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ORIGINAL ARTICLE

Assisted Reproductive Technology

# Antibiotic usage in surgical sperm retrievals among IVF centers

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Surgical sperm retrieval (SSR) is currently one of the most common procedures in *in vitro* fertilization (IVF). However, a gap between the guidelines and routine clinical practice regarding antibiotic use in SSR, which might lead to antibiotic resistance, is a challenging problem worldwide. A cross-sectional survey was conducted from May 1, 2021, to July 15, 2021, to investigate antibiotic usage by medical professionals when performing SSR in IVF centers in Vietnam. The confidential questionnaire comprised 12 items, including characteristics of the study population, awareness of antimicrobial resistance, attitude toward prescribing antibiotics, and current practice of prescribing antibiotics when performing SSR. Surveys were completed by 30 of 45 registered IVF centers (66.7%). Among 67 physicians working at those centers, the age and work-experience years (mean  $\pm$  standard deviation [s.d.]) were  $38.6 \pm 6.6$  years and  $11.2 \pm 7.0$  years, respectively. Over 60% of them held a degree in Obstetrics and Gynecology, and over four-fifths were men. Most respondents “often/very often/always” raised awareness of antimicrobial resistance to their patients (83.3%), but only half of them “often/occasionally” prescribed antibiotics to patients with SSR in cases where the prescription would be optional. About one-tenth of respondents followed the recommendation from the American Urological Association using “prophylaxis only” for SSR patients. For more invasive SSR, physicians tended to prescribe more complicated and sometimes inappropriate regimens. In conclusion, antibiotic usage in SSR was not always appropriate among IVF centers. Further studies may define specific recommendations for regimens, intervention strategies, and programs to promote appropriate antibiotic use for SSR patients among IVF specialists.

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**Keywords:** antibiotic usage; *in vitro* fertilization; prophylaxis; surgical sperm retrieval; treatment

## INTRODUCTION

The prevalence of azoospermia is about 1.0% of the general population and 10.0%–15.0% of men presenting with infertility.<sup>1</sup> In this scenario, surgical sperm retrieval (SSR) followed by *in vitro* fertilization (IVF)/intracytoplasmic sperm injection (ICSI) may be appropriate for achieving pregnancy.<sup>2,3</sup> These procedures (*e.g.*, percutaneous epididymal sperm aspiration [PESA], microsurgical epididymal sperm aspiration [MESA], testicular sperm aspiration [TESA], testicular sperm extraction [TESE], and microsurgical testicular sperm extraction [micro-TESE]) are classified as “clean” urologic operations,<sup>4,5</sup> which are performed in uninfected areas with no involvement of the urinary tract, and primary closure is established after the operation.<sup>6–8</sup> Adequate aseptic, germicide procedures, sterilization operating rooms, and medical instruments are necessary to forestall postoperative infection following clean urologic procedures.<sup>9</sup>

However, there remain differences and controversies between various professional associations or organizations, leading to a gap between the guidelines and clinical practice regarding antibiotic use in SSR. In 2019, according to the American Urology Association (AUA) wound classification, scrotal surgery without entry to the urinary tract was considered a clean wound (Class I), and antibiotic

prophylaxis is a highly recommended indication.<sup>4</sup> Meanwhile, the Centers for Disease Control and Prevention (CDC) Guideline showed that additional prophylactic antibiotics should not be prescribed to wounds closed after clean procedures, even if drainage occurred from wounds.<sup>5</sup> In clinical practice, prophylactic antibiotics are still regularly prescribed for preoperative preparation,<sup>10</sup> and some physicians also prescribe empirical oral antibiotics for 3–5 days after the procedures.<sup>11,12</sup> Excessive, unnecessary antibiotic usage may lead to antibiotic resistance, a challenging problem worldwide, causing higher medical costs, prolonged hospital stays, and higher mortality. This clinical practice is relevant in view of the recent increase in the number of Vietnamese IVF centers performing SSR where the patients have to self-fund infertility treatments.

To our knowledge, there has been no report on antibiotic usage of medical professionals among IVF centers when performing SSR. This study will provide valuable information to formulate appropriate intervention strategies or adjustment programs to enhance the safe use of antibiotics. The survey’s primary objectives were to determine (i) the attitude and current practice of prescribing antibiotics for SSR among IVF centers and (ii) the awareness of antimicrobial resistance among physicians utilizing SSR.

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## PARTICIPANTS AND METHODS

### Study design, recruitment, and data collection

A confidential cross-sectional survey was conducted from May 1 to July 15, 2021. All heads/directors of IVF centers or team leaders of male infertility groups of 45 IVF centers in Vietnam registered with the Ministry of Health of Vietnam were invited to participate in this survey by email. In order to understand and prepare for the response contents carefully, the questionnaires were emailed to heads/leaders of these IVF centers first. Then, the investigator called them and discussed the study details (*i.e.*, study aims, interview duration, voluntary participation, and freely able to discontinue) with them. The answers would be kept strictly confidential and reported anonymously in aggregated form. The answer sheet will be assigned a code to appear on all questionnaires. Completion of the questionnaire was interpreted as consent to take part in the survey. Some data in questionnaires, which were not readily available in the interview, were collected afterward by phone to enable the heads/leaders to check information and fill the survey out. Partial completion response to any item was classified as a nonresponse when some or all answers were not completed. Completing more than 90.0% of questions was classified as a completed survey.

The survey was piloted in April 2021 with five clinical IVF specialists to validate the questionnaire in terms of length, the order of questions and wording, and the survey logistics. The final questionnaire contains 12 questions, including four questions for characteristics of the study population (Q1, Q2, Q3, and Q12), three questions for awareness toward antimicrobial resistance (Q4, Q9, and Q10), three questions for attitude toward prescribing antibiotics (Q7, Q8, and Q11), and the other two (Q5 and Q6) for current practice of prescribing antibiotics when performing sperm retrieval in IVF centers. The questionnaire form is shown in **Supplementary Information**. The data were stored on the computers of the investigators in Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) and password-protected files.

### Terms of antibiotics usage

Surgical antibiotic prophylaxis (SAP), called “prophylaxis only”, refers to preventing infectious complications by administering one antimicrobial agent before SSR. According to the recommendation of Ministry of Health of Vietnam, World Health Organization (WHO), AUA, and American Society of Health-system Pharmacists (ASHP), the prophylaxis antibiotics should be administered before the procedure within 60–120 min while considering the half-life of the antibiotic; prophylaxis antibiotics should not be prolonged within 24 h after the procedure.<sup>4,13,14</sup> Any antibiotics taken beyond this period were considered “prolonged prophylaxis”.<sup>13</sup> The “empirical treatment” was defined as the initial empirical antibiotics for 3–5 days after the SSR.<sup>11,12</sup> Any combination of two or more antimicrobial agents is called “combination”.<sup>15</sup>

### Characteristics and classifications of surgical sperm retrievals

Every procedure has its advantages and disadvantages.<sup>16</sup> From other perspectives, some procedures are “simple and less invasive” than others. “Simple and less invasive” procedures in this study were defined with some characteristics, including fast, repeatable methods with minimal morbidity, no surgical exploration, and few instrument/materials (*e.g.*, PESA). “Complicated and invasive procedures” in this study were defined with some characteristics, including longer operation time, surgical exploration/open surgery, and microsurgical expertise (*e.g.*, micro-TESE).

### Statistical analyses

All analyses were performed using R (version 3.6.2) and R Studio (version 1.3.959) software (Delaware Public Benefit Corporation and

Certified B Corporation, Boston, MA, USA). Continuous variables were summarized as mean and standard deviation (*s.d.*), and frequencies and percentages of categorical variables were calculated. The imputation technique, which replaces any missing value with the mean of that variable in all other cases, was only used on surveys that we designated to be incomplete.

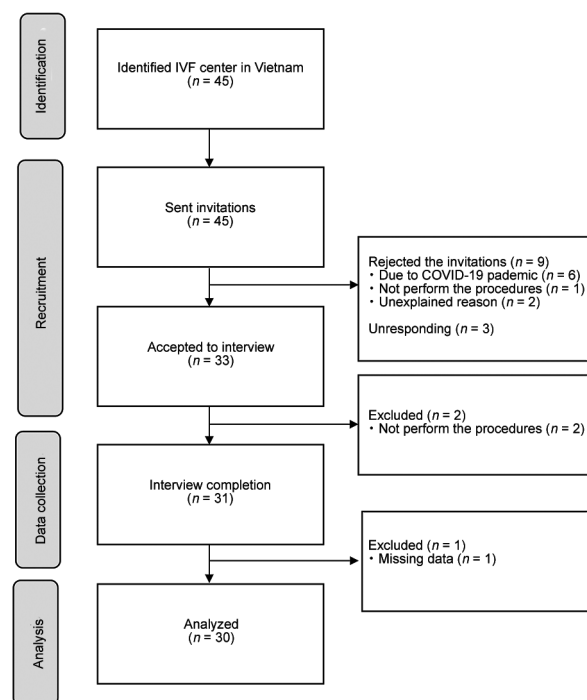
### Ethical considerations

The study was conducted following the ethical standards of the Helsinki Declaration (1975, revised in 2013) and other guidelines/regulations from the Ministry of Health of Vietnam. The study was reviewed, completely approved, and monitored by the local Institutional Review Board (IRB) of Tam Anh General Hospital (protocol IRB No. TAHN.011) in Ha Noi, Vietnam. The key ethical issues were whether the analysis would put the subjects at undue risks and whether the subjects were sufficiently informed about the purpose of the study. The report would not be carried out until the local IRB approval was achieved.

## RESULTS

Of the invited 45 IVF centers, 30 (66.7%) centers completed the surveys (**Figure 1**). Among 67 physicians working at the centers, the age and work-experience years (mean  $\pm$  *s.d.*) were  $38.6 \pm 6.6$  years and  $11.2 \pm 7.0$  years, respectively. Over 60.0% (42) of them held a degree in Obstetrics and Gynecology, and 82.1% (55) were men. Further demographic characteristics of their clinical practices (*e.g.*, sperm retrievals and most common complications) are given in **Table 1**.

When the physicians counseled patients about SSR, 23.3% of patients “never” and 53.3% “sometimes” required antibiotics after procedures. There was also “no impact at all” (43.3%) or “minor impact” (46.7%) of patients’ expectations on the prescription of antibiotics for SSR. Furthermore, 83.3% of the physicians often/very often/always raised awareness of antimicrobial resistance to their patients (**Table 2**). However, 50.0% of physicians often or occasionally prescribed

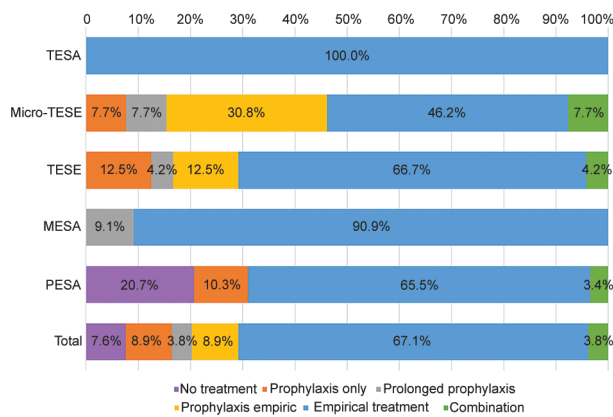


**Figure 1:** Flowchart of recruitment and interview process. IVF: *in vitro* fertilization; COVID-19: coronavirus disease 2019.

antibiotics to patients with SSR in cases where the prescription might not be necessary or could be optional. The detailed protocols for each antibiotic and procedure are listed in **Table 3**. Amoxicillin/clavulanic acid, under different dosage regimens, was the most common antibiotic (46.7%) prescribed for sperm retrieval procedures, while cefuroxime showed as a second option by physicians (23.3%). **Figure 2** is built on **Table 2** by looking further at the proportion of respondents choosing antibiotic use strategy when conducting SSR. There are only 8.9% of respondents chose “prophylaxis only” for SSR patients as AUA’s recommendation.

## DISCUSSION

Inappropriate antibiotic use poses a significant challenge to public health through the risks of increasing antimicrobial resistance



**Figure 2:** Proportion of respondents choosing antibiotic use strategy when conducting surgical sperm retrievals. PESA: percutaneous epididymal sperm aspiration; MESA: microsurgical epididymal sperm aspiration; TESA: testicular sperm aspiration; TESE: testicular sperm extraction; micro-TESE: microsurgical testicular sperm extraction.

(AMR), which raises medical costs, prolongs hospital stays, and creates adverse effects and mortality risks.<sup>17</sup> However, gaps remain between the guidelines/recommendations and clinical practice regarding antibiotic use in clean urologic operations (*i.e.*, SSR). The present survey addressed the antibiotic usage of medical professionals among IVF centers when performing SSR. It was found that (i) 83.3% of the respondents often/very often/always raised awareness of antimicrobial resistance to their patients; (ii) 50.0% of respondents often/occasionally prescribed antibiotics to patients with SSR in cases where the prescription might not be necessary or could be optional; and (iii) 8.9% of respondents chose “prophylaxis only” for SSR patients as a recommendation from AUA.

As mentioned above, the physicians faced the dilemma of a “good” attitude/awareness on antibiotic use/resistance or prescribing antibiotics to patients with SSR. Although there was “no impact at all” (43.3%) or “minor impact” (46.7%) of patients’ expectations on the prescription of antibiotics for SSR, half of the respondents often/occasionally prescribed antibiotics to patients with SSR in cases where the prescription might not be necessary or could be optional. Moreover, IVF physicians tended to prescribe more complicated and inappropriate regimens (*i.e.*, prolonged prophylaxis, prophylaxis combined with empirical treatment, and combination) when conducting more invasive procedures (from PESA to micro-TESE; **Figure 2**). The reasons might be prophylactic purposes (60.0%) and infection concerns at the second visit (36.7%) of IVF physicians (**Table 2**). However, the possible risk of developing antibiotic resistance and increasing medical costs is of great importance rather than the postoperative infection concerns, which might be actively prevented by adequate aseptic, germicide procedures, sterilization operating rooms, and medical instruments.

Only 8.9% of respondents chose the “prophylaxis only” regimen consistent with the AUA’s recommendation for clean urologic procedures,<sup>4</sup> while 7.6% of respondents performed SSR without antibiotics which was consistent with a randomized controlled trial

**Table 1: Characteristics of medical professionals among *in vitro* fertilization centers and their clinical practices**

Demographic characteristic	IVF centers (n=30)	Government (n=16)	Private (n=14)
Gender, n/total (%)			
Male	55/67 (82.1)	25/35 (74.1)	30/32 (93.8)
Female	12/67 (17.9)	10/35 (25.9)	2/32 (6.2)
Age (year), mean±s.d.	38.6±6.6	38.9±6.4	38.2±6.9
Specialty, n/total (%)			
Obstetrics and gynecology	42/67 (62.7)	26/35 (74.3)	16/32 (50.0)
Andrology	23/67 (34.3)	7/35 (20.0)	16/32 (50.0)
Urology	2/67 (3.0)	2/35 (5.7)	0/32 (0)
Duration of clinical practice (year), mean±s.d.	11.2±7.0	10.7±6.8	11.9±7.4
Sperm retrievals, n/total (%)			
PESA	1276/2208 (57.8)	821/1269 (64.7)	456/939 (48.6)
MESA	124/2208 (5.6)	74/1269 (5.8)	50/939 (5.3)
TESE	365/2208 (16.5)	208/1269 (16.4)	156/939 (16.6)
Micro-TESE	423/2208 (19.2)	146/1269 (11.5)	277/939 (29.5)
TESA	20/2208 (0.9)	20/1269 (1.6)	0/939 (0)
Most common complications, n/total (%)			
Hematoma	13/30 (43.3)	7/16 (43.8)	6/14 (42.9)
Infection	7/30 (23.3)	2/16 (12.5)	5/14 (35.7)
Others <sup>a</sup>	3/30 (10.0)	1/16 (6.2)	2/14 (14.3)
No complication	7/30 (23.3)	6/16 (37.5)	1/14 (7.1)

<sup>a</sup>Others included wound pain, scrotal pain, chronic wound. Data were shown as mean±s.d. (continuous variables) and n (%) with categorical variables. s.d.: standard deviation; IVF: *in vitro* fertilization; PESA: percutaneous epididymal sperm aspiration; MESA: microsurgical epididymal sperm aspiration; TESA: testicular sperm aspiration; TESE: testicular sperm extraction; micro-TESE: microsurgical TESE

**Table 2: Awareness of antimicrobial resistance and attitude of prescribing antibiotics for surgical sperm retrievals among *in vitro* fertilization centers**

Awareness/attitude	IVF centers (n=30)	Government (n=16)	Private (n=14)
Do you think antibiotics are helpful in treating patients with surgical sperm retrievals?			
Yes	19 (63.3)	9 (56.2)	10 (71.4)
Occasionally yes	11 (36.7)	7 (43.8)	4 (28.6)
No	0 (0)	0 (0)	0 (0)
Please rate the impact of patients' expectations on your prescription of antibiotics for SSR?			
No impact at all	13 (43.3)	6 (37.5)	7 (50.0)
Minor impact	14 (46.7)	8 (50.0)	6 (42.9)
Moderate impact	3 (10.0)	2 (12.5)	1 (7.1)
High impact	0 (0)	0 (0)	0 (0)
Very high impact	0 (0)	0 (0)	0 (0)
How often do your patients/their carers request antibiotics when consulting for SSR?			
Always	2 (6.7)	1 (6.2)	1 (7.1)
Very often	2 (6.7)	1 (6.2)	1 (7.1)
Often	3 (10.0)	3 (18.8)	0 (0)
Sometimes	16 (53.3)	9 (56.2)	7 (50.0)
Never	7 (23.3)	2 (12.5)	5 (35.7)
Please select reasons for prescribing antibiotics to patients with sperm retrievals			
Treatment of prevention	18 (60.0)	8 (50.0)	10 (71.4)
Second visit for the surgical site infection	11 (36.7)	8 (50.0)	3 (21.4)
Satisfy the patient or his carer	6 (20.0)	6 (37.5)	0 (0)
Fear of medicolegal issue if the patient's condition deteriorates	6 (20.0)	4 (25.0)	2 (14.3)
Help saving time	1 (3.3)	0 (0)	1 (7.1)
Do not want to be perceived as doing nothing for the patient	1 (3.3)	1 (6.2)	0 (0)
Better doctor-patient relationship	1 (3.3)	1 (6.2)	0 (0)
Influence by representatives from pharmaceutical companies	0 (0)	0 (0)	0 (0)
Diagnostic uncertainty	0 (0)	0 (0)	0 (0)
Those who really want antibiotics would obtain them anyway	0 (0)	0 (0)	0 (0)
Others <sup>a</sup>	4 (13.3)	0 (0)	4 (28.6)
Have you prescribed antibiotics to patients with SSR in cases where the prescription might not be necessary/could be optional?			
Yes, often	9 (30.0)	7 (43.8)	2 (14.3)
Yes, occasionally	6 (20.0)	3 (18.8)	3 (21.4)
Never	15 (50.0)	6 (37.4)	9 (64.3)
When you prescribe antibiotics, how often do you remind patients that improper use of antibiotics will increase antimicrobial resistance?			
Always	13 (43.3)	6 (37.5)	7 (50.0)
Very often	7 (23.3)	2 (12.5)	5 (35.7)
Often	5 (16.7)	5 (31.2)	0 (0)
Sometimes	4 (13.3)	3 (18.8)	1 (7.1)
Never	1 (3.3)	0 (0)	1 (7.1)

<sup>a</sup>Others included standard operating procedures, gonorrhea treatment; Values are presented as *n* (%) with categorical variables. IVF: *in vitro* fertilization; SSR: surgical sperm retrieval

(RCT) of Wahyudi *et al.*<sup>9</sup> The only RCT study, in which the most frequently performed operation was SSR, showed that clean urologic operations could be safely performed without prophylaxis antibiotics.<sup>9</sup> However, this study showed some limitations, especially the small sample size might make it difficult to determine whether a particular outcome is a factual finding. Of note, the rest of the respondents (approximate 83.5%) prescribed more complicated and inappropriate regimens (including prolonged prophylaxis, prophylaxis combined with empirical treatment, and combination) as compared to AUA's recommendation (Figure 2). This was vastly higher than the CDC's report, which showed that up to 50.0% of antibiotic use in humans is unnecessary or inappropriate.<sup>18</sup>

The potential explanations for this inappropriate antibiotic usage need to be elucidated, but few reasonable hypotheses remain. First, there may be confusion due to differences between guidelines

of various professional associations or organizations on antibiotics use when performing SSR.<sup>4,5,10-12</sup> These guidelines might lead to differing clinical perspectives on antibiotics usage on SSRs among IVF physicians with different backgrounds (62.7% were Obstetrics and Gynecology physicians, 34.3% were Andrologists, and 3.0% were Urologists), as shown in Table 1. Second, the crucial principles of antimicrobial therapy might be affected by many variables. Essential considerations when prescribing antimicrobial therapy might include behavior and expectations of local patients, doctor's experience, prior knowledge of bacteria known to affect SSR patients, local bacterial resistance patterns, cost-effective drugs for the shortest duration necessary, and more.

This study highlights the need for further studies to confirm appropriate antimicrobial strategies for SSR (*e.g.*, no treatment versus prophylaxis, prophylaxis versus prolonged prophylaxis, and

**Table 3: Current antibiotic regimen when performing sperm retrieval in *in vitro* fertilization centers**

Procedure	Strategy	Antimicrobial	Route	Daily dose	Duration of therapy (day)	
PESA	Prophylaxis only	Cefuroxime	IV	750 mg SD	1	
		Cefdinir	IV	1 g SD	1	
		Ceftriaxone	IV	1 g SD	1	
	Empirical treatment	Amoxicillin/clavulanic acid	PO	625 mg/1g b.i.d or t.i.d	3-7	
		Cefuroxime	PO	500 mg b.i.d	3-7	
		Cefixime	PO	200 mg b.i.d	5-10	
		Amoxicillin	PO	500 mg/1g b.i.d	3-5	
		Azithromycin	PO	500 mg b.i.d	3	
		Cefpodoxime	PO	200 mg b.i.d	2	
	Combination	Doxycycline + cefixime	PO + PO	100 mg b.i.d + 100 mg b.i.d	7 + 7	
MESA	Prolonged prophylaxis	Cefuroxime + cefuroxime	IV + PO	750 mg SD + 500 mg b.i.d	1 + 7	
	Empirical treatment	Amoxicillin/clavulanic acid	PO	625 mg/1g b.i.d or t.i.d	3-7	
TESE	Prophylaxis only	Ampicillin/sulbactam	IV	1.5 g SD	1	
		Cefdinir	IV	1 g SD	1	
		Ceftriaxone	IV	1 g SD	1	
	Prolonged prophylaxis	Cefuroxime + cefuroxime	IV + PO	750 mg SD + 500 mg b.i.d	1 + 7	
	Prophylaxis + empiric	Ampicillin/sulbactam + cefuroxime	IM + PO	1.5g SD + 500 mg b.i.d	1 + 7	
		Metronidazole + cefuroxime	IV + IV	500 mg b.i.d + 1.5 g b.i.d	3 + 3	
		Cefazolin + cefixime	IV + PO	2 g SD + 200 mg b.i.d	1 + 7	
		Empirical treatment	Amoxicillin/clavulanic acid	PO	625 mg/1g b.i.d or t.i.d	3-7
	Combination	Cefuroxime	PO	500 mg b.i.d	3-7	
		Ampicillin/sulbactam	PO	375 mg b.i.d	7	
		Cefdinir	PO	300 mg b.i.d	2	
		Cefixime	PO	200 mg b.i.d	10	
		Ciprofloxacin	PO	500 mg b.i.d	5	
		Doxycycline + cefixime	PO	100 mg b.i.d + 200 mg b.i.d	7	
		Micro-TESE	Prophylaxis only	Cefdinir	IV	1 g SD
	Prophylaxis + empiric	Ampicillin/sulbactam + cefuroxime	IM + PO	1.5 g SD + 500 mg b.i.d	1 + 7	
		Metronidazole + cefuroxime	IV + IV	500 mg SD + 1.5 g b.i.d	3 + 3	
Ampicillin/sulbactam + Amoxicillin/clavulanic acid		IV + PO	1.5 g SD + 1 g b.i.d	1 + 5		
Cefazolin + cefixime		IV + PO	2 g SD + 200 mg	1 + 7		
Ceftriaxone + cefuroxime + metronidazole		IV + PO + PO	1 g SD + 500 mg b.i.d + 500 mg b.i.d	1 + 5 + 5		
Empirical treatment		Amoxicillin/clavulanic acid	PO	1g b.i.d	7	
Combination	Levofloxacin	PO	500mg b.i.d	7		
	Ceftriaxone	IM	1 g b.i.d	5		
	Doxycycline + cefixime	PO	100 mg b.i.d + 200 mg b.i.d	7		
TESA	Empirical treatment	Amoxicillin/clavulanic acid	PO	500 mg b.i.d	5	
		Amoxicillin	PO	625 mg b.i.d	5	

PO: oral; IM: intramuscular; IV: intravenous; SD: single dose; b.i.d: twice daily; t.i.d: three times daily; IVF: *in vitro* fertilization; PESA: percutaneous epididymal sperm aspiration; MESA: microsurgical epididymal sperm aspiration; TESA: testicular sperm aspiration; TESE: testicular sperm extraction; micro-TESE: microsurgical TESE

prophylaxis vs empiric), which leads to consensus guidelines between various associations and organizations and between specialties. Additional data are also needed to make specific recommendations toward dosages, routes, duration of therapy, and timing of presurgical antimicrobials prescribed for SSR patients. Moreover, the behavior and attitudes of IVF specialists in prescribing antibiotics might help policymakers formulate intervention strategies and promotion programs on the appropriate use of antibiotics shortly. Finally, this survey might be recommended to other countries to increase the generalizability of the study with a wider range of population groups. The study question also refers to other common procedures in reproductive medicine (*e.g.*, oocyte collection).

This study also has several limitations. First, the nonresponse bias might occur because the survey measured only 67.0% of registered IVF centers. Second, the respondents were the heads/directors of IVF centers or team leaders of male infertility groups instead of IVF specialists who do the daily prescribing of antibiotics. Although these might not completely represent the opinions of all IVF specialists in their everyday clinical practices, the feedbacks of leaders/heads mostly showed the policy in which IVF centers were officially complying. Third, the study was only based on a quantitative approach. Future

studies should include a qualitative aspect to gain a deep understanding of these issues.

## CONCLUSIONS

There was inappropriate usage of antibiotics in surgical sperm retrieval among IVF centers. Further studies are needed to make specific recommendations toward regimens, intervention strategies, and promotion programs on the appropriate use of antibiotics for SSR patients among IVF specialists.

## AUTHOR CONTRIBUTIONS

LDK, NDTV, NPH, GHN, LH, and DJH participated in study design and protocol writing. NDTV, NMML, LDT, DTA, NPH, GHN, NDT, and LH conducted participants' enrolment, execution, and coordination. LDK, NDTV, NMML, LDT, DTA, NPH, GHN, NDT, and LH collected the data of the study. LDK, NDTV, and NMML performed statistical analysis and drafted the manuscript. LDK, NDTV, NMML, LDT, DTA, NPH, GHN, NDT, and LH revised the article before DJH provided editorial corrections. All authors read and approved the final manuscript.

## COMPETING INTERESTS

All authors declare no competing interests.



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Supplementary Information is linked to the online version of the paper on the *Asian Journal of Andrology* website.

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## QUESTIONNAIRE (in English)

**Protocol Title:** USAGE OF ANTIBIOTICS IN SURGICAL SPERM RETRIEVAL  
AMONG IVF CENTRES IN VIETNAM

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- Nguyen Dinh Tao, HASAR
- Le Hoang, Tam Anh Hospital HN
- David Handelsman, Sydney Medical School

Thank you for participating in our project titled "**Usage of antibiotics in surgical sperm retrievals among IVF centres in Vietnam**". We would like to collect information about the practice of antibiotics prescription in your IVF centre. The questionnaire will take less than 10 minutes to complete. Please be assured that your responses will be kept in strict confidence and reported anonymously and collectively with responses from other respondents.

The results of this survey will be published in scientific journals and we will make this available to you. The choice to enter into this study is yours. If you enrol in this trial you will still have the right to withdraw at any time. Please let us know what you doing in this.

Thank you for your participation.



**Participant:**

- Agree to join                       Disagree join (stop surveying)

**IVF centre's name:**

\_\_\_\_\_

**1. Type of clinical practice of IVF centre:**

a-Private                      b-Government                      c-Others – please specify \_\_\_\_\_

**2. A-Number of surgical sperm retrievals per year in your centre: \_\_\_\_\_**

**B-Common complications in your center when performing surgical sperm retrievals**

a-Hematoma                      b-Infection                      c-Others \_\_\_\_\_

**3. Type and percentage of surgical sperm retrievals (MULTIPLE CHOICE)**

a-PESA \_\_\_\_\_ %                      b-MESA \_\_\_\_\_ %                      c-TESE \_\_\_\_\_ %

d-TESA \_\_\_\_\_ %                      e-micro-TESE \_\_\_\_\_ %

**4. Do you think antibiotics are helpful in treating patients with surgical sperm retrievals? (SINGLE ANSWER)**

a- Yes                                      b- Occasionally yes                                      c- No

**5. Over the past year, what were the THREE most common antibiotics that you had prescribed in the IVF centre for patients performing sperm retrievals?**

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

**6. How is antimicrobial stewardship when performing sperm retrieval?**

Procedure	Regimen*	Antimicrobial	Route**	Dosage (mg)	Duration	Alternatives
<i>PESA</i>	N / E / P/C					
<i>MESA</i>	N / E / P/C					
<i>TESE</i>	N / E / P/C					
<i>Micro TESE</i>	N / E / P/C					
<i>TESA</i>	N / E / P/C					

**Notice: (\*) N= no treatment, P= prophylaxis, E= empirical treatment, C=Combination; (\*\*) O= oral, IM= intramuscular, IV= intravenous, SC= subcutaneous**

**7. Have you prescribed antibiotics to patients with SSR in cases where the prescription might not be necessary / could be optional? (SINGLE ANSWER)**

- a- Yes                                      b- Occasionally yes                                      c- No

**8. Please select reasons for prescribing antibiotics to patients with sperm retrievals. Please select all the answers that apply. If there are other reasons, please fill in the space provided. (MULTIPLE CHOICE)**

- Satisfy the patient or his/her carer      Better doctor-patient relationship  
 Help saving time                                      Influence by representatives from  
 Those who really want antibiotics      pharmaceutical companies  
 would obtain them anyway                      Diagnostic uncertainty  
 Fear of medicolegal issue if the      Second visit for the surgical site infection  
 patient's condition deteriorates      Others \_\_\_\_\_  
 Do not want to be perceived as      \_\_\_\_\_  
 doing nothing for the patient

**9. How often do your patients / their carers request antibiotics when consulting for SSR? (SINGLE ANSWER)**

- a- Always      b- Very often      c- Often      d- Sometimes      e- Never

**10. Please rate the impact of patients' expectation on your prescription of antibiotics for SSR? (SINGLE ANSWER)**

*Not impact at all*

*Very high impact*

- 1                                      2                                      3                                      4                                      5

**11. When you prescribe antibiotics, how often do you remind patients that improper use of antibiotics will increase antimicrobial resistance? (SINGLE ANSWER)**

- a- Always      b- Very often      c- Often      d- Sometimes      e- Never

**12. Demography of specialist(s) being in charge of sperm retrieval**

	Specialties/Medical qualification*	Age	Gender**	Year(s) of clinical practice
1				
2				
3				

<b>4</b>				
<b>5</b>				
<b>6</b>				

**Note: (\*) O&G = Obstetrics and Gynecology, A = Andrology, U = Urology, O = Others; (\*\*) M = Male, F = Female**

**Thank you for completing this survey!**

## **BỘ CÂU HỎI PHÒNG VẤN (in Vietnamese)**

**Tên nghiên cứu:** TÌNH HÌNH SỬ DỤNG KHÁNG SINH TRONG PHẪU THUẬT THU TINH TRÙNG TẠI CÁC TRUNG TÂM IVF Ở VIỆT NAM.

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- Nguyễn Đình Tảo, HASAR
- Lê Hoàng, Bệnh viện Tâm Anh Hà Nội
- David Handelsman, Trường đại học y Sydney

Cảm ơn bạn đã tham gia nghiên cứu của chúng tôi với tiêu đề "**TÌNH HÌNH SỬ DỤNG KHÁNG SINH TRONG PHẪU THUẬT THU TINH TRÙNG TẠI CÁC TRUNG TÂM IVF Ở VIỆT NAM**". Chúng tôi mong muốn thu thập thông tin về việc kê đơn thuốc kháng sinh tại trung tâm IVF của bạn. Bảng câu hỏi sẽ mất không quá 10 phút để hoàn thành. Hãy yên tâm rằng câu trả lời của bạn sẽ được bảo mật nghiêm ngặt và được báo cáo ẩn danh cùng với các câu trả lời từ những đơn vị khác.

Kết quả nghiên cứu sẽ được công bố trên các tạp chí khoa học và chúng tôi sẽ cung cấp thông tin này cho bạn. Sự lựa chọn tham gia nghiên cứu này là của bạn. Nếu đăng ký tham gia nghiên cứu, bạn vẫn có quyền rút lại bất kỳ lúc nào. Hãy tận dụng cơ hội này để cho chúng tôi biết thực hành lâm sàng của bạn đối với vấn đề này. Xin chân thành cảm ơn vì sự tham gia của bạn.

Người tham gia nghiên cứu:

ĐỒNG Ý                       KHÔNG ĐỒNG Ý (KẾT THÚC NGHIÊN CỨU)

Tên trung tâm: \_\_\_\_\_

**1. Loại hình trung tâm**

a-Tư nhân                      b-Công lập                      c-Khác. Ghi rõ:.....

**2A. Số ca phẫu thuật thu tinh trùng mỗi năm tại trung tâm của bạn:** \_\_\_\_\_

**2B. Những loại biến chứng thường gặp tại đơn vị của bạn khi thực hiện thủ thuật trích tinh trùng?**

a-Tụ máu bìu                      b-Nhiễm trùng vết thương                      c-Khác: \_\_\_\_\_

**3. Tỷ lệ phần trăm số ca phẫu thuật thu tinh trùng phân theo kỹ thuật (Chọn nhiều đáp án)**

a-PESA \_\_\_ %                      b-MESA \_\_\_ %                      c-TESE \_\_\_ %                      d-TESA \_\_\_ %  
e-micro-TESE \_\_\_ %

**4. Bạn có cho rằng kháng sinh hữu ích trong việc điều trị bệnh nhân phẫu thuật thu tinh trùng? (Chọn 1 đáp án)**

a-Có                      b-Có thể                      c-Không

**5. Trong một năm qua, 03 loại kháng sinh phổ biến nhất mà bạn đã kê đơn cho bệnh nhân thực hiện phẫu thuật thu tinh trùng tại trung tâm IVF của mình là gì?**

a- \_\_\_\_\_  
b- \_\_\_\_\_  
c- \_\_\_\_\_

**6. Chỉ định dùng kháng sinh như thế nào?**

Phẫu thuật	Phác đồ*	Loại kháng sinh	Đường dùng**	Liều (mg)	Thời gian	Ghi chú
PESA	N / E / P/C					
MESA	N / E / P/C					
TESE	N / E / P/C					

<i>Micro TESE</i>	N / E / P/C					
<i>TESA</i>	N / E / P/C					

**Ghi chú:** (\*) N= Không dùng kháng sinh, P= Kháng sinh dự phòng, E= Kháng sinh điều trị theo kinh nghiệm, C= kết hợp; (\*\*) O= Đường uống, IM= Tiêm bắp, SC= Tiêm dưới da

**7. Bạn đã từng kê đơn kháng sinh cho bệnh nhân làm phẫu thuật thu tinh trùng trong trường hợp điều trị có thể là không cần thiết chưa? (Chọn 1 đáp án)**

a-Có                      b-Có thể                      c-Không

**8. Vui lòng chọn lý do kê đơn thuốc kháng sinh. Vui lòng chọn tất cả các câu trả lời phù hợp. Nếu có lý do khác, vui lòng điền vào chỗ trống (nhiều lựa chọn)**

- |  |   |
|--|---|
| Làm hài lòng bệnh nhân/người chăm sóc                    | Cải thiện mối quan hệ bác sĩ – bệnh nhân        |
| Giúp tiết kiệm thời gian                                 | Ảnh hưởng của đại diện từ các công ty dược phẩm |
| Bệnh nhân muốn dùng kháng sinh sẽ lập tức được kê ngay   | Không chắc chắn về chẩn đoán                    |
| Lo sợ vấn đề pháp lý nếu tình trạng của bệnh nhân xấu đi | Tái khám phát hiện nhiễm trùng vết mổ           |
| Không muốn bị cho là không làm gì cho bệnh nhân          | Khác: .....                                     |

**9. Bệnh nhân/người chăm sóc có yêu cầu được sử dụng kháng sinh? (Chọn 1 đáp án)**

a-Luôn luôn    b-Rất thường xuyên    c-Thường nhắc    d-Thỉnh thoảng    e-Không nhắc

**10. Vui lòng đánh giá mức độ ảnh hưởng của bệnh nhân đối với việc kê đơn thuốc kháng sinh của bạn? (Chọn 1 đáp án)**

*Không ảnh hưởng*

*Rất ảnh hưởng*

1

2

3

4

5

**11. Khi kê đơn kháng sinh, bạn có thường nhắc nhở bệnh nhân việc sử dụng kháng sinh không đúng cách sẽ làm tăng tình trạng kháng thuốc không? (Chọn 1 đáp án)**

a-Luôn luôn b-Rất thường xuyên c-Thường nhắc d-Thỉnh thoảng e-Không nhắc

**12. Thông tin về phẫu thuật viên thực hiện thủ thuật trích tinh trùng tại đơn vị của bạn**

	<b>Chuyên khoa/Trình độ chuyên môn*</b>	<b>Tuổi</b>	<b>Giới tính**</b>	<b>Số năm kinh nghiệm</b>
C1				
C2				
C3				
C4				
C5				
C6				

**Ghi chú:** (\*) O&G = Sản phụ khoa, A = Nam khoa, U = Tiết niệu, O = Khác; (\*\*) M = Nam, F = Nữ

**Xin cảm ơn đã hoàn thành bảng khảo sát này!**