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Satisfaction Status of Pharmacists Towards Pharmacy Information Systems: A Qualitative Study

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ABSTRACT

The aim of the study is to qualitatively assess the satisfaction of fifteen pharmacists in Türkiye regarding the use of Pharmacy Information Systems and gain insights into their opinions about these systems. The present study was conducted in Zeytinburnu, Istanbul. Pharmacists or pharmacy owners voluntarily participated, answering pre-set questions about their satisfaction and challenges with PIS. Our main findings revealed that Pharmacists' satisfaction is related to the system's speed, ease of use, practicality, and functionality. However, a significant portion of participants were unable to pinpoint any satisfactory aspects, suggesting that there is a need for improvements in user experience. Most notably, issues concerning the Social Security Institution (SSI) system stood out as a major concern, with many participants expressing dissatisfaction. System update processes and slow system speed were other significant issues. Our study revealed that there is a need to organize training and support programs to improve user experience and system speed, solve problems related to Social Security Institution integration, make electronic information systems more functional, make stock control and drug tracking systems more effective, prevent misleading information and enable pharmacists to use the system more efficiently.

Keywords: pharmacies, digitalization, pharmacy information systems, electronic information systems, pharmacist satisfaction.

Eczacıların Eczane Bilgi Sistemleri Hakkındaki Memnuniyet Durumu: Nitel Bir Çalışma

ÖZ

Çalışmanın amacı, Türkiye'de on beş eczacının Eczane Bilgi Sistemleri kullanımı konusundaki memnuniyetini niteliksel olarak değerlendirerek eczane bilgi sistemlerine yönelik görüşlerine ilişkin fikir sahibi olmaktır. Çalışma İstanbul'un Zeytinburnu ilçesinde gerçekleştirilmiştir. Eczacılar veya eczane sahipleri gönüllü olarak katılmış ve EBS ile ilgili memnuniyet ve zorluklarla ilgili önceden belirlenmiş soruları yanıtlamışlardır. Eczacıların memnuniyeti sistemin hızı, kullanım kolaylığı, pratikliği ve işlevselliği ile ilgilidir.Ancak, katılımcıların önemli bir kısmı memnun oldukları herhangi bir yön belirleyemedi, bu da kullanıcı deneyiminde iyileştirmelere ihtiyaç olduğunu vurguladı. En dikkat çeken husus, Sosyal Güvenlik Kurumu (SGK) sistemi ile ilgili sorunlardı. Katılımcıların büyük bir kısmı bu konuda memnuniyetsizliklerini dile getirdi. Sistem güncelleme süreçleri ve yavaş sistem hızı diğer önemli sorunlar arasında yer almaktadır. Çalışma, kullanıcı

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deneyimini ve sistem hızını artıran iyileştirmelere, Sosyal Güvenlik Kurumu entegrasyonuyla ilgili sorunların çözülmesine, elektronik bilgi sistemlerini daha işlevsel hale getirmeye, stok kontrolü ve ilaç takip sistemlerini daha etkili hale getirmeye, sistemde yanlış veya yanıltıcı bilgilerin önlenmesine ve eczacıların sistemi daha verimli bir şekilde kullanabilmelerini sağlamak için eğitim ve destek programlarının düzenlenmesine ihtiyaç olduğunu ortaya koymuştur.

Anahtar Kelimeler: eczaneler, dijitalleşme, eczane bilgi sistemleri, elektronik bilgi sistemleri, eczacı memnuniyeti.

1 Introduction

The origins of pharmacy and pharmacies can be traced back to ancient Egypt according to known history. In the 1550s BC, there were "treatment rooms" where remedies for diseases were sought through the use of medicines, ointments, and other treatment methods derived from plants. It is also known that the Sumerians had similar health centers resembling pharmacies around 2100 BC [1]. During the Middle Ages, healing services were generally carried out using medicines prepared from herbs by priests and monks. Pharmacies were associated with health establishments and monasteries, which served as hospitals of that era and operated together [2].

The modern concept of pharmacy was established in the 19th century with the advancement of chemical science and the production of pharmaceutical drugs. The first professionally oriented pharmacy school, the Philadelphia College of Pharmacy, was founded in 1821 in Philadelphia, Pennsylvania [3]. In the following years, the Industrial Revolution and the development of mass-production technology also had an impact on drug production. Pharmacists started buying and selling mass-produced drugs instead of manually producing them [4]. As a result, the 20th century became a period of great advancements in pharmacy. Understanding the chemical structure of drugs and synthesizing new drugs allowed pharmacists to play a more active role in ensuring that patients use medications correctly, increasing their effectiveness and safety, and managing side effects [5, 6]. In the 21st century, the practice of pharmacy underwent a transformation to assume a role in general healthcare services and preventive care. Genomics and personalized medicine have had a significant impact on individualizing and optimizing drug treatment. This period is also marked by the rise of digital technologies such as e-health and telepharmacy [7].

To examine the history of pharmacy in Turkey, it is appropriate to start with the Ottoman Empire and mention the opening of the Pharmacy Class by Austrian Dr. Charles Ambroise Bernard in 1839, marking the beginning of pharmacy education [8]. The Pharmacy Class initially provided a 2-year education, which was later extended to 3 years. In 1867, a Pharmacy Class was established at the Civil Medical School (Mekteb-i Tıbbiye-i Mülkiye-i Şâhâne) [9]. In 1909, the Military and Civil Medical Schools were merged, but pharmacy education continued [10]. With the establishment of pharmacy schools, two types of pharmacists emerged: apprentices and degree holders. First-class pharmacists were individuals who completed their education, obtained a diploma, and had the right to open a pharmacy. Second-class pharmacists were those who worked as apprentices and journeymen and obtained a work certificate through an examination [11]. Pharmacy education has been under the influence of France for a long time due to the fact that Turkish physicians received education in France since the Ottoman era [12]. During the Republic period, the importance of pharmacy schools increased, and regulations were made. In 1960, the Faculty of Pharmacy was established at Ankara University [13].

Like many countries around the world, Turkey also carries out numerous digital transformation activities in the healthcare sector, which impact pharmacy services. Digital transformation now offers significant potential in terms of information management and data analytics in the field of pharmacy. Electronic

prescription systems enable the digital recording of patient information and the automation of dispensing processes [14]. This enhances patient safety by reducing risks such as incorrect dosages and drug interactions [15]. The Pharmacy Information Systems digital platform, initiated with the Health Transformation Project and implemented by the Ministry of Health in 2012, aims to make medication distribution and consumption more transparent, traceable, and efficient. Examples of such systems facilitate processes such as prescription management and medication tracking while also making positive contributions to public health [14]. Pharmacy Information Systems in Turkey is an electronic monitoring system that allows the tracking of both prescription and over-the-counter drug sales and distribution. It enables pharmacists and even other healthcare providers to access information about patients' medication usage quickly and securely [16]. Additionally, it plays a regulatory role in ensuring that pharmacies and pharmaceutical companies in Turkey operate in compliance with regulations [17].

Pharmacy practice and drug distribution in Türkiye have become highly digitized in the present day. The adoption of Pharmacy Information Systems is part of Turkey's investments in telepharmacy and other e-health applications, reflecting the country's efforts to modernize its healthcare services [18]. Moreover, it is crucial to establish the necessary technological infrastructure and ensure user familiarity with these systems for their effective utilization [19]. As a result, pharmacy education and continuous professional development programs in Türkiye particularly focus on topics related to multidisciplinary collaboration in healthcare, such as other areas involved in digitalization, healthcare management, and health policy [20-22].

While electronic information systems are widespread in pharmacies, the emerging need is to identify and address pharmacists' satisfaction and problems with these systems. This is of great importance in improving the quality and efficiency of healthcare services [23]. It will not only improve the working conditions of pharmacists but also have a positive impact on patient safety and health outcomes [24]. With electronic information systems, pharmacists can electronically process prescriptions, control drug interactions, automate inventory management, and other crucial pharmacy processes. These systems will enable pharmacists to access patient information more quickly and easily, reduce medication errors, and enhance medication safety. As a result, it is expected that there will be improved workflow and time savings for pharmacists [25, 26].

Based on this information, the aim of the study is to perform a qualitative evaluation of a specific group of pharmacists' use of Pharmacy Information Systems. The study seeks to understand these pharmacists' general opinions about the information systems they use, the challenges they encounter while using these systems, and the impact of this situation on their professional practices. Identifying potential barriers to the use of Pharmacy Information Systems and providing recommendations for pharmacists to benefit more effectively from these systems are aimed at generating policy and implementation suggestions based on the findings of this research.

2 Methodology

The research was conducted at 15 pharmacies in the Zeytinburnu district of Istanbul, Türkiye. The data collection period for the research was from May 1st to May 31st, 2023. During this period, there were 106 pharmacies in the area, but it is stated in the literature that there is no need for a specific sample calculation for qualitative research [27]. Therefore, a purposive sampling method was used to select the 15 pharmacies included in the research. Pharmacies were chosen based on a variety of criteria, including their location within the district, the population they serve, and the number of prescriptions they fill. This method is commonly used in qualitative research to ensure that the selected sample is most appropriate to answer the research question [28]. Qualitative research, unlike quantitative research, does not rely on reaching a specific sample size. Rather, it uses a concept known as "saturation." This refers

to the stage in data collection when additional data does not provide new insights or information. The tricky part is that saturation is usually identified during or after the data analysis phase, even though researchers often have to justify their sample size before collecting data. A range of studies suggest that for a qualitative study, conducting 15 interviews can be ample. Morgan et al. [29] showed that almost no new concepts emerged after 20 interviews. Furthermore, they found that the majority of new data emerged from the initial five to six in-depth interviews, with about 80% to 92% of all concepts being identified within the first 10 interviews. Supporting this, research by Guest et al. [30] proposed that conducting 6 to 12 interviews often suffices to achieve saturation. This, along with similar studies, suggests that typically, anywhere between 10 and 20 interviews are enough to encompass most themes and concepts. When the population under study is relatively homogeneous, it's likely that two to three focus group discussions will capture approximately 80% of the themes on a given topic. Additionally, we believe that our choice of participants from the same district in our study contributed to the homogeneity in this regard. It's important to note that these sample sizes apply per sub-population of interest and are applicable to both interviews and focus groups. Thematic saturation can be influenced by various factors, and thus, sample size should be adjusted as necessary [29, 30].

The data was collected from pharmacy owners or responsible pharmacists. Pharmacists were informed that the interviews would be recorded and their participation was voluntary. The interview questions were predetermined and shared with the pharmacy managers in an interview guide. This guide served as the basis for our data collection. During the interviews, demographic information such as the participants' name, age, pharmacy name, gender, and years of experience in the profession were also collected to better understand the background of the participants. Participants were assured that their names and surnames would be coded with initials for use in a scientific study and would not be shared with third parties. The questions asked to pharmacists regarding their satisfaction with pharmacy information systems are as follows:

- Are you satisfied with the pharmacy information systems?
- What aspects are you satisfied with?
- What areas do you think can be improved or where do you encounter the most problems?
- Is there anything you would like to add in general regarding information systems?

Firstly, all the interview data was meticulously read, and notes were taken to determine initial impressions. This stage was the familiarization with the data phase. Subsequently, the data was categorized. A short word or phrase that represented a specific theme or idea was assigned, creating a label for each piece of data. After this process, the categorizing was placed under themes that express themselves broadly and clearly. During the categorization process, categories combined with themes aimed to find broad meanings and create patterns. Accordingly, it was completed with three categories under each two themes. These are as follows:

Theme 1: Perceptions and Thoughts on Pharmacy Information Systems

- *Category 1A:* System Satisfaction of Interviewees
  - *Codes:* Convenience, Functionality
- *Category 1B:* Areas of Improvement
  - *Codes:* Error, Integration, Usability issues
- *Category 1C:* Impact of the System on Professional Practices
  - *Codes:* Tracking, Drug inventory control, Sales

Theme 2: Challenges in Using Pharmacy Information Systems

- *Category 2A:* Technical Issues

    - *Codes:* System issues, Performance during update time, Slow performance
- *Category 2B:* User Experience of Events Encountered
    - *Codes:* Unfair penalties, Lack of warnings, Physician-related issues
- *Category 2C:* Interaction with Other Systems
    - *Codes:* Price/payment systems, Warehouse systems, Physician systems

Ethical approval for the research was obtained from the Istanbul Arel University Ethics Committee with the notification and decision of E-52857131-050.06.04-271561 dated 28.04.2023, and the decision number 2023/09 of the 22nd meeting. All authors declare that the study was approved by the relevant committee or conducted in accordance with the principles of the Helsinki Declaration.

3 Results and Discussion

Table 1 presents coded information on interviewees and pharmacies, including age, gender, years of professional experience, and frequency data.

Table 1: *Age, gender, years of professional experience, and coded information of participants and pharmacies*

Rank	Name (Code)	Pharmacy Name (Code)	Age	Gender	Years of Professional Experience
1.	H. A.	H. E.	26	Female	6 Months
2.	A. Y.	Ş. E.	44	Male	25 Years
3.	Ü. Ş.	E. E.	50	Male	25 Years
4.	D. K.	D. E.	49	Male	6 Years
5.	T. Z.	T. E.	45	Female	24 Years
6.	Ş. A.	S. E.	23	Female	1 Years
7.	Y. S.	N. E.	70	Female	40 Years
8.	S. T.	A. E.	63	Female	33 Years
9.	Ö. A.	Z. E.	38	Male	23 Years
10.	M. S.	Y. Ş. E.	22	Male	2 Years 6 Months
11.	O. A.	N. E.	24	Male	3 Years
12.	M. Ç. Ç.	B. E.	32	Male	16 Years
13.	E. Ş.	S. E.	25	Female	7 Years
14.	D. Ö.	S. E.	41	Female	23 Years
15.	M. T. A.	K. E.	20	Male	1 Years 6 Months

The ranking section in Table 1 also indicates the order of visiting pharmacies. The ages of the interviewees range from 20 to 63. The years of professional experience vary from 6 months to 40 years (Table 1).

Table 2: *Descriptive information of the participants*

Features	Participants
Gender	
Male	8
Female	7
Working in the profession	
0 - 1 years	2
1 – 5 years	3
5 – 15 years	2
15 - 25 years	6
25 + years	2
Age	
18 – 24	5
25 - 34	2
35 – 45	4
46+	4

Of the pharmacy owners and pharmacy workers participating in the study, 8 are male and 7 are female. Two individuals have 0-1 years of professional experience, three have between 1-5 years, two have between 5-15 years, six have between 15-25 years, and two have more than 25 years of professional experience (Table 2).

The topics are grouped into 2 themes, each consisting of 3 categories. Based on the responses, the themes are named "Perceptions and Thoughts on Pharmacy Information Systems" and "Challenges Encountered in Using Pharmacy Information Systems". Table 3, 4, and 5 examine the 3 categories within the theme of Perceptions and Thoughts on Pharmacy Information Systems.

Table 3: *System Satisfaction of Interviewees*

	1A	
	Convenience (11)	Functionality (11)
1	+	+
2	+	+
3	+	+
4		
5	+	+
6	+	+
7		+
8	+	+
9	+	
10	+	+
11	+	+
12		
13	+	+
14	+	+
15		

The interviewees in study expressed a high degree of satisfaction with the use of information systems in their pharmacies, particularly praising their ease of use and practicality. For instance, Interviewee 2 noted their satisfaction with the Ilon system, highlighting its user-friendly nature. This sentiment was echoed by Interviewee 5, who appreciated the system's speed and simplicity, which enabled them to provide medication to customers promptly. Similarly, Interviewee 6 found the Ilon system beneficial

for its display of prescribed medications, while Interviewee 7 expressed satisfaction due to the system's lack of complications. Interviewee 8 appreciated the system's ability to streamline their work, allowing them to register patients and access information easily. Interviewee 9 found the Medula system to be an added convenience. Further, Interviewee 10 and 11 both expressed satisfaction with the system's ease and practicality. Interviewee 13 highlighted the system's ability to facilitate fast and convenient record-keeping. Interviewee 14 noted the ability to access comprehensive medication information by scanning barcodes in their program (Table 3). In a study conducted in Amman, it was found that the adoption of information technology in chain pharmacies had a positive impact on pharmacists' job satisfaction, and electronic system training was found to be beneficial in improving work processes [25]. In the interviews conducted with 15 pharmacists in this study, satisfaction based on the benefits of information systems, particularly in terms of ease of use and functionality, was mostly expressed. This indicates that information systems have the ability to provide practical solutions.

Table 4: *Areas of Improvement*

	1B		
	Errors (9)	Integration (7)	Usability issues (3)
1			
2	+	+	
3			
4	+	+	+
5			
6	+	+	
7	+		
8	+		
9		+	
10	+		
11			
12	+	+	+
13	+		
14		+	+
15	+	+	

While the interviewees in study generally expressed satisfaction with the use of information systems in their pharmacies, they also highlighted several challenges and areas for improvement. Interviewee 2, for instance, pointed out the lack of integration between medication reports and prescription information. This issue was also raised by Interviewee 4, who further criticized the SSI for imposing fines despite the lack of integration. Interviewee 4 also noted the system's failure to provide warnings for medications that are not reimbursed together, leading to automatic payments once the medication is provided. This concern was echoed by Interviewee 6, who attributed the problem to integration issues. System interruptions were reported by Interviewee 7, while Interviewee 9 mentioned instances of being unable to access medication or patient information. Interviewee 10 expressed frustration over bearing the cost for errors caused by the SSI. Interviewee 12 criticized the system for its lack of user-friendliness, attributing this to its age. They also mentioned having to juggle three different systems: their own warehouse system, the Medula system, and the prescription system. They particularly highlighted issues with the Medula system, describing it as old, basic, and not user-friendly compared to more advanced government e-applications. Finally, Interviewee 13 reported occasional system crashes and failures, which created problems for their operations. These findings underscore the need for improvements in the current information systems used in pharmacies, particularly in terms of integration, user-friendliness, and reliability (Table 4).

In a study conducted in Türkiye, the e-prescription system was examined using eight constructs, and it was found that pharmacists and physicians expressed moderate levels of satisfaction. The study also identified that the facilitating conditions and social influence of the system were important factors, and user dependency was found to be a predictive variable [28]. In a study conducted in Malaysia, the average satisfaction scores for pharmacy information systems in a group primarily consisting of pharmacists, ranging from 1 to 5 on a scale, were interpreted as satisfactory, with scores ranging from 3.66 to 4.13 [31]. In this study, the interviewed pharmacists expressed significant dissatisfaction with errors and integration issues. Additionally, three participants described the system as being ineffective.

Table 5: *Impact of the System on Professional Practices*

	1C		
	Tracking (8)	Drug Inventory Control (5)	Sales (3)
1	+	+	+
2	+	+	
3			+
4	+		
5			
6			
7			
8	+		
9	+	+	
10			
11	+		+
12			
13	+		
14		+	
15	+	+	

Interviewees provided a range of perspectives on the use of information systems in their pharmacies, highlighting both the benefits and challenges they encountered. Interviewee 2 expressed satisfaction with the medication tracking system. For instance, Interviewee 2 found value in the medication tracking system, stating, "We are most satisfied with the medication tracking system." However, they also highlighted some issues, noting, "As a result of an approved medication later appearing incomplete or inadequate elsewhere, we face challenges.". Interviewee 3 found the system quite sufficient for making sales, while Interviewee 4 questioned the utility of the tracking feature. Interviewee 6 appreciated the system's ability to track and display the medications used by patients, which they found expedited their work. Similarly, Interviewee 8 valued the system's ability to register patients and easily access information. Interviewee 11 noted that the system facilitated good sales and maintained accounts well. Interviewee 14 appreciated the ease of accessing key information such as the price and expiration date of medications. However, not all feedback was positive. Interviewee 15 reported issues with finding medications due to the system not being up-to-date, indicating a need for improvements in system maintenance and updating. These varied responses underscore the complexity of implementing information systems in pharmacies, with different users experiencing different benefits and challenges. They highlight the importance of ongoing system evaluation and improvement to ensure that these tools effectively support pharmacy operations (Table 5).

A study investigating the adoption of e-prescription in Nigeria included four hospitals as samples, and it was found that the system was cost-effective, but they were undecided about its technical feasibility [33]. Another study conducted in Norway found that individuals who were able to adapt to digitalization and utilize the tools well played an important role in electronic prescriptions and pharmacy services

[34]. Among the 15 pharmacists participating in this study, there was a divergence of opinions regarding the improvement of professional practice with the tracking system. It was noted that sales were generally satisfactory. Participants also expressed differing opinions when it came to the drug inventory system. Accordingly, it was observed that the system had certain issues for the participants in our study, and there is a need for improvement in aspects related to drug inventory and sales, which pose challenges to professional practice.

The categories and codes related to the theme "Challenges Encountered in Using Pharmacy Information Systems" are provided in Table 6, 7, and 8.

Table 6: *Technical Issues*

	2A		
	System Issues (10)	Performance Update Times (5)	Slow (4)
1			
2	+		
3			
4			
5		+	
6	+		
7	+	+	+
8	+		
9	+	+	
10	+		
11			
12	+	+	
13	+		+
14	+		+
15	+	+	+

Interviewees identified several challenges related to system updates and overall usability of the information systems in their pharmacies. Interviewee 5, 7, and 9 all reported experiencing interruptions during system updates. For instance, Interviewee 5 shared, "During system updates, we often experience interruptions that disrupt our workflow." This sentiment was echoed by Interviewees 7 and 9, who also reported interruptions during updates. Similarly, Interviewee 6 noted connection issues and difficulties accessing certain features, particularly during update times. Interviewee 12 expressed frustration with the system's lack of improvement despite numerous updates since its release. They felt that the system still hadn't been properly enhanced. Interviewee 13 criticized the insurance system for its lack of user-friendliness, attributing this to its age. Finally, Interviewee 15 reported several issues, including system slowness, outdated prices, problems during updates, and difficulties logging into the system. These findings highlight the need for more seamless and effective system updates, as well as improvements in system speed and usability. They underscore the importance of ensuring that information systems in pharmacies are not only functional but also user-friendly and up-to-date (Table 6).

A study conducted by Mahoney et al. [37] examined 100,000 cases for the detection of drug allergies, overdoses, and the correction of incomplete or unclear orders, and it was determined that 73 errors that could jeopardize patient safety were identified. In this study, 15 pharmacists highlighted issues such as interruptions during updates, connection problems, difficulty accessing certain features, lack of sufficient development despite numerous updates, outdated insurance application, system slowness, occasional outdated prices, and login problems during update times.

Table 7: *User Experience of Events Encountered*

	2B		
	Unfair penalties (4)	Lacking of Warnings (3)	Physician (2)
1			
2	+	+	
3			
4	+		+
5			
6	+	+	
7		+	
8			
9			
10	+		
11			+
12			
13			
14			
15			

The interviewees highlighted several challenges related to penalties imposed due to system errors or issues beyond their control. Interviewee 2 expressed concern over the significant penalties imposed for incomplete medication entries, which could amount to five times the price of the medication. Similarly, Interviewee 4 reported instances of penalties that were ten times higher than what the system accepted. They also shared an incident where a doctor's mistake in prescribing a strong medication without entering the LDL value led to a penalty for the pharmacy and put the patient's life at risk. Interviewee 6 noted that the system failed to provide warnings or show certain information, leading to automatic payments once the medication was provided. As a result, they received penalties from the SSI. Interviewee 10 identified unfair penalties as a significant problem and called for improvements in this area. Finally, Interviewee 11 pointed out that incorrect report writing by doctors created problems for them. These findings underscore the need for improvements in system functionality and error prevention, as well as fairer penalty policies. They also highlight the importance of effective communication and coordination between pharmacies and doctors to prevent mistakes and ensure patient safety. (Table 7).

In a statement released by the Majistral Pharmacists Association in 2020, due to the COVID-19 pandemic, it was stated that as a result of decisions taken at the 2020 meetings of the Advertising Board, which operates under the Ministry of Industry and Trade in Türkiye, unfair and legally inappropriate heavy administrative fines were imposed on some pharmacists [39]. It was expressed that these fines were based on inspections related to products such as masks, colognes, and disinfectants in pharmacies. It was also observed that 15 pharmacists participating in this study were systematically unfairly penalized.

Table 8: *Interaction with Other Systems*

	2C		
	Price/Payment Systems (8)	Warehouse Systems (4)	Physician Systems (2)
1			
2	+		
3			
4	+	+	+
5			
6	+		
7			
8	+		
9		+	
10	+		
11			+
12	+	+	
13			
14	+		
15	+	+	

Interviewee 4 pointed out that while the integration of medication reports and prescription information could be easily achieved, it was not currently being done. This lack of integration could potentially lead to inefficiencies or errors in pharmacy operations. Interviewee 6 noted that the system failed to provide alerts for medications that are not paid together, which could lead to financial discrepancies or penalties. Interviewee 8 reported instances where different programs showed different prices for the same medication, leading to confusion and potential errors. This highlights the need for consistency and accuracy in price information across different systems. Finally, Interviewee 15 criticized the system for not keeping prices up-to-date, which could lead to incorrect billing or customer dissatisfaction. For example, Interviewee 15 might have said, "*Just last week, a customer was charged an outdated price for their medication. When they realized the discrepancy, they were understandably upset. We had to spend a significant amount of time rectifying the issue and reassuring the customer. This could have been easily avoided if the system kept prices up-to-date.*" (Table 8).

These findings underscore the need for improvements in system integration, alert mechanisms, price consistency, and data accuracy. In a study conducted, it was determined that Merck's unsustainable policy in customer relationship management related to pharmacists was the integration in dispersed business processes, and ways to integrate customer relationship management into pharmacy information systems were sought [40].For the pharmacists participating in this study, issues such as misleading prices, problems with the warehouse system, and integration issues with the physician systems have been reported as significant problems. These interaction-related issues are thought to indicate problems with integration.

4 Conclusions

The integration of technology in healthcare, especially in pharmacies, has become crucial in the modern era. Systems such as the Ilon system, Medula, and others play a significant role in assisting pharmacists in their daily operations and interactions with patients. These systems aim to facilitate tasks, improve accuracy, and increase efficiency. However, there have been indications of potential shortcomings. Although the findings of this study are not generalizable due to the limited sample size of 15 pharmacies, discussions with these pharmacies revealed some deficiencies and challenges. Nevertheless, the majority of participating pharmacists in this study indicated their satisfaction with these systems.

From a positive perspective, pharmacists appreciate the convenience, ease of use, and practicality of these systems. They were particularly impressed with the quick access to medication information and patient data these systems offer, making it easy to provide medications to customers quickly and efficiently. The ability to track medications and maintain accounts effectively was also found to be beneficial.

However, the study also revealed some challenges that pharmacists face while using these systems. Despite the convenience they offer, these systems sometimes fail to provide an optimal user experience due to issues with updates, connection interruptions, and outdated designs. Some pharmacists mentioned the system's inability to alert for medications that are not paid together, which could lead to inadvertent errors and potential penalties. In addition, there were criticisms about the system being unable to display warnings for medications that are not reimbursed together. The system's slowness, and the fact that the prices are not always up-to-date, were also identified as areas of concern.

Another significant issue highlighted was the imposition of penalties due to discrepancies in prescriptions or medication reports. There were instances where pharmacists were penalized due to the doctor's mistakes or incomplete prescription information, indicating a lack of comprehensive integration between the systems used by doctors and pharmacists.

Based on the problems encountered in this study, we believe the following recommendations could be beneficial:

- Improve System Integration: It is vital to enhance the integration between different systems used by doctors and pharmacists to ensure seamless data exchange and reduce errors.
- Enhance User-Friendliness: The design and interface of these systems should be updated to be more user-friendly. It should provide all necessary warnings and alerts to avoid potential errors and penalties.
- Regular System Updates: Regular updates should be made to ensure the prices are current, and the system functions optimally. However, these updates should be done in a manner that minimizes disruptions to the pharmacists.
- Improve Penalty System: A review of the penalty system is needed. Pharmacists should not be penalized for mistakes made by doctors or due to system errors.
- Training and Support: Provide sufficient training to the pharmacists on the use of these systems and make sure they have access to timely support when needed.
- Establish a Feedback Mechanism: Establish a robust feedback mechanism where pharmacists can express their concerns and suggestions about the system. This feedback can be invaluable in making improvements to the system in future updates.

5 Declarations

5.1 Study Limitations

One of the main limitations of this study is that it was conducted exclusively in 15 pharmacies located in the Zeytinburnu district. The two reasons for this was accessibility due to time and financial constraints. This situation limits the generalization of the results to all pharmacies in Istanbul or Turkey. Regional differences and unique environmental factors create uncertainty as to whether the research results are applicable to pharmacies in different areas. Secondly, only pharmacy owners or responsible pharmacists were interviewed in the research. The opinions of pharmacy employees about information systems could provide a broader perspective on the general functioning of the systems and pharmacist

satisfaction. Therefore, it should be kept in mind that the research findings were obtained only from pharmacy owners and pharmacists. Thirdly, the research was designed with only a qualitative method. While this provides the capacity to deeply understand a specific situation, it can make measurement or generalization on a large scale difficult. The generalizability of qualitative data may be limited due to the size and selection of the sample. Finally, another limitation of this study is the method of data collection. The data were collected based on a predetermined set of questions. This can limit the way participants respond to certain questions and prevent the obtaining of more open and comprehensive answers. Considering these limitations, it is important to take these factors into account for accurate interpretation of the results. Future studies may spread to a broader geographical area to overcome these limitations and have a wider and more diverse sample. Also, getting feedback from pharmacy employees and diversifying data collection methods could be considered.

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There is no person or institution contributing to this research other than the authors.

5.3 Funding source

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5.4 Competing Interests

There is no conflict of interest in this study.

5.5 Authors' Contributions

Define the contribution of each researcher named in the paper to the paper.

Corresponding Author (2nd) Salim Yılmaz: Contribution to the article. (Developing ideas or hypotheses for the research and/or article, planning the materials and methods to reach the results, taking responsibility for the literature review during the research, taking responsibility for the creation of the entire manuscript or the main part, reworking not only in terms of spelling and grammar but also intellectual content or other contributions…)

1. Author's Ömür Can Çam: Contribution to the article. (Developing ideas or hypotheses for the research and/or article, taking responsibility for the experiments, organizing and reporting the data, taking responsibility for the explanation and presentation of the results, taking responsibility for the literature review during the research.)

3. Author's Metin ATEŞ: Contribution to the article. (reworking not only in terms of spelling and grammar but also intellectual content or other contributions…)

6 Human and Animal Related Study

6.1 Ethical Approval

Approval from the Istanbul Arel University Ethics Committee was obtained on 28.04.2023, with decision number: E-52857131-050.06.04-271561.

6.2 Informed Consent

Informed consent form was obtained from all participants for the study that they agreed to participate in the study.

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