

# KNOWLEDGE AND ATTITUDES OF SURGEONS ON THE USE AND STEWARDSHIP OF PROPHYLACTIC ANTIBIOTICS \*

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## ABSTRACT

This study aimed to examine the reasons for using and not using surgical antibiotic prophylaxis (SAP), the reasons for inappropriate use, and the opinions and recommendations of the surgeons working in two public hospitals on the use of antibiotics. For this purpose, a questionnaire consisting of open and closed-ended questions developed using the literature was used. Between February 5 and September 6, 2019, when the research was carried out, 54 surgeons from a total of 58 surgeons working in these hospitals were reached and the questionnaire was applied one-to-one. Surgeons mostly rely on the recommendations of books or scientific articles (25.4%). They stated that avoidance of increasing the postoperative infection rate the most in their decision to apply SAP ( $8.3\pm 2$ ) and the fact that the conditions that fully comply with the information sources ( $5.9\pm 3.7$ ) were effective in their decision not to apply SAP. Most surgeons stated that they see the inappropriate use of SAP as a major problem and that inappropriate use is mostly due to unnecessary prophylaxis. 75.9% of surgeons think that an antibiotic management program is necessary. In a possible program, it is recommended to use the toolkit and antibiogram package as a strategy to monitor the use and provide feedback and to determine patient risk stratification as a tool. It is thought that the research findings will help the development of antibiotic management and education programs to improve antibiotic use. Also, the results obtained will be beneficial for the antibiotic control team or antibiotic management program planned to be established in hospitals. There is a need for training programs specifically targeting surgeons.

**Keywords:** Surgical antibiotic prophylaxis, antimicrobial stewardship, surgeons.

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## CERRAHLARIN PROFİLAKTİK ANTİBİYOTİK YÖNETİMİ VE KULLANIMI İLE İLGİLİ BİLGİ VE TUTUMLARI \*

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### ÖZ

Bu araştırmada, iki kamu hastanesinde görev yapan cerrahların cerrahi antibiyotik profilaksi (CAP) kullanma ve kullanmama nedenleri, uygunsuz kullanım nedenleri, antibiyotik kullanımı konusundaki görüş ve önerilerinin incelenmesi amaçlanmıştır. Bu amaçla literatürden yararlanılarak geliştirilen açık ve kapalı uçlu sorulardan oluşan bir soru formu kullanılmıştır. Araştırmanın yürütüldüğü 5 Şubat–6 Eylül 2019 tarihleri arasında bu hastanelerde görev yapan toplam 58 cerrahtan 54'üne ulaşılmış ve soru formu birebir uygulanmıştır. Cerrahlar en fazla kitap ya da bilimsel makalelerin önerilerini (%25,4) kaynak almaktadırlar. CAP uygulama kararı almalarında en fazla postoperatif enfeksiyon oranını artırmaktan kaçınma (8,3±2) ve CAP uygulamama kararı almalarında ise bilgi kaynaklarına tam uyan koşulların var olması (5,9±3,7) nedenlerinin etkili olduğunu belirtmişlerdir. Çoğu cerrah, uygun olmayan CAP kullanımını önemli bir sorun olarak gördüklerini ve uygunsuz kullanımın çoğunlukla gereksiz p rofilaksiden kaynaklandığını belirtmiştir. Cerrahların %75,9'u bir antibiyotik yönetim programının gerekli olduğunu düşünmektedir. Olası bir programda, strateji olarak kullanımın izlenmesi ve geri bildirim sağlanması ve araç olarak hasta risk sınıflandırmasının belirlenmesi için araç kiti ve antibiyogram paketinin kullanılması önerilmektedir. Araştırma bulgularının antibiyotik kullanımını geliştirmeye yönelik antibiyotik yönetimi ve eğitim programlarının geliştirilmesine yardımcı olacağı düşünülmektedir. Elde edilen sonuçların, hastanelerde kurulması planlanan antibiyotik kontrol ekibi ya da antibiyotik yönetim programı açısından faydalı olacağı düşünülmektedir. Özellikle cerrahları hedef alan eğitim programlarına ihtiyaç vardır.

**Anahtar Kelimeler:** Cerrahi antibiyotik profilaksisi, antimikrobiyal yönetimi, cerrahlar.

### MAKALE HAKKINDA

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## **I. INTRODUCTION**

There are many interrelated factors that influence irrational drug use at various levels of the health system. Especially physicians prescribing drugs are affected by many internal and external factors. These factors can be expressed as inadequate education, weak control system, insufficient information about drugs and their side effects, excessive patient burden, and pressure to prescribe by patients or their relatives (Management Sciences for Health, 2012). Physicians are the main actors who are most responsible for creating and disseminating awareness of rational drug use. However, lack of objective information and education about drugs and prescribing, unreliability of the information provided by the supplier, excessive patient load, prescribing pressure and weak control system can complicate the prescribing decisions of physicians (World Health Organization, 2001; Holloway and Green, 2003; Management Sciences for Health, 2012). Moreover, information about drugs is constantly changing, new drugs are entering the market and new indications are being developed (de Vries et al., 1994; Demirkiran and Şahin, 2012; Yılmaz et al., 2018).

Surgical antibiotic prophylaxis (SAP), which is used to prevent surgical site infection (SSI) and one of the areas of use of antibiotics, should be used in accordance with certain rules and guidelines. In the consumption of these antibiotics in the J01 subclass, Turkey has the highest antibiotic consumption after Greece (34.1 Defined Daily Dose [DDD]), with 31.9 DDD per 1000 capita. Accordingly, it is seen that the measures taken, and the improvements made should be increased (OECD, 2021). Many factors related to the patient, surgical procedure, operating room environment, hospital, surgeon, and other health personnel are important factors in the development of SSI. Although administration recommendations and principles have been determined worldwide for these factors, the problems have not been completely avoided. SAP compliance, which is defined as the right indication, the right drug, adequate dose, appropriate route, timing, and duration of administration, are the main goals of national and international health services. These practices, also called “Antibiotic Stewardship”, are expressed as a coordinated strategy to enhance the use of antibiotics to improve the health outcomes of patients, reduce antibiotic resistance and unnecessary costs, according to the Society for Healthcare Epidemiology of America (SHEA, 2020; Tiri et al., 2020). The Core Elements of Hospital Antibiotic Stewardship Programs (ASP), recommended by the Centers for Disease Control and Prevention (CDC) for all acute care hospitals, provides a framework for establishing and improving antibiotic management in hospitals. Since its adoption, it has been used as a framework by healthcare systems and has become part of The Joint Commission's accreditation standard (CDC, 2014; CDC, 2019).

Practices related to prophylactic antibiotic measures in surgery require the coordination of all perioperative health personnel (including surgical technicians, nurses and all physicians involved in the treatment of patients) (Crader and Varacallo, 2019). Although the principles of practice have been clearly defined and various guidelines have been published, it remains a problem among surgeons (Tourmousoglou et al., 2008). Difficulties faced by surgeons in updating their knowledge, dependence on habits rather than evidence-based practices, lack of institutional policies, and difficulties/failures in practice are some of the possible factors (Gul et al., 2005). Without the support and effort of physicians, it will not be possible to achieve the goals of improving the rational use of drugs (WHO, 2003). For these reasons, it is important to evaluate surgeons' adherence to guidelines and their knowledge and attitudes regarding prophylactic antibiotic use. Although there are clinical or hospital-based evidence-based SAP guidelines to prevent inappropriate SAP use, there are different evaluation criteria and practices due to the lack of a national guideline in Turkey. Besides the guideline, the important thing is the surgeon's decision to use in which cases, what kind of antibiotics, at what time, by which route, for how long and at the dose. Therefore, it is necessary to determine the reasons underlying the surgeons' decision to use or not use SAP.

In the literature on the subject, there are various studies (Abdel-Aziz et al., 2013; Ahmed et al., 2019; Badar et al., 2018; Baniyadi et al., 2016; Binown et al., 2021; Khan et al., 2021; Madubueze et al., 2015; Mmari et al., 2021; Sartelli et al., 2018; Pelullo et al., 2020) although these studies are very limited in Turkey (Karaali et al., 2020; Koçak et al., 2017). Existing studies mostly included evaluations of surgeons' level of adherence to guidelines and their views on antibiotic management. In

this study, it is aimed to fill the gap in the literature by revealing surgeons' reasons for administrating or not administrating SAP, as well as surgeons' opinions and suggestions about ASP.

It is thought that the results of the research will be useful in the preparation of a national guide to improve the optimum use of antibiotics in hospitals and in the development of antibiotic stewardship and education programs.

## II. METHODS

This cross-sectional study was carried out in Ankara Gazi Mustafa Kemal State Hospital (GMKSH) with 174 beds and Yozgat City Hospital (YCH) with 475 beds, which are affiliated with the Ministry of Health (MoH). In the study, all surgeons working in these hospitals between February 5 and September 6, 2019, were tried to be reached, by not choosing a sample. 33 surgeons out of 36 in YCH and 21 out of 25 surgeons in GMKSH were reached, and the participation rate of the surgeons in the research was 88.5%.

A questionnaire form was developed by using the literature to determine the opinions and suggestions of surgeons regarding the reasons for administrating and not administrating SAP, the unnecessary use of SAP and the development of an antibiotic stewardship program. In the first part of the questionnaire, there are questions about the surgeons' gender, age, working time in the profession, surgical specialty, whether they have a higher specialization, malpractice history, and information/decision sources about SAP selection. In the second part, there are questions to determine the reasons for surgeons to administrate and not administrate prophylaxis, the situations caused by inappropriate use (Hosoglu et al., 2003; Karahocagil et al., 2007; Tünger et al., 2000), recommendations for inappropriate use and the strategies and tools that should be included in the content of ASPs.

Face validity was used for the validity of the questionnaire. For this, the readability, comprehensibility, and ease of application of the questions were evaluated based on both the literature and the opinions of three experts (three surgeons working in the MoH Afyonkarahisar State Hospital, apart from the hospitals where the research was conducted).

SPSS 23.0 (Statistical Package for the Social Sciences) package program was used in the analysis of the data and descriptive statistics such as frequency, percentage, mean, and standard deviation were used.

The questionnaire was applied by the researchers by face-to-face interview method. The reliability of the questions on the reasons for administrating and not administrating the SAP, graded from 1 to 10, was evaluated with Cronbach's alpha ( $\alpha$ ) and it was determined that they were above acceptable values ( $\alpha=0.728$ ;  $\alpha=0.846$ , respectively).

The study was approved by Hacettepe University Non-Interventional Clinical Research Ethics Committee (Decision Date: February 5, 2019; Decision number: 2019/04-12). Institutional permissions were obtained from the hospitals where the research was conducted (Number GMKSH: 92143444-799 and number of YCH: 78535428-799).

## III. RESULTS

As seen in Table 1, 83.3% of the surgeons who answered the questionnaire were male. The mean age was  $39.7 \pm 9.8$  years, and the surgeons aged 35 years and younger in YCH (72.7%) and surgeons over 35 years of age (90.5%) in GMKSH were in the majority. In both hospitals, there are general (18.5%), orthopedics (16.7%), urology and ear, nose, and throat (ENT) (11.1%) surgeons at most. Considering the working time of surgeons in the profession, while the general average is 13.7 years, it is seen that this average is 7.4 years in YCH and 23.6 years in GMKSH. 51.9% of the surgeons stated that they were highly specialized and only two surgeons in GMKSH had a malpractice history. It has

been observed that while surgeons mostly consider books or scientific articles (25.4%) in their SAP selection, they consult infection and/or infectious diseases specialists the least (11.9%).

**Table 1. Descriptive Characteristics of Surgeons**

Variables		YCH		GMKSH		Total	
		n	%	n	%	n	%
Gender	Female	4	12.1	5	23.8	9	16.7
	Male	29	87.9	16	76.2	45	83.3
Age	≤35	24	72.7	2	9.5	26	48.1
	>35	9	27.3	19	90.5	28	51.9
		$\bar{x}$ (Ss) Min-Max	33.9±3.2 (29-45)	48.9±9.6 (33-66)		39.7±9.8 (29-66)	
Surgical specialty	Brain and Nerve Surgery	3	9.1	2	9.5	5	9.3
	Pediatric Surgery	1	3.0	-	-	1	1.9
	General Surgery	4	12.1	6	28.6	9	18.5
	Thoracic Surgery	2	6.1	-	-	2	3.7
	Eye	2	6.1	1	4.8	3	5.6
	Obstetrics	2	6.1	1	4.8	3	5.6
	Heart and Vascular	4	12.1	1	4.8	4	9.3
	ENT	5	15.2	1	4.8	6	11.1
	Orthopedics	4	12.1	5	23.8	8	16.7
	Plastic surgery	3	9.1	1	4.8	4	7.4
	Urology	3	9.1	3	14.3	4	11.1
Working years in the profession	<10	25	75.8	1	4.8	26	48.1
	≥10	8	24.2	20	95.2	28	51.9
		$\bar{x}$ (Ss) Min-Max	7.4±4.2 (1.5-21)	23.6±10.5 (8-42)		13.7±10.7 (1.5-42)	
Senior specialization	Yes	20	60.6	8	38.1	28	51.9
	No	13	39.4	13	61.9	26	49.1
Malpractice history	Yes	0	0.0	2	9.5	2	3.7
	No	33	100.0	19	90.5	52	96.3
Information source on SAP selection*	Books or articles	17	25.4	13	25.5	30	25.4
	Training	17	25.4	12	23.5	29	24.6
	Clinical protocols	13	19.4	11	21.6	24	20.3
	SAP guidelines of the hospital	12	17.9	9	17.6	21	17.8
	Infection specialists	8	11.9	6	11.8	14	11.9

\*Percentage in preferences is given.

According to Table 2, avoidance of increasing the postoperative infection rate (8.3±2) the most and being followed by the infection control committee the least (3.8±2.9) are effective in the decision of surgeons to administrate SAP. Apart from these, the surgeons participating in the study were asked to state their evaluations if there were other reasons that pushed them to administrate SAP other than the reasons not included in the question. In YCH, a general surgeon stated that they performed SAP because “there is a risk of organ perforation (when imaging or routine blood tests do not help)” and another general surgeon stated that they administrated SAP because it was a “minor/major case”. Again, in YCH, an eye surgeon and an orthopedist stated that they administrated SAP in every surgical case. It was found that the reasons for the surgeons not to administrate SAP were mostly due to the conditions in which full compliance with the information/decision sources (5.9±3.7) and being followed by the infection control committee at least (2.6±2.7) were effective.

**Table 2. Reasons for surgeons to administrate and not administrate SAP**

Reasons		YCH	GMKSH	Total
		$\bar{x}\pm Ss$	$\bar{x}\pm Ss$	$\bar{x}\pm Ss$
Administration	Being a habit/routine practice as a surgical team	8.1±2.7	7.6±3.2	7.9±2.8
	The thought that there may be problems in the treatment process	6.4±2.9	7.8±2.4	6.9±2.8
	Not wanting to take responsibility for the risk of infection	7.2±2.8	7.7±2.7	7.4±2.8
	Filling the gaps in sterility	4.4±3.4	5.6±3.2	4.9±3.3
	Having the conditions stated by the information/decision sources	7.1±2.7	7.7±2.9	7.3±2.8
	Avoiding increasing the post-operative infection rate	8.4±2.1	8.2±1.9	8.3±2.0
	Avoiding prolonged length of stay	6.8±3.3	7.7±2.8	7.2±3.1
	Being monitored by the infection control committee	3.3±2.9	4.5±2.9	3.8±2.9
Not administration	Thought it would be unnecessary	4.8±4.0	5.2±4.1	5.0±4.0
	Being meticulous during the operation	5.2±3.6	5.2±4.0	5.2±3.7
	The thought it would increase the treatment costs of patient	3.1±2.8	3.6±3.6	3.3±3.1
	The thought it would increase antibiotic resistance of patient	6.1±3.1	5.4±3.9	5.8±3.4
	The thought it would increase drug costs of hospital	3.3±2.9	3,5±3,4	3.4±3.1
	Being monitored by the infection control committee	2.2±2.2	3.3±3.2	2.6±2.7
	Having the conditions stated by the information/decision sources	5.8±3.4	6.1±4.0	5.9±3.7

Although most surgeons see the inappropriate use of SAP as a problem and state their reasons, some surgeons (17 out of 54 surgeons) consider it is not a major problem. According to Table 3, 38 of 54 surgeons stated that "unnecessary prophylaxis" was used among the reasons for inappropriate use of SAP, followed by "wrong choice of antibiotic" and "prophylaxis lasting longer than 24-48 hours". According to these answers, the first three most common reasons can also be expressed as "caused by the inappropriate use of antibiotics". On the other hand, "inappropriate dose intervals" and "choosing an expensive antibiotic while there are cheaper antibiotics with the same effect" are cited as less effective reasons for inappropriate antibiotic use.

**Table 3. Reasons for Inappropriate Use of SAP**

Reasons	YCH		GMKSH		Total	
	n	%*	n	%*	n	%*
Unnecessary prophylaxis	25	19.7	13	12.4	38	16.4
Wrong choice of antibiotic	18	14.2	13	12.4	31	13.4
Prophylaxis lasting longer than 24-48 hours	13	10.2	14	13.3	27	11.6
Insufficient or excessive dose of antibiotics	14	11	10	9.5	24	10.3
Antibiotic use that is not compatible with culture results	13	10.2	11	10.4	24	10.3
Using antibiotics without indication	14	11	7	6.7	21	9.1
Use of antibiotics without the necessary diagnostic evaluation	10	7.9	10	9.5	20	8.6
Concurrent use of more than two antibiotics without an indication	7	5.5	10	9.5	17	7.3
Choosing an expensive and new antibiotic instead of a known effective antibiotic	5	3.9	7	6.7	12	5.2
Inappropriate dose intervals	4	3.2	5	4.8	9	3.9
Choosing an expensive antibiotic when there are cheaper antibiotics with the same efficacy	4	3.2	5	4.8	9	3.9

\*Percentage in preferences is given.

The open-ended recommendations answered by surgeons for inappropriate use of SAP are grouped under four main headings (Table 4). Accordingly, surgeons basically made recommendations on frequent training and supervision, optimization of surgical conditions, a full evaluation of patients and determination of duties and responsibilities in this process, and finally, using technology to support their clinical decision-making in a more systematic way.

**Table 4. Recommendations for Surgeons for Inappropriate Use of SAP**

<p><b>Education-Audit</b></p> <ul style="list-style-type: none"> <li>• Prophylaxis training for physicians should be more frequent</li> <li>• Training on prophylaxis in clean-clean contaminated wounds</li> <li>• Information should be made</li> <li>• Dissemination of adequate information and routine practices in surgical specialization education from the medical faculty</li> <li>• Keeping the guideline up to date</li> <li>• There should be strict control</li> <li>• Awareness should be raised about the harm caused by unnecessary antibiotic use to the human body</li> <li>• Ensuring full compliance with the SAP guideline</li> </ul>
<p><b>Improvement of surgical conditions</b></p> <ul style="list-style-type: none"> <li>• Optimizing surgical conditions</li> <li>• Wound hygiene should be provided before the operation</li> <li>• Ventilation, sterilization, trained personnel, hepafilter required</li> <li>• Sterility conditions need to be optimized/standardized</li> <li>• Having stricter rules according to the risk assessments of the patients before the operation and not only the physician is responsible for the administration</li> </ul>
<p><b>Patient assessment and responsibility</b></p> <ul style="list-style-type: none"> <li>• The patient should be well evaluated</li> <li>• The reasons for using SAP should be explained</li> <li>• Indication necessity should be well researched</li> <li>• If necessary, infectious disease specialist should decide whether to start</li> <li>• Every patient should be evaluated by infection control committee prior to SAP</li> <li>• Evaluation of prophylaxis by an infection specialist before surgery and taking responsibility for the infection of the patient by the infection specialist</li> <li>• It should be used in necessary patients</li> <li>• It is necessary and the people responsible for this work to do their work on this issue</li> <li>• Conducting prophylaxis by a team</li> <li>• Reducing the use of prolonged SAP in the postoperative period</li> </ul>
<p><b>Integration with technology</b></p> <ul style="list-style-type: none"> <li>• Resistance development should be prevented by creating algorithms</li> <li>• In cases where the doctor makes excessive and unnecessary SAP, the hospital operating system should remind the relevant people such as infection nurses to administrate correctly.</li> <li>• Developing a well-attended and approved algorithm for SAP</li> </ul>

To prevent or minimize the use of inappropriate SAPs, surgeons' opinions were taken about whether it is necessary to establish the ASP, which has been started to be established in hospitals in Turkey in recent years. Accordingly, most surgeons (75.9%) think it is necessary, while almost ¼ consider it not necessary. Surgeons, who stated that it was necessary to create an ASP, made recommendations as strategies to prevent this problem in a possible program, such as strict control of use, providing feedback, continuing training periodically, and making restrictions (Table 5). In addition, they recommended controlling the uses, administrating antibiotics according to surgical risks, reporting the culture results, updating the guidelines at short intervals according to the clinics, sharing the statistics on the use of SAP, and rearranging the operating room conditions accordingly in case of nosocomial infections. To realize these strategies, surgeons consider it necessary to use tools such as patient risk classification, tool kit to determine drug resistance index, antibiogram package and 3-day antibiotic control package. Apart from these, they stated that prophylaxis recommendation should be made through a system integrated with the diagnosis while choosing antibiotics and an information system should be established to detect the hospital infection rate.

**Table 5. Strategies and Tools to be Included in the Content of the ASP**

Strategy and Tools		n
Strategies	Supervision, strict supervision, control	21
	Feedback	20
	Education	19
	Restriction	9
	It should be used according to surgical risks (wound risk etc.)	1
	Reporting of culture results	1
	Updating the current infection guidelines at short intervals	1
	Statistics sharing	1
	If there is a hospital infection, the operation order should be reconstructed	1
Tools	Patient risk classification	14
	Drug resistance index tool kit	13
	3-day antibiotic control package	13
	Microbiology antibiogram package	11
	Appearance of prophylaxis recommendation integrated with diagnosis through the system	1
	Determination of hospital infection rate by establishing a data system whether infection develops or not with close follow-up.	1
	There should be a template and prophylaxis should be administrated accordingly	1

#### IV. DISCUSSION

Surgeons stated that they mostly benefited from books or scientific articles when deciding on SAP selection. The hospital's utilization rate from the SAP guideline corresponds to a rate of 17.8% among all preferences. In a multicenter study in Turkey, surgeons mostly rely on department protocol, information obtained from initial training, and textbook recommendations in their antibiotic selection, while relatively few uses national or international guidelines (Hosoglu et al., 2003). Again, in a similar study in Turkey, 46.2% of surgeons stated that they did not know whether there was an SAP guideline, 34% stated that there was a guideline in the institution, and 5.1% stated that there was a guide but did not examine it (Koçak et al., 2017). In a study conducted by MacCormick and Akoh (2018), it was concluded that 46% were aware of existing guidelines and 95% stated that a new guideline is needed. Interviews with surgeons at a teaching hospital in India indicated that surgeons are aware of national and international guidelines, but there are many gaps in the generally available evidence (Khan et al., 2021).

In this study, surgeons prefer to administrate SAP for reasons such as avoiding increasing the rate of postoperative infection. They stated that they did not administrate SAP because of the conditions in which there is full compliance with the information/decision sources. Systemic factors such as lack of knowledge about reasons for the practice, corporate culture and the role of hospital pharmacies can be associated with inappropriate practices. Since there is primarily physician autonomy in clinical practice, the characteristics of surgeons are attributed as the main determinants. For this reason, the experience and training of surgeons have a direct effect (Bohnen, 2003). In a study evaluating the knowledge and compliance of surgeons regarding SAP guidelines in India, the infrastructure and the skill and experience of the surgeon are more important than antibiotics, and the over-cautious attitude of the surgeons, the lack of necessary antibiotics in the hospital and the effects of patient characteristics and type of surgery on prescribing were stated as the reasons affecting compliance with the guideline. In addition, it was stated that the protocols could not be adhered to because the recommendations in the protocols are valid practices in developed countries and the conditions are different in India. In addition, due to the low socio-economic background of most of the patients, the poor hygienic environment of patients who do not shower before surgery and the high risk of infection compel surgeons to prescribe high-quality antibiotic agents to prevent infection (Khan et al., 2021). Fear of failure of surgery and inadequate conditions in hospitals cause more and longer SAP use (Khan et al., 2021; Ulu-Kilic et al., 2015).



According to the surgeons participating in this study, inappropriate use of SAP is mostly due to unnecessary prophylaxis, wrong antibiotic selection and prolonged prophylaxis. In another study, surgeons' concerns about developing postoperative infections, the absence of a clinical pharmacist, untrained assistants, and the absence of drug protocols and treatment guidelines are among the reasons for inappropriate SAP administration (Khan et al., 2021). The lack of information about hospital infections and causative microorganisms in the institution, the administration of prophylactic antibiotics at the planned time and dose by non-physician health personnel, and the inadequacy of the guideline prevent surgeons from complying with the guidelines (Koçak et al., 2017). Lack of consensus among surgeons on recommendations in the guideline, lack of awareness about guidelines (Khan et al., 2020b), the impact of medical school education, personal preferences, the influence of colleagues, and lack of hospital antibiotic policy (Ng and Chong, 2012) seen as the reasons for their failure.

Surgeons, who think that inappropriate use of SAP is an important problem, stated that these problems can be solved through education and supervision, improvement of surgical conditions, holistic evaluation of patients, clear determination of duties and responsibilities, and use of technology to make clinical decision-making more systematic. In a similar study, it is recommended to conduct training programs such as practical seminars and workshops to improve compliance with the guideline. Periodic supervision of surgical prophylaxis by the infection control team is among the corrective measures that can be used (Ng and Chong, 2012). Interventions that include training, supervision, and feedback with a multidisciplinary team, as recommended by WHO, provide improvement. Practices based solely on passive educational activities such as courses and informative brochures are not recommended as they are not effective on their own (Barlam et al., 2016; Knox and Edye, 2016). In case of prolonged SAP, infection control nurses may be authorized to discontinue antibiotic use. Restriction policies such as automatic alerts to prevent redosing can also be effective for controlling overuse (Ulu-Kilic et al., 2015).

Most surgeons consider it necessary to establish ASP practice in their hospitals to improve antibiotic use. For this purpose, prevention strategies such as monitoring the use, providing feedback, continuing training periodically and making restrictions have been suggested within the scope of the program. To fulfill these, it is considered necessary to use tools such as a drug resistance index tool kit, patient risk classification, antibiogram package and 3-day antibiotic control package. In Şişli Etfal Training and Research Hospital, the antibiotic guideline and practices revised according to the CDC's checklist are one of the first ASP practices in Turkey. There was a decrease in the amount of antibiotic use between the pre-and post-administration periods (Eksi Alp et al., 2021). Considering that only 4% of low- and middle-income countries have ASP initiatives and only 15% have national policies, there is still a long way to go. In a university hospital in Pakistan, ASP was found to be effective when it performed key interventions (training of pharmacists, forward-feedback supervision and pre-authorization for restricted drugs, update physicians' SAP practice knowledge). It was determined that compliance with the guideline was poor in terms of appropriate antibiotic selection and treatment duration in the period before ASP. After ASP, the target of appropriate antibiotic selection and administration for less than 5 days is made progress significantly. Approximately 50% reduction has been achieved in the prophylactic and empirical use of antibiotics. This remarkable effect of the ASP administration may be related to the participation of the pharmacist who has training in infectious diseases to the team. Prospective monitoring with feedback reduced delays in antibiotic prescribing, drug dispensing and administration (Hussain et al., 2020). It is necessary to guide the use of ASPs and thus control the spread of antibiotic resistance. ASPs administrated in hospitals appear to have a positive effect (Thabit et al., 2021).

## **V. CONCLUSIONS**

In this study, it was tried to determine the attitudes, opinions, and recommendations of surgeons regarding the SAP administration. The findings can be used to determine the issues that need to be considered during the preparation of the guideline, especially for hospitals that do not have SAP guidelines. For hospitals that have a guideline, the activities to be done and the measures to be taken to

increase compliance with the guideline can be determined. Because although a guideline has been used for a long time in GMKSH, the hospital's SAP guide ranks fourth among the resources that surgeons refer to when deciding on SAP selection. Here, the quality and reliability of the guideline are among the issues that need to be discussed and examined.

As seen in this study, surgeons often made recommendations such as training on the guideline and prophylaxis, keeping the guide up-to-date, and providing information. In addition, it is thought that the fact that they make suggestions on improving surgical conditions and ensuring wound hygiene explains why surgeons prefer to administrate SAP to avoid increasing the rate of postoperative infection. This leads to positive defensive medicine practices. Surgeons who see it as a routine practice as a surgical team, on the other hand, continue to practice with their colleagues in the same specialty with more experience than themselves and prefer to administrate SAP in every procedure, which again shows that the guideline has been ignored.

It is seen that the knowledge, skills, and experience of surgeons are necessary for the successful implementation of guidelines and protocols. To be effective, continuous feedback on compliance and outcomes is required based on reliable clinical data. However, no protocol will ever replace a physician, and sound clinical judgment will always be needed based on the patient's individual circumstances. It is important to update, develop and improve existing knowledge and skills, as the profession of medicine is a profession where continuous medical education and professional development are required. Although surgeons with primary influence are included in the study here, specialists such as operating room and infection nurses, anesthesiologists, clinical pharmacists, and clinical microbiology specialists are actors that directly or indirectly affect the results of SAP administrations. In the process of creating the ASP, improvement plans should be prepared specifically for the department and even for surgical procedures.

**Ethical Approval:** The study was approved by Hacettepe University Non-Interventional Clinical Research Ethics Committee (Decision Date: February 5, 2019; Decision number: 2019/04-12).

## REFERENCES

- Abdel-Aziz, A., El-Menyar, A., Al-Thani, H., Zarour, A., Parchani, A., Asim, M., El-Enany, R., Al-Tamimi, H., & Latifi, R. (2013). Adherence of surgeons to antimicrobial prophylaxis guidelines in a tertiary general hospital in a rapidly developing country. *Advances in Pharmacological Sciences*, 2013, 1-6.
- Ahmed, A. M., Nasr, S., Ahmed, A. M., & Elkhidir, O. (2019). Knowledge, attitude and practice of surgical staff towards preoperative surgical antibiotic prophylaxis at an academic tertiary hospital in Sudan. *Patient Safety in Surgery*, 13(1), 1-6.
- Badar, V., Parulekar, V. V., & Garate, P. (2018). Study of knowledge, attitude and practice amongst medical professionals about antimicrobial stewardship in tertiary care teaching hospital in India: a questionnaire-based study. *International Journal of Basic & Clinical Pharmacology*, 7(3), 511.
- Baniasadi, S., Alaeen, Z., & Shadmehr, M. B. (2016). Surgical antibiotic prophylaxis: a descriptive study among thoracic surgeons. *Tanaffos*, 15(3), 154.
- Barlam, T. F., Cosgrove, S. E., Abbo, L. M., MacDougall, C., Schuetz, A. N., Septimus, E. J., et al. (2016). Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America. *Clinical infectious diseases: an official publication of the Infectious Diseases Society of America*, 62(10), e51–e77.

- Binown, K. A., Alhabradi, F. A., Aljahani, A. M., & Shadid, A. M. (2021). Saudi orthopedic surgeons' knowledge, attitude, and practice regarding surgical antibiotic prophylaxis. *Journal of Musculoskeletal Surgery and Research*, 1-11.
- Bohnen, J. M. (2003). Why do surgeons not comply with "best practice"? *Canadian Journal of Surgery*, 46(4), 251-2.
- Centers for Disease Control and Prevention. (2014). *Core Elements of Hospital Antibiotic Stewardship Programs*. Atlanta, GA: US Department of Health and Human Services, CDC.
- Centers for Disease Control and Prevention. (2019). *Antibiotic Use in Hospitals, 2017, Antibiotic Use by Healthcare Setting*. Accessed 09 April 2020, <https://www.cdc.gov/antibiotic-use/stewardship-report/hospital.html>.
- Crader, M. F., & Varacallo, M. (2019). *Preoperative Antibiotic Prophylaxis*. Treasure Island (FL): Stat Pearls Publishing.
- de Vries, T. P. G. M., Henning, R. H., Hogerzeil, H. V., & Fresle, D. A. (1994). *Guide to Good Prescribing*. WHO/Action Programme on Essential Drugs, Geneva.
- Demirkıran, M., & Şahin, B. (2012). Hekimlerin reçete yazma davranışlarının incelenmesi: viral tonsillofarengit hastalığına ilişkin yazılı hasta olgusu örneği. *Sağlıkta Performans ve Kalite Dergisi*, 4(2), 19-38.
- Eksi Alp, E., Oncul, A., Dalgic, N., Akgun, C., Aktas, E., & Bayraktar, B. (2021). Antibiotic stewardship program experience in a training and research hospital. *The Medical Bulletin of Sisli Etfal Hospital*, 55(2), 253.
- Gul, Y. A., Hong, L. C., & Prasanna, S. (2005). Appropriate antibiotic administration in elective surgical procedures: still missing the message. *Asian Journal of Surgery*, 28(2), 104-108.
- Holloway, K., & Green, T. (2003). *Drug and therapeutics committees: a practical guide*. (No. WHO/EDM/PAR/2004.1). World Health Organization Department of Essential Drugs and Medicines Policy Geneva, Switzerland.
- Hosoglu, S., Sunbul, M., Erol, S., Altindis, M., Caylan, R., Demirdag, K., et al. (2003). A national survey of surgical antibiotic prophylaxis in Turkey. *Infection Control & Hospital Epidemiology*, 24(10), 758-761.
- Hussain, K., Khan, M. F., Ambreen, G., Raza, S. S., Irfan, S., Habib, K., & Zafar, H. (2020). An antibiotic stewardship program in a surgical ICU of a resource-limited country: financial impact with improved clinical outcomes. *Journal of Pharmaceutical Policy and Practice*, 13, 1-10.
- Karaali, C., Emiroglu, M., Esin, H., Sert, I., Aydın, C., Atalay, S., et al. (2020). Assessment of prophylactic antibiotic usage habits of the general surgeons in Turkey. *The Journal of Infection in Developing Countries*, 14(07), 758-764.
- Karahocagil, M. K., Er, A., Kırıkçı, A. D., Sünnetçioğlu, M., Yapıcı, K., Bilici, A., et al. (2007). Yüzüncü Yıl Üniversitesi Tıp Fakültesi Araştırma Hastanesinde yatan hastalarda antibiyotik kullanımının incelenmesi. *Van Tıp Dergisi*, 14(2), 46-51.
- Khan, Z., Ahmed, N., Rehman, A. ur., Khan, F. U., Saqlain, M., Martins, M. A. P., & Rahman, H. (2020a). Audit of pre-operative antibiotic prophylaxis usage in elective surgical procedures in two teaching hospitals, Islamabad, Pakistan: An observational cross-sectional study. *PLoS ONE*, 15(4), e0231188.

- Khan, Z., Ahmed, N., Zafar, S., Khan, F. U., Saqlain, M., Kamran, S., & Rahman, H. (2020b). Audit of antibiotic prophylaxis and adherence of surgeons to standard guidelines in common abdominal surgical procedures. *Eastern Mediterranean Health Journal*, 26(9), 1052-1061.
- Khan, F., Chaudhary, B., Sultan, A., Ahmad, M., Alvi, Y., Shah, M. S., & Khan, H. M. (2021). Qualitative thematic analysis of knowledge and practices of surgical antimicrobial prophylaxis at a tertiary care teaching hospital. *Surgical Infections*, 22(4), 434-441.
- Knox, M. C., & Edey, M. (2016). Educational antimicrobial stewardship intervention ineffective in changing surgical prophylactic antibiotic prescribing. *Surgical Infections*, 17(2), 224-228.
- Koçak, F., Balkan, İ. İ., Çelik, A. D., Durdu, B., Demirel, A., Gencer, S. et al. (2017). Perioperatif antimikrobiyal profilaksi uygulamalarında rehberlere uyum: Çok merkezli bir çalışma. *Anadolu Kliniği*, 22(1), 8-15.
- MacCormick, A. P., & Akoh, J. A. (2018). Survey of surgeons regarding prophylactic antibiotic use in inguinal hernia repair. *Scandinavian Journal of Surgery*, 107(3), 208-211.
- Madubueze, C. C., Umaru, H., & Alada, A. (2015). Attitudes of Nigerian orthopaedic surgeons to the use of prophylactic antibiotics. *International Orthopaedics*, 39(11), 2161-2165.
- Management Sciences for Health. (2012). *Managing for Rational Medicine Use. MDS-3: Managing Access to Medicines and Health Technologies*. Arlington, VA: Management Sciences for Health.
- Mmari, E. E., Pallangyo, E. S., Ali, A., Kaale, D. A., Mawalla, I. H., & Abeid, M. S. (2021). Perceptions of surgeons on surgical antibiotic prophylaxis use at an urban tertiary hospital in Tanzania. *PloS one*, 16(8), e0256134.
- Ng, R. S., & Chong, C. P. (2012). Surgeons' adherence to guidelines for surgical antimicrobial prophylaxis—a review. *The Australasian Medical Journal*, 5(10), 534-540.
- Organization for Economic Co-operation and Development Health Statistics (OECD). (2021). *Pharmaceutical Market: Pharmaceutical consumption*. OECD Health Statistics (database) Accessed 11 September 2021, [https://stats.oecd.org/Index.aspx?DataSetCode=HEALTH\\_PHMC](https://stats.oecd.org/Index.aspx?DataSetCode=HEALTH_PHMC)
- Pelullo, C. P., Pepe, A., Napolitano, F., Coppola, N., & Di Giuseppe, G. (2020). Perioperative antibiotic prophylaxis: Knowledge and attitudes among resident physicians in Italy. *Antibiotics*, 9(6), 357.
- Sartelli, M., Kluger, Y., Ansaloni, L., Coccolini, F., Baiocchi, G. L., Hardcastle, T. C., et al. (2018). Knowledge, awareness, and attitude towards infection prevention and management among surgeons: identifying the surgeon champion. *World Journal of Emergency Surgery*, 13(1), 1-6.
- Society for Healthcare Epidemiology of America. (2020). *Antimicrobial Stewardship*. Accessed 02 Feb 2020, <https://www.shea-online.org/index.php/practice-resources/priority-topics/antimicrobial-stewardship>.
- Thabit, A. K., Shea, K. M., Guzman, O. E., & Garey, K. W. (2021). Antibiotic utilization within 18 community hospitals in the United States: A 5-year analysis. *Pharmacoepidemiology and Drug Safety*, 30(4), 403-408.

- Tiri, B., Bruzzone, P., Priante, G., Sensi, E., Costantini, M., Vernelli, C. et al. (2020). Impact of antimicrobial stewardship interventions on appropriateness of surgical antibiotic prophylaxis: How to improve. *Antibiotics*, 9(4), 168.
- Tourmousoglou, C. E., Yiannakopoulou, E. C., Kalapothaki, V., Bramis, J., & Papadopoulos, J. S. (2008). Adherence to guidelines for antibiotic prophylaxis in general surgery: a critical appraisal. *Journal of Antimicrobial Chemotherapy*, 61(1), 214-218.
- Tünger, Ö., Dinç, G., Özbakkaloğlu, B., Atman, Ü.C., & Algün, Ü. (2000). Evaluation of rational antibiotic use. *International Journal of Antimicrobial Agents*, 15, 131-135.
- Ulu-Kilic, A., Alp, E., Cevahir, F., Tucer, B., Demiraslan, H., Selçuklu, A., & Doğanay, M. (2015). Economic evaluation of appropriate duration of antibiotic prophylaxis for prevention of neurosurgical infections in a middle-income country. *American Journal of Infection Control*, 43(1), 44-47.
- World Health Organization. (2001). *Guidelines for developing national drug policies, 2nd edition*. Geneva: World Health Organization. Accessed 24 May 2019, <https://apps.who.int/iris/bitstream/handle/10665/42423/924154547X.pdf;jsessionid=27D2EDF8ACC1A8F7DD75EDDD55607BB1?sequence=1>
- World Health Organization. (2003). *Introduction to drug utilization research*. WHO Library Cataloguing-in-Publication Data, Oslo, Norway.
- Yılmaz, M., Yılmaz, A., Özyörk, M., Turunç, F., Gürleyik-Erkman, N., Kınalıkaya, A., & Arslan, E. (2018). Akılcı ilaç kullanımı: Düzce’de aile hekimlerinin bilgi ve davranışları. *Türkiye Aile Hekimliği Dergisi*, 22(1), 20-27.

