug consultation

Drug consultation is an important part of pharmaceutical care offered by the hospital. This service not only promotes optimal medication use, which helps improve health outcomes, but it also represents an opportunity for pharmacists to hone their professional skills.3 However, there is no experience for pharmacists to draw upon in regards to direct patient advisement, and adapting pharmacist care to better serve the patient is a learning process. We have provided various ways for people to consult clinical pharmacists about medication use, such as face-to-face, telephone and online consultations.4 It is particularly convenient for patients, medical providers (eg doctors and nurses) and pharmacists to provide these consultation services via telephone.5

1.2 | The objective of this study

Since the establishment of our clinical pharmacy department, Fudan University Obstetrics and Gynecology Hospital set up a special telephone line for drug consultation, which serves patients and medical staff inside and outside the hospital, and the service time is from 8:00 to 17:00 on weekdays. Clinical pharmacists promote drug consultation through rational drug use publicity inside and outside the hospital. The telephone answering centre of our hospital has set up a consultation telephone line, and the consultation related to drugs is transferred to the department of clinical pharmacy. The clinical pharmacists record and file the answered telephone consultations. To explore the characteristics of telephone drug consultations and uncover some of needs for pharmaceutical care, we analysed the records of telephone consultations regarding medication use in our hospital between 2014 and 2019. We hope to provide a reference for developing better approaches to drug consultation, which will also improve the expertise of pharmacists.

METHODS

2.1 | Data extraction

We analysed records of telephone consultations regarding medication use between 2014 and 2019 in the Fudan University Obstetrics and Gynecology Hospital, a 820-bed tertiary specialist hospital. Any consultation cases with incomplete records were excluded from our analysis.

2.2 | Statistical analysis

We sorted data using parameters, such as the content of the consultations, types of medications and groups of people, using Excel 2013. We then created a Pareto diagram to prioritize consultation questions. Based on the Pareto principle, the consultation questions were divided into the following categories: main issues (cumulative percentage 0%-80%), minor issues (cumulative percentage 80%-90%) and general issues (cumulative percentage 90%-100%).6 To avoid bias in data processing and analysis, all data were assessed by two pharmacists independently. A discussion was held with a third pharmacist to resolve any discrepancies during data evaluation.7

RESULTS

3.1 | Number of drug consultations

Our hospital has two districts, so we collected the records of drug consultations from the two districts.

After excluding incomplete records, a total of 1353 consultation cases were included in our study. From 2014 to 2019, the annual number of drug consultations is shown in Table 1.

3.2 | Content of consultations

The consultation content was divided into 12 categories, among which the main issues were usage and dosage, choice of drug variety, drug
incompatibilities, adjustment of the treatment plan and skin tests (cumulative percentage 76.3%). The minor issues involved medication use during pregnancy and lactation, and adverse reactions (cumulative percentage 86.2%). Drug usage and dosage was the most common issue, representing 28.5% (385 cases) of all concerns. The content of consultations is shown in Table 2. The Pareto diagram is shown in Figure 1.

3.3 | Types of medications being inquired about

According to drug classification in the ‘China Pharmaceutical Reference’, the top three types of drugs that callers requested information about were antimicrobials (600 cases, 44.4%), anti-tumour drugs (151 cases, 11.2%) and reproductive system drugs (111 cases, 8.2%). See Table 3.

3.4 | Groups of people callers belong to

Callers were divided into following four groups: doctors, nurses, patients and other medical professionals. Doctors (865 cases, 63.9%) and nurses (280 cases, 20.7%) were by far most likely to consult us about medications over the telephone. See Table 4.

4 | DISCUSSION

4.1 | Analysis of consultation content

Using Pareto analysis, we found that drug usage and dosage, choice of drug variety, drug incompatibility, adjustment of the treatment plan, and skin tests were the most common issues addressed during consultation. These five issues concern the direct clinical usage of drugs. People often seek professional advice from pharmacists when they have questions about the amount and frequency of medication use, what specific variety within a drug class should be used, whether or not two or more drugs are safe to be used together for intravenous infusion, how to adjust the original treatment plan when the efficacy is not satisfactory, and whether to perform skin tests before using cephalosporins. The overall goal of such consultations is to ensure medications are safely and effectively used.

Less common issues involved medication use during pregnancy and lactation, and adverse reactions. When drug use is involved during pregnancy or lactation, questions such as effects of drugs on foetal development or how long a woman should wait before she can breastfeed her child after using a certain drug are usually asked. People also consult our services concerning adverse reactions to a specific medication and treatments for such reactions.

4.2 | Analysis of types of medications being inquired about

With regard to the types of medications people inquire about, antibiotics were the most common. Most frequently, people called to ask for information about the usage and dosage and the choice of a specific variety of antimicrobial agent for the prevention or treatment of inflammation, as well as the adjustment of anti-inflammatory therapies, which represented the main issues for consultation. Reasons why we answered questions about antimicrobial agents most frequently were as follows: (a) as a hospital specializing in gynaecology and obstetrics, many patients admitted to the gynaecology department have cervical cancer, endometrial cancer, ovarian cancer or uterine fibroids and require surgery. Those admitted to the obstetrics department often require a caesarean section, have premature rupture of membranes or suffer from Group B Strep urinary tract infection. For patients without infection, the use of prophylactic antibiotics during the perioperative period is often necessary. In addition, anti-inflammatory therapies are often needed for those with infection. (b) In 2011, the Ministry of Health of the People’s Republic of China (now called the National Health Commission of the People’s Republic of China) launched a campaign to advocate for the appropriate use of antibacterial agents. During the three-year campaign period and years after this campaign, clinical pharmacists in our hospitals made concerted efforts to organize education and training programmes to inform medical staff about the safe and proper use of antibiotics. As a result, many of our medical staff have realized that the overuse of antibiotics can lead to increased resistance in harmful bacteria and have become more cautious when using antibiotics to fight bacterial infections, which explains the increasing demand for consultations about the smart use of these medications.

| Year | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|------|------|------|------|------|------|------|
| Number of drug consultation (n) | 244  | 211  | 293  | 247  | 170  | 188  |

The remaining five issues fell into the ‘general’ category. During consultation, we were also often asked about different dosages of a specific drug and the availability of medications recommended by doctors from other hospitals. Questions regarding prescriptions tended to concern the authority to prescribe antibacterial drugs and the standard writing of drug names. In terms of drug storage, we were often asked about how to store drugs already prepared for intravenous infusion, and whether it is necessary to avoid light during infusion. As many doctors have a satisfactory knowledge concerning the indications of specific drugs, there were only a few consultations about the indications and contraindications of medications, most of which were from patients about the use of sexual hormones. Other consultation questions were about pharmacokinetics and pharmacodynamics, medication interactions and the handling of medication errors.
Gynaecological tumour therapy-related drugs were the second more commonly inquired about group. Questions centred around the usage and dosage of anti-tumour drugs, drug incompatibility and the treatment of adverse reactions to anti-tumour drugs. Reproductive system drugs were the third most commonly inquired about drug group. In terms of drugs for the disorders of the reproductive system, people were mainly concerned about the adverse reactions of sexual hormones and usage and dosage of topically applied vaginal medications. Cancer drugs were the least frequently asked about medications and questions usually related to drug incompatibility and usage and dosage.

4.3 | Analysis of the groups to which callers belong

Unlike outpatient face-to-face drug consultation services, which were mainly used by patients, it was doctors and nurses who consulted with us concerning medications over the telephone. Doctors called us to inquire about medications most frequently, which is related to the fact that clinical pharmacists in our hospital take an active part in ward rounds, patient education and pharmaceutical consultation.

Different groups of people tended to have different questions to ask. Doctors care more about the usage and dosage of drugs, the choice of the appropriate drug and adjustment of the treatment plan. Nurses were more likely to ask questions about drug incompatibility and skin tests. Patients usually sought guidance about usage and dosage, and adverse reactions.

4.4 | Cases in point

4.4.1 | Dosage and usage

Case 1 (Dosage of medications in children)
A 13-year-old child (weight 38 kg) with Müllerian agenesis consulted gynaecologists in our hospital. Genital reconstruction was planned.
As the reconstructive procedure requires class II surgical wounds, prophylactic antibiotic use is indicated during the perioperative period. Doctors chose cefotiam and ornidazole for antibiotic prophylaxis and asked us about the dosage of these medications in children.

After reading the package inserts and searching relevant materials, we proposed the following drug use plan. The daily recommended dosage of cefotiam for children was 40-80 mg/kg. As this patient weighs 38 kg, the total daily dosage should be 1.5-3.0 g. Therefore, the cefotiam infusion plan was 0.5 g Q8H intravenous drip. By contrast, the daily dosage of ornidazole was 20-30 mg/kg, which means a total daily dosage of 0.76-1.14 g (0.5 g Q12H intravenous drip) for this patient. Both of these two medications should be used for up to 24 hours, with the first dose administered 0.5-1 hour before operation. If the intraoperative bleeding volume was >1500 mL or the operation took >3 hours, an additional dose should be given during the operation.

**Case 2 (Missed dose of sexual hormones)**

The patient visited our hospital because of polycystic ovary syndrome. She was given ethinylestradiol and cyproterone acetate tablets orally, once a day. She took one tablet at 10:00 PM on a daily basis. However, one night she forgot to take the pill, and she took the missed dose at 7:00 AM the next morning. She called us to ask whether this is necessary. Clinical pharmacists replied that ethinylestradiol and cyproterone acetate tablets are mainly used to change period cycles, reduce androgen levels and prevent unwanted pregnancy. For birth control, patients should take the missed dose as soon as they can remember and take the next dose at the usual time. If the missed dose is taken within 12 hours, effective contraception can still be achieved. Therefore, the patient did the right thing.

**Case 3 (Overdose)**

Pharmacists in our hospital pharmacy called to determine whether it is safe to give a pregnant woman a 1 g injection of ambroxol hydrochloride. We found that the patient was at 36 weeks of her first pregnancy. She had gestational diabetes, gestational hypertension, Cushing’s syndrome, hypothyroidism and foetal growth restriction. The patient was hospitalized due to poor blood pressure and blood sugar control. After assessment of her condition, early delivery was recommended. To prevent respiratory distress syndrome in premature infants, glucocorticoids such as dexamethasone or betamethasone are commonly used. However, the patient had gestational diabetes, hypothyroidism and Cushing’s syndrome, which rules out the option of using glucocorticoids. Therefore, doctors chose an ambroxol hydrochloride injection (1 g via intravenous injection) to promote the maturity of the foetal lungs. Through searching relevant clinical literature, we only found one study reporting the use of ambroxol hydrochloride injection (1 g via intravenous injection once a day for three days) can reduce the incidence of respiratory distress syndrome in preterm infants. However, systematic reviews showed that the antenatal use of ambroxol has minimal effects in preventing infant respiratory distress syndrome. In addition, the use of ambroxol in large doses increases the incidence of adverse reactions, which requires close monitoring. Lastly, doctors need to fully inform patient and obtain their consent before using large doses of ambroxol.

**Table 3** Types of medications being inquired about and their percentages

| Classification of medications       | Number of consultations (n) | Percentage (%) |
|-------------------------------------|-----------------------------|----------------|
| Antimicrobials                      | 600                         | 44.4           |
| Anti-tumour drugs                   | 151                         | 11.2           |
| Reproductive system medications     | 111                         | 8.2            |
| Drugs for electrolytes and acid-base disorders and nutrition support | 102 | 7.5 |
| Digestive system medications        | 100                         | 7.4            |
| Blood system medications            | 66                          | 4.9            |
| Endocrine system medications        | 55                          | 4.1            |
| Cardiovascular medications          | 43                          | 3.2            |
| Chinese patent medicine             | 40                          | 3.0            |
| Respiratory medications             | 25                          | 1.9            |
| Nervous system medication           | 20                          | 1.5            |
| Immune system medication            | 20                          | 1.5            |
| Antipyretics and analgesics         | 18                          | 1.3            |
| Diagnostic medications              | 2                           | 0.2            |
| Total                               | 1353                        | 100            |

**4.4.2 | Choice of drug variety**

**Case 4**

A patient had undergone a radical hysterectomy for cervical cancer. Five days after the operation, she developed fever and a cough. Routine blood work showed an increased white blood cell count. Lung computed tomography showed possible lung inflammation. Anti-inflammation therapy was planned. However, the patient was allergic to penicillin and cephalosporins. Not knowing which variety of antibiotics to use, her gynaecologist called us to seek advice. Based on the inventory of antibacterial agents at our hospital, we recommended the use of quinolones, such as levofloxacin or moxifloxacin to combat infection. Respiratory secretions or blood samples should be used for bacterial culture and drug susceptibility testing.

**4.4.3 | Drug incompatibility**

**Case 5**

A pregnant woman presented with intrahepatic cholestasis of pregnancy. To reduce bile acid and protect the liver, she was prescribed ademetionine 1,4-butanedisulfonate for injection (solvent: 5% glucose injection 250 mL) and polyene phosphatidylycholine injection (solvent:
5% glucose injection 250 mL). A nurse at the ward of the obstetrics department consulted with us over the telephone about whether it is necessary to flush the intravenous injection line between infusion of the two medications. We replied that the intravenous injection line has to be flushed with 5% dextrose injection between infusion of these medications. Otherwise, infusion fluids may become cloudy, which previously occurred with one patient who received consecutive infusion of these two medications without intravenous injection flush between each administration. We believe the reason for clouding is decreased pH values upon mixing of the two medications.12

4.4.4 | Adjusting treatment plan

**Case 6**

A patient had received surgery for stage Ib1 cervical cancer. Forty days after this procedure and 1 day after the removal of ureteral stents, she developed shivering and fever and experienced loss of consciousness for 5 seconds. Physical examination revealed the following: body temperature 40.1 °C, blood pressure 88/59 mm Hg, heart rate 112 beats/min and breath rate 25 breaths/min. Septic shock was suspected. She was given imipenem and cilastatin sodium 1.0 g Q12H intravenous drip (1.0 g was the dosage of imipenem). One day later, the patient still had a high fever and the body temperature was 39.1°C. Her care team called us to discuss the possibility of using a different antibiotic. We advised them to increase the dosage of Imipenem and cilastatin sodium to 1.0 g Q8H intravenous drip. They took our advice. On the next day, her cervical secretion and urine cultures tested positive for *Escherichia coli*. Critical value reports of the anaerobic blood culture bottle indicated Gram-negative and anaerobic bacteria (specific strains unknown). Her doctors consulted us again. We recommended that the current treatment plan should be continued, as the patient’s highest body temperature had dropped to 38.6°C, and imipenem is active against Gram-negative and anaerobic bacteria. With this treatment, the patient was afebrile 3 days later. Blood culture later identified *Veillonella parvula*.

4.4.5 | Skin tests

**Case 7**
The ward nurse consulted that the patient had a history of penicillin allergy and needed to use ceftriaxone due to infection. Did patients need a ceftriaxone skin test before use? We suggested that it is necessary to determine the severity of the patient’s previous penicillin allergy. Ceftriaxone is not recommended whether the patient has a severe allergic reaction such as anaphylactic shock. For common allergic reactions such as skin rash, ceftriaxone can be used. A skin test is not required before use, but observation should be strengthened during use.

### 4.4.6 | Medication use during pregnancy/lactation

**Case 8**

A patient had a caesarean delivery and received intramuscular injection of 100 g methotrexate due to placenta accreta. Her obstetrician called us to inquire about breastfeeding issues. We suggested that methotrexate should not be used in lactating women as it can pass into breast milk. We recommended a patient should not breastfeed her child when using this medication. Exactly when patients can resume breastfeeding after discontinuing this medication depends on the frequency of medication use and total dosage administered.

It has been reported that no methotrexate can be found in the breast milk of patients with placenta accreta 48-72 hours after they have received intramuscular injection of methotrexate at a dosage of 50 mg/m². Therefore, this study recommended that patients start breastfeeding again after 72 hours.13 Thomas Hale, author of the book ‘Medications and Mothers’ Milk’, suggested a gap of 4 days in breastfeeding if a patient has received >75 mg of methotrexate.14 Taking all the above information into consideration, we advised the patient restart breastfeeding 4 days after medication discontinuation.

### 4.5 | Improving the quality of drug consultation services

4.5.1 | Encouraging pharmacists to take initiatives to offer patient-centred, outcome-oriented pharmaceutical care

Based on our experience in providing consultation about medication use for medical staff in our hospital via telephone, we updated the drug inventory and formulary of our hospital in a timely...
manner to make it easier for our medical staff to obtain precise drug information. Together with pharmacists from the Intravenous Drug Preparation Center in our hospital, we compiled a ‘Collection of Safety Information of Commonly Used Injections’ guideline by referring to package inserts and books, such as the ‘China Pharmaceutical Reference’ and ‘Guidelines for the Preparation and Use of Clinical Intravenous Drugs’. We hope to inform our medical staff about the choice of solvents, drug incompatibilities and the storage conditions for injectables listed in the drug inventory of our hospital.

We also organized a team of clinical pharmacists to compile the ‘Collection of Safety Information on Drug Use during Pregnancy’ guidelines for our hospital by referring to books, such as ‘Drugs in Pregnancy and Lactation’ and ‘New Pharmacology’. In addition, we compiled the ‘Collection of Safety Information on Drug Use during Lactation’ guidelines according to how different medications are prescribed and used by patients after childbirth in our hospital. We devoted energy and time to extracting information about drug use during pregnancy and lactation from the reference materials. In addition, we added information about the half-life of drugs in our collection and information about using drugs safely during lactation. Typically, 97% of a given dose will be eliminated from the bloodstream through first-order kinetics after 5 half-lives, which can be used as a reference for deciding when to resume breastfeeding after using certain medications. We uploaded the updated collections on safe use of medications to the Office Automation System in our hospital, which can be viewed online or downloaded by all medical staff of our hospital.

There is still no consensus regarding whether skin tests are needed before the use of cephalosporins in China. Some clinical studies have shown that skin tests can effectively prevent adverse reactions. However, most studies in the clinical literature conclude against the use of cephalosporin skin tests due to many problems existing in this procedure, such as the lack of appropriate primary and minor determinants for cephalosporins, inconsistent skin test concentrations and methods and the resulting inaccuracy of the test results. In cooperation with the Nursing Department, we formulated the guidelines for skin tests in our hospital. Before using cephalosporins, nurses will ask patients whether or not they have a history of allergy to cephalosporins, penicillins or other beta-lactam antibiotics. Skin tests for cephalosporins will not be performed unless otherwise stated in the package inserts.

4.5.2 Exploring various approaches to consultation services

Due to the limitations of telephone consultations, we established an online platform for drug consultations and opened an official account called ‘Red House Pharmacist’ on WeChat to educate people about the proper use of drugs and offer consultation services. When a patient proposes a drug consultation on the platform, the clinical pharmacist responds within 24 hours. We also offer face-to-face consultation services from free-of-charge outpatient drug consultation services to paid clinical services for medication use during pregnancy and lactation to further improve pharmaceutical care and build a ‘top brand’ of pharmaceutical services.

4.5.3 Introducing state-of-the-art software for safe drug use

We commissioned a software company to develop a software programme to promote the appropriate use of commonly prescribed medications in our hospital. With this system, all prescriptions made by doctors will be automatically sent to us to check before payment. We will remind doctors about any potential errors or concerns regarding the prescription so necessary changes to ensure the proper use of drugs can be made. The system also comes with a tool for the doctors to search relevant package inserts and calculate the optimal drug dosage, greatly improving the efficiency of pharmaceutical care.

4.5.4 Further education

Consultant pharmacists must keep learning to be at the leading edge and to stay current with the latest pharmaceutical developments and resources. The hospital can also provide opportunities to improve pharmacist expertise and enhance career growth.

5 WHAT IS NEW AND CONCLUSION

In this study, we systematically analysed records of telephone consultations about medication use in our hospital over the past few years. We uncovered the needs for pharmaceutical care in clinical practice, which can help consultant pharmacists focus their efforts on developing these badly needed skills. The characteristics of consultation questions uncovered here can also provide insights that would enable pharmacists to offer customized consultation to doctors, nurses and other medical staff. Through the ‘Drug Formulary’, ‘Collection of Safety Information of Commonly Used Injections’ and ‘Collection of Safety Information on Drug Use during Pregnancy and Lactation’, we compiled information that covers common questions regarding the prescription so necessary changes to ensure the proper use of drugs can be made. The system also comes with a tool for the doctors to search relevant package inserts and calculate the optimal drug dosage, greatly improving the efficiency of pharmaceutical care.

Through this survey and analysis, the number of telephone drug consultation did not increase year by year, especially in 2018 and 2019. Reasons for this are as follows: (a) some medical staff’s consultation questions decrease with the release and timely update of the drug reference collection provided by us. The relevant information can be obtained through office automation; and (b) in order to ensure the safety of clinical medication, some complex medication problems such as the adjustment of treatment plan, clinicians gradually invite clinical pharmacists to participate in written consultation.
We also found that only a few patients use telephone consultations to ask for information about medication use, possibly due to the limitations of such an approach. For this reason, we launched an online drug consultation platform and offered clinical services dedicated to drug consultations.

### 6 LIMITATIONS

With years of awareness-raising campaigns, many nurses, doctors and patients have now realized the importance of using medications safely and effectively. Pharmacists can further promote such processes by offering high-quality drug consultation services to medical staff and patients alike. Our study is limited in that it is a single-centre study with a relatively small sample size. Multi-centre, large-sample studies are needed to further explore the role pharmacists play in improving patient care by optimizing medication use and to answer new questions that will inevitably arise in the ever-changing world of pharmaceutical care.

### ACKNOWLEDGMENTS

This work was supported by The Key Specialty Construction Project of Shanghai Clinical Pharmacy (No. AB83110002017005) and Shanghai ‘Rising Stars of Medical Talent’ Youth Development Program (No. AB83030002019004).

### ETHICAL APPROVAL

This study only contains consulting questions. Personal information, including ID and insurance was not included during data analysis. Thus, we did not apply for the approval from the Hospital Medical Ethics Committee.

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How to cite this article: Wang X, Pang Y, Sun H, et al. Analysis and improvement measures of telephone drug consultation in a specialized hospital of obstetrics and gynaecology in China. J Clin Pharm Ther. 2021;46:78–85. [https://doi.org/10.1111/jcpt.13253](https://doi.org/10.1111/jcpt.13253)