EAI Endorsed Transactions
on Pervasive Health and Technology
Research Article EAI.EU

Evaluating Physicians' Satisfaction with Using eHealth System for Managing Patients in Primary and Secondary Care

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Abstract

INTRODUCTION: eHealth systems are raising both patient satisfaction and medical care. The proper workflow regulations and data exchange between primary and secondary healthcare are crucial.
OBJECTIVES: Investigation of the major determinants influencing the physicians' satisfaction while using an eHealth information system.
METHODS: A survey of primary and secondary healthcare medical professionals was conducted in R.N. Macedonia. The categorical variables from the data analysis were presented and a logistic regression was carried out.
RESULTS: The multiple logistic regression model was statistically significant for sufficient evidence to reject the null hypothesis in which the overall satisfaction rating of the eHealth system usage for managing patients and other healthcare services will not be affected by the other variables in favour of the alternative Ha.
CONCLUSION: Various factors between primary and secondary healthcare professionals regarding system's usage satisfaction are presented and studied. Various issues were revealed between both parties that should serve the policymakers and medical authorities for further improvements.

Keywords: eHealth system, physician satisfaction, patient management, eHealth services.

Received on 16 10 2023, accepted on 10 02 2025, published on 18 02 2025

doi: 10.4108/eetpht.11.4157

1. Introduction

The eHealth systems' development highly impacted the healthcare industry. This sector started to be researched by the European Commission in 1988, and by 2004 a broad number of eHealth systems had been presented to support healthcare for the member countries of the European Union (EU). This advancement was greatly achieved by the collaborative efforts in the research and development projects between EU and non-EU countries [1, 2].

Medical health systems are a subset of health information systems (HIS). Medical health systems focus on the management of healthcare data and information, while HIS encompasses a broader range of components and interactions to guide public health policies and programs [3].

The adoption of HIS was initiated by evolving digitalization and developments in the healthcare industry. HIS represents essential tools used by organizations and everyone involved within the healthcare industry towards the modernization of health-related procedures, operations, and improvement of healthcare delivery. The main goal of HIS is the interaction of people, processes, and technology to support the functions and management in providing healthcare services [4].

Basically, the goal of the eHealth systems was to reduce costs for healthcare providers by lowering administrative work, providing high-quality healthcare, and increasing medical consumers' satisfaction. This was only possible with

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efficient electronic data interoperability and sharing between primary and secondary healthcare (PSH) and by establishing well-organized workflow regulations. Consequently, this also improves patients' access to PSH physicians [5, 6].

Data exchange between PSH systems is essential for the improvement of the experience of end users. Common technological standards for data interchange between the PSH systems allow smooth integration and data sharing among several platforms. Some of these standards are DICOM [7] (Digital Imaging and Communications in Medicine), SNOMED CT [8] (designed as a multilingual international core set for electronic clinical data exchange that can be used in Electronic Health Records systems), and HL7 FHIR [9] (next-generation standard for interoperability developed by Fast Healthcare Interoperability Resources and Health Level 7 to provide efficient and quick health data exchange) [10].

Digitalizing patients' records and medical staff information were combined in the core of the eHealth systems which call for careful administration and security support. This conversion to digital technology highlights the need for increased data security plans in safeguarding the patient's privacy and following data protection legislation. To show the system's integrity and raise confidence and trust in the system, strong security measures must be presented to the public. Transitioning to eHealth systems introduces new challenges like IT support, maintenance costs, and basic computer knowledge for medical professionals (MedP) [11, 12].

The eHealth care medical platform "Pinga", a central-oriented electronic information system that holds all medical-related data, started its integration in various countries [13]. In 2011, it was presented as an eHealth information system called "Moj Termin" ("My Term"), functioning as a scheduling appointment system. The main goal was the improvement of scheduling appointments and acquiring reserved time slots for visitations and check-ups with MedP. Now, all appointments and scheduling at the health care facilities, all information and resources on the electronic prescriptions and referrals for the patients are integrated as a system core utilities and services in "Moj Termin" [14, 15].

The eHealth system was built to join the three healthcare levels for data and information distribution and patient management [15, 16]:

- Primary healthcare (primary care physicians (PrimC));
- Secondary healthcare (specialist outpatient clinics); and
- Tertiary healthcare (public health facilities – hospitals, a total of 114 registered in Macedonia in 2018 [17].

The MedP were affected by using the eHealth system the most, and they can provide the best practical knowledge and experience using the system. Furthermore, reducing the waiting time and raising the level of satisfaction of the patients was crucial on a national level [14]. During the corona COVID-19 pandemic case, the medical world turned towards using eHealth systems even more mainly because of the limitations on patient-physician contacts. Another key feature of the software applications was to provide help and information to the population on the current pandemic progress [18]. How did this influence the usage of the eHealth system? Are there any opportunities for making an improvement for further development of the systems to help with preventing pandemic outbreaks or at least slow down? What about the MedP who were using the eHealth system? How was everything affecting them with the implementation and usage of the eHealth system? How were they satisfied with the system's usage? What was their opinion on patient management with the system according to their experience? These were some of the questions that needed to be answered by the users of the eHealth system to further improve and develop the eHealth systems [19, 20].

Therefore, this study explores the operability range and challenges of using an eHealth system interface from the users' point of view and establishes suitable and practicable system performance by understanding the user's preferences. It investigates the major determinants that may have influenced the satisfaction of the physicians and their opinion on using an eHealth system, how it was affecting their professional career, exploring the pros and cons, the challenges, and what can be done to improve the user experience between PSH physicians. To the best of our knowledge, this would be the first study to approach this issue on the challenges, overall satisfaction, and usage experience in patient management on the eHealth system.

The current paper is organized into six sections. Section 2 discusses the related work relevant to this research. Section 3 describes the materials and methods used, while Section 4 presents the outcomes. Section 5 offers a discussion of the findings, and finally, the paper concludes with a summary of limitations, future work, and a list of references.

2. Related work

In correlation to the healthcare level, the eHealth system can have various effects on MedP. In some cases, a productivity rise would lead to lowering services, however, the request for healthcare services from patients remains the same [19]. Furthermore, as the MedP would receive the ability to monitor patients in different locations remotely, the medical personnel would need to respond to the raised requests for services even more, especially from patients with chronic conditions [21].

As new generations of MedP arrive at the already progressed world of technology, they would have to adapt to the already established eHealth system environment where it would be expected to contribute to even greater eHealth development [19, 22].

However, integrating an eHealth system would certainly add to alternating the workflow process of the MedP, which would lead to some medical personnel dissatisfaction with system usage. The main reason was skipping steps in filling out all necessary data and information of the patients in the system's database [21]. Many MedP were dissatisfied with wasted time on administration work, whereas they would rather practice medicine, making them frustrated [23]. This was leading to unnecessary stress at their working facility in fear of neglecting, or not improving their medical skills [24].

As research suggests, there were many studies regarding the topic of user experience and satisfaction with eHealth systems by MedP. Many studies started to investigate the adoption rate of eHealth systems for managing patients and started to incorporate the technology acceptance model (TAM) to understand and explore the results on the topic at hand [20]. Continuing, the adoption of eHealth systems was mainly influenced by the viewpoints of the MedP and managers of healthcare institutions, and it had a low influence on issues regarding the work performance and experience of the MedP. Due to the unwillingness to accept new technological changes and improvements by the MedP, poor healthcare institution infrastructure, and relatively low experience with new technology, the benefits from using such systems were yet to be discovered in many countries that still had low adoption rates [25]. Other factors that influence the lack of physicians' motivation, concerns regarding security issues, and inadequate operational and management strategies would add to poor adoption of the technologies [26]. The younger and more technology-oriented population were inclined to improve healthcare services by using electronic healthcare records. Adding to this, the appropriate training, financing, implementation strategies, and procedures further influenced physicians' opinions in adopting new technologies [27].

3. Materials and methods

3.1. Environment and Study Population

For this study, the MedP from PSH were considered. This included any medical personnel that was using the eHealth system "Moj Termin". To meet the research objectives to be relevant for this country, by using the standardized sample size formula, the minimal sample size of the population was calculated [28]:

$$n=(z^2\pi(1-\pi)/e^2)/(1+z^2\pi(1-\pi)/e^2N). \quad (1)$$

where:

- n - sample size;
- z - wanted confidence level, which dictates the value of z - critical value from the standard normal distribution;
- e - acceptable sampling error;
- π - proportion of the population; and
- N - population size.

According to the Health Insurance Fund of North Macedonia, at the time of accessing, there were registered [29]:

- 1554 general practitioners,
- 1243 dentists,
- 160 gynaecologists,
- 1793 pharmacies, and
- 4636 specialists.

As such, from the total population of 9386 registered MedP mentioned above, at least 370 participants were necessary to fill out the online questionnaire with a set confidence level and margin of error of 95% and 5% respectively [28].

3.2. Structured Questionnaire

An online questionnaire was used, and it was structured into six modules:

(i) Demographic characteristics of the MedP from the PSH introduced as individual factors;
(ii) MedP' viewpoints and impressions introduced as factors of satisfaction;
(iii) Issues and challenges introduced as factors of context;
(iv) MedP' recommendations introduced as factors concerning actionable opportunities;
(v) Required necessities for working in the eHealth system were introduced as factors that were controllable; and
(vi) Possible barriers that may appear while using the eHealth system introduced as factors that were non-controllable.

The online questionnaire was carried out in R.N. Macedonia from February 7th to April 7th, 2022, for a duration of two months.

3.3. Statistical Analysis

The gathered data was analyzed in the statistical software IBM-SPSS Statistics v.23.0 for the Windows operating system [30]. Frequencies and percentages were used to represent the category variables and a logistic regression model was built.

The model included logistic regression to the dependent variable (dummy variable 0=Dissatisfied, 1=Satisfied) converted from the scaled dependent variable satisfaction of using the eHealth system with a set of variables grouped into:

- individual factors, including healthcare level, education, physician's age, experience, marital status, etc.;
- factors of satisfaction, including the start of work with the eHealth system, current viewpoint on usage, etc.;
- factors of context, including issues, challenges, workflow process, etc.;
- factors of actionable opportunities, including help from authorities, workflow organization, etc.;
- factors that were controllable, including Internet connection, IT equipment necessities, etc.; and
- factors that were non-controllable, including system blockages, system crashes, daily usage time, etc.

The econometric specification was as follows:

$$\log(p/1-p)=\alpha+\beta Ai+\gamma Bi+\delta Ci+\mu Di+\varepsilon Ei+\zeta Fi+\eta i \quad (2)$$

where:

- Yi=log(p/1-p) - value of satisfaction in using the eHealth system by the MedP in binary;
- p - success probability;
- (p/1-p) - odd ratio;
- α - intercept/constant;
- β - coefficient/slope for A, a matrix of individual factors as independent variable;
- γ - coefficient/slope for B, a matrix of additional factors of satisfaction as independent variable;
- δ - coefficient/slope for C, a matrix of factors of context as independent variable;
- μ - coefficient/slope for D, a matrix of factors of actionable opportunities as independent variable;
- ε - coefficient/slope for E, a matrix of factors that were controllable as independent variable;
- ζ - coefficient/slope for F, a matrix of factors that were non-controllable as independent variable; and
- ηi - portion of random error.

To test the impact and the significance between the variables in a cross-tabulation, Pearson Chi-Square and Phi and Cramer's V tests were used. Two-tailed P-value<0,05 was considered for significance.

For the set null hypothesis of the logistic regression model, it was assumed that the set of grouped variables was not having any effect on the overall rating of satisfaction in using the eHealth system for patient management and other healthcare services (ORS-EHS), i.e.:

- H_0: The ORS-EHS will not be affected by the other variables in this study.
- H_a: The ORS-EHS will be affected by the other variables in this study.

4. Results

A total of 5567 individual email messages of the online questionnaire were sent to the MedP from PSH. Four hundred sixty-seven (467) of them were recognized as non-existent, non-valid, or unreachable by the email service provider, which led to a total of 5100 valid. From these, only 375 responses were successfully collected in the provided period, hence, a response rate of 7,35% was estimated. The collected response number met and satisfied the calculated optimal sample size from the provided population (1), which made it relevant for this research study. Considering the number of collected responses, a margin of error of 4,97% was re-estimated. Furthermore, before conducting the statistical analysis, data cleaning was initiated after which, a total of 370 submitted responses were considered valid for the statistical analysis, still fulfilling the estimated optimal sample size.

4.1. Demographic characteristics of the participants

As such, 370 MedP participated in this research of which 253 (70,3%) were from primary healthcare and 107 (29,7%) were from secondary healthcare as presented in Figure 1.

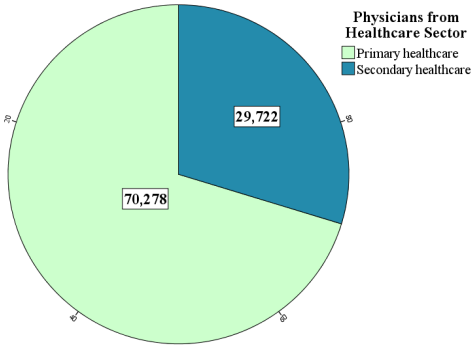

Figure 1. The healthcare level of the participants

From the base demographic characteristics of the MedP presented in Table 1, most participants were between the ages of 28 and 62 years. The majority were females or 66,1%, were married, or 84,9%, and had finished a specialization, or 56,4%. The average experience working as a physician was estimated at 19 years with a standard deviation (SD) of ±10,5 years.

Most of the physicians that participated in this study were working in a medical facility located in an urban area or 87,2%. The average years of experience working before the integration of the eHealth system were estimated at 10,8 years with an SD of ±9,3 years. Furthermore, the average years of experience working on the eHealth system after its integration were estimated at 7,5 years with an SD of ±3,8 years.

Table 1. Base characteristics of the MedP

Characteristics	
Age, Mean(±SD)	46,9(±10,9)
Gender, N(%)	
Female	244(66,1)
Male	125(33,9)
Marital Status, N(%)	
Unmarried	37(10,0)
Married	314(84,9)
Widowed	17(4,6)
Other	2(0,5)
Education, N(%)	
Graduate	123(33,7)
Postgraduate	16(4,4)
Specialization	206(56,4)
PhD	19(5,2)
Other	1(0,3)
Health Care Level of Physicians, N(%)	
Primary Health Care	253(70,3)
Secondary Health Care	107(29,7)

Overall Years of Experience, Mean(±SD)	19,1(±10,)
Area of the Medical Facility, N(%)	
Rural area	47(12,8)
Urban area	321(87,2)
Years of Experience in Patient Management Before the Integration of the eHealth system, Mean(±SD)	10,8(±9,3)
Years of Experience in Patient Management with the eHealth system, Mean(±SD)	7,5(±3,8)

4.2. Affecting Factors on the Satisfaction in the eHealth System Usage

4.2.1. Satisfaction of Using an eHealth System

In Table 2 the participants' impressions and viewpoints or the satisfaction factors regarding the eHealth system are presented. Most of the physicians (40%) had very high expectations when they first heard about the integration of an eHealth system into Macedonian healthcare. The majority (40,5%) were neither satisfied nor dissatisfied when they first started working on the eHealth system. Furthermore, from their perspective on their interaction with patients, most of them considered that the patients were neither satisfied nor dissatisfied with the new way of operation in healthcare with the eHealth system (45,5%). Finally, the majority were also neither satisfied nor dissatisfied with the current usage of the system (35,7%), however, it was a close line with those who were satisfied (32,4%).

Table 2. Impressions and viewpoints of the physicians

Satisfaction factors	N(%)
Expectations when the integration of the eHealth system began	
Very low	8(2,2)
Below average	15(4,1)
Average	105(28,4)
Above average	94(25,4)
Very high	148(40)
Initial satisfaction when started to work in the eHealth system for the first time	
Very dissatisfied	14(3,8)
Dissatisfied	36(9,7)
Neither	150(40,5)
Satisfied	112(30,3)
Very satisfied	58(15,7)
Physicians' viewpoints on the satisfaction of the majority of patient population regarding the eHealth system	
Very dissatisfied	20(5,4)
Dissatisfied	66(17,9)
Neither	168(45,5)
Satisfied	89(24,1)
Very satisfied	26(7,0)
Current satisfaction in using the eHealth system	
Very dissatisfied	21(5,7)
Dissatisfied	42(11,4)
Neither	132(35,7)
Satisfied	120(32,4)
Very satisfied	55(14,9)

4.2.2. Challenges and Issues

Having already a large quantity of knowledge concerning security and privacy issues in healthcare systems, particularly in medical information systems, it stands in line with the increased emphasis on data security, compliance with the Health Insurance Portability and Accountability Act, and the General Data Protection Regulation, and lastly patient privacy. To ensure improvement in these fields, it is crucial to find practical insights utilized by all parties involved. As such, Table 3 shows the physicians' viewpoints on the challenges and issues they were facing while using the eHealth system. Most of the physicians were neither satisfied nor dissatisfied with the current workflow process of the system for patient management (38,5%), however, it was a close line with those who were satisfied (32,8%). Most of them sometimes run into consistent technical issues while working in the eHealth system, however, it was also close line with those that very often have encountered consistent technical issues (33,3%). The majority replied that they rarely received technical support or help from the medical authorities when encountering technical issues (26,4%), 24,8% sometimes, and 20,2% very often, however, 16,1% stated as never. When the physicians initially started using the system, most of them had never received any introduction or explanation on what security measures were considered related to the protection of sensitive data of patients (36%), and 24,3% very little. Most of them had no experience or knowledge of other similar eHealth systems for patient management or systems in development in other countries (52,8%). During the COVID-19 pandemic, it was necessary to modify and expand the functionalities of the system to assist with the new threat, and most of the participants on how the system was modified and functioning during the COVID-19 pandemic were neither satisfied nor dissatisfied (36,0%) and 25,7% were satisfied. Finally, most of the participants, through their experience while working in the system and its functioning in managing patients strongly agreed that the eHealth system required important updates to be integrated into the current installation (56,9%).

Table 3. Viewpoints on challenges and issues in the eHealth system usage by physicians

Factors regarding satisfaction	N(%)
Viewpoints of the workflow process currently established to manage patients	
Very dissatisfied	17(4,6)
Dissatisfied	40(10,8)
Neither	142(38,5)
Satisfied	121(32,8)
Very satisfied	49(13,3)
Consistent technical issues often encountered while working in the eHealth system	
Never	11(3,0)
Rarely	48(13,0)
Sometimes	133(36,0)
Very often	123(33,3)
Always	54(14,6)

The health authorities often helped or technical support was provided when encountered technical issues while working in the eHealth system	
Never	59(16,1)
Rarely	97(26,4)
Sometimes	91(24,8)
Very often	74(20,2)
Always	46(12,5)
Introduction to security measures related to the protection of sensitive data of the patients in the system	
Not at all	132(36,0)
Very little	89(24,3)
Somewhat	93(25,3)
To a great extent	53(14,4)
Experience or knowledge in similar systems like "Moj Termin" or systems in development in other countries	
Not at all	195(52,8)
Very little	88(23,8)
Somewhat	53(14,4)
To a great extent	33 (8,9)
Viewpoints on the adaptation and functioning of the eHealth system during Covid-19 pandemic	
Very dissatisfied	47(12,8)
Dissatisfied	58(15,8)
Neither	135(36,9)
Satisfied	94(25,7)
Very satisfied	32(8,7)
The current eHealth system needs improvements with important system functionalities	
Strongly disagree	3(0,8)
Disagree	14(3,8)
Undecided	60(16,3)
Agree	82(22,2)
Strongly agree	210(56,9)

4.2.3. Recommendations

Table 4 shows the viewpoints of the participants on various recommendations to the health authorities to improve the current eHealth system even further. Most of them agreed that the workflow organization for patient management in the system should be improved, changed, or upgraded (80,8%) of which 55,6% strongly agreed. Furthermore, the majority greatly agreed above all others that the health authorities needed to provide more help to physicians and improve/increase the collaboration between both sides (93,2%) of which 83,7% strongly agreed. Adding to this, the majority neither agreed nor disagreed that the eHealth system included unnecessary modules that they barely or never used (30%), however, most of them agreed that there were functions not required by the system (43,8%) of which 25,3% strongly agreed. Finally, in the participants' experience, most of them were satisfied with the quality of the system for patient management and rated it as a good quality eHealth care information system (62,6%) of which 10,8% rated it as very good.

Table 4. Physicians' recommendations on the eHealth system usage

Factors of actionable opportunities	**N(%)**
The workflow organization of the eHealth system needs to be improved, changed, or upgraded	
Strongly disagree	4(1,1)
Disagree	13(3,5)
Undecided	54(14,6)
Agree	93(25,2)
Strongly agree	205(55,6)
More help was required from the health authorities and the collaboration between both sides needed to be improved/increased	
Strongly disagree	2(0,5)
Disagree	2(0,5)
Undecided	21(5,7)
Agree	35(9,5)
Strongly agree	309(83,7)
The eHealth system currently has unnecessary modules not required for the physicians' work, i.e., they were never or never used	
Strongly disagree	32(8,8)
Disagree	63(17,4)
Undecided	109(30,0)
Agree	67(18,5)
Strongly agree	92(25,3)
Satisfaction with the quality of the eHealth system for patient management according to the physicians' experience	
Very poor	13(3,5)
Poor	32(8,7)
Acceptable	132(35,8)
Good	152(41,2)
Very good	40(10,8)

4.2.4. Factors That Were Controllable

Table 5 shows controllable factors in using the eHealth system, and as such, most of the participants were satisfied with the information computer technology equipment (ICT) accessibility in their medical facilities (68,6%) of which 35,5% were very satisfied. Small percentages were dissatisfied with the ICT equipment in which they worked (9,2%). Having in mind that, most of them procured their own ICT equipment in the medical facilities out of necessity to work in the eHealth system (60,4%), which was understandable from the previous question. For a small percentage of participants, their equipment was provided by their superior (17,9%), and 17,9% inherited it the moment they were employed. A very small percentage were provided with ICT equipment by the medical authorities (3,5%). Most of the medical facilities were equipped with a high-speed Internet connection (67%) and 32,2% experienced difficulties in connection to the Internet, which led to rating the quality of the Internet connection in the country as good (71,3%) of which 36,2% rated it as very good. A small percentage of physicians, mostly from rural areas had difficulties with the Internet connection (7,1%) of which 3,0% rated it as very poor. As they expressed very strongly the requirement to improve the collaboration between the health authorities and the physicians in upgrading, using, and maintaining the system, most of the participants didn't receive any instructions on the proper usage (41,7%). Some had received

instruction in managing patients and using the system (33,1%) and 22% received instructions only from their supervisors at the medical facilities.

Table 5. Factors that were controllable regarding the physicians using the eHealth system

Controllable factors	N(%)
Satisfaction with the ICT equipment accessibility at the medical facility	
Very dissatisfied	11(3,0)
Dissatisfied	23(6,2)
Neither	82(22,2)
Satisfied	122(33,1)
Very satisfied	131(35,5)
ICT equipment procurement in the medical facility	
I procured my own	223(60,4)
It was provided by the medical authorities	13(3,5)
It was provided to me by my superiors	66(17,9)
I used the already-established equipment	66(17,9)
Other	1(0,3)
High-speed Internet connection or difficulties in connecting	
It has high-speed Internet connection	246(67,0)
I experience difficulties in connecting to the Internet	121(33,0)
Internet connection quality at the medical facility	
Very poor	11(3,0)
Poor	15(4,1)
Acceptable	80(21,6)
Good	130(35,1)
Very good	134(36,2)
Usage instructions on managing patients in the eHealth system	
I received instructions from the medical authorities	122(33,1)
I received instructions from my superior at the medical facility	81(22,0)
I did not receive any instructions	154(41,7)
Other	12(3,3)

4.2.5. Factors That Were Non-Controllable

The opinions on the non-controllable factors are shown in Table 6. Most of the participants stated that the system was only sometimes being upgraded or maintained (47,5%), however, for most of them the system often had system crashes or blockages (41,7%) of which it was always or 21% and for 37,3% it was sometimes. These system blockages happened during work on the system (37%), very often (29,3%), and for 11% it was always, leading to frustration in practicing healthcare. For the majority this was treated as wasting precious time (75,6%) of which 59,6% was very often, instead, they were stuck doing administrative work for a prolonged duration of time.

Table 6. Factors that were non-controllable regarding the physicians using the eHealth system

Non-controllable factors	N(%)
The eHealth system was being upgraded or maintained on regular basis	
Never	11(3,1)
Rarely	89(25,0)
Sometimes	169(47,5)
Very often	72(20,2)
Always	15(4,2)
During upgrade/maintenance phase the eHealth system was often disabled/blocked	
Never	13(3,6)
Rarely	62(17,4)
Sometimes	133(37,3)
Very often	74(20,7)
Always	75(21,0)
While working in the eHealth system it often had system crashes or blockages	
Never	10(2,7)
Rarely	173(20,0)
Sometimes	135(37,0)
Very often	107(29,3)
Always	40(11,0)
Often feeling frustrated when experiencing system crashes or blockages while working in the eHealth system	
Never	10(2,7)
Rarely	17(4,6)
Sometimes	63(17,1)
Very often	59(16,0)
Always	220(59,6)
Hours spent daily working in the eHealth system – Mean(±SD)	5,25(±2,8)
Hours spent daily working in the eHealth system influenced the ability for professional improvement and job performance of the physicians	
Strongly disagree	23(6,3)
Disagree	26(7,1)
Undecided	81(22,1)
Agree	90(24,5)
Strongly agree	147(40,1)
ORS-EHS on a scale from 0 to 10 – Mean (±SD)	5,78(±1,9)

The average hours spent daily in working in the eHealth system was estimated at 5,25 hours per day with a SD of 2,8 hours as presented in Figure 2.

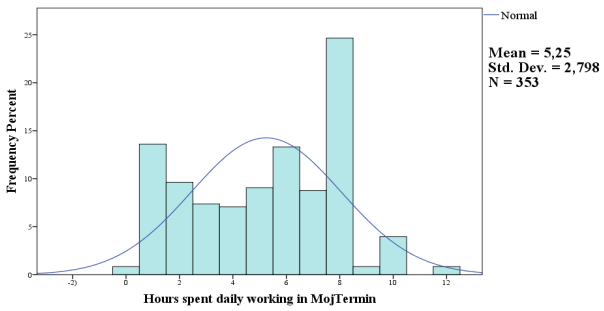

Figure 2. Distribution of the hours spent daily working in the eHealth system

The average of the ORS-EHS on a scale from 0 to 10 was estimated at 5,78 with a SD of 1,9 as presented in Figure 3.

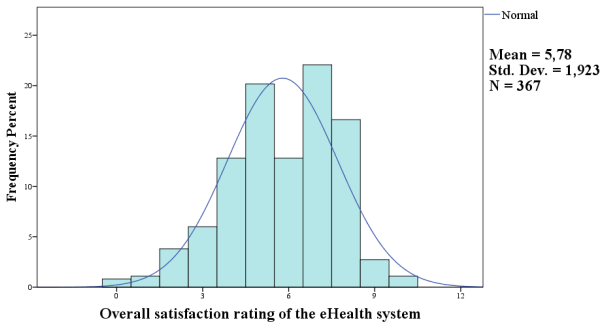

Figure 3. Distribution of the ORS-EHS on a scale from 0 to 10

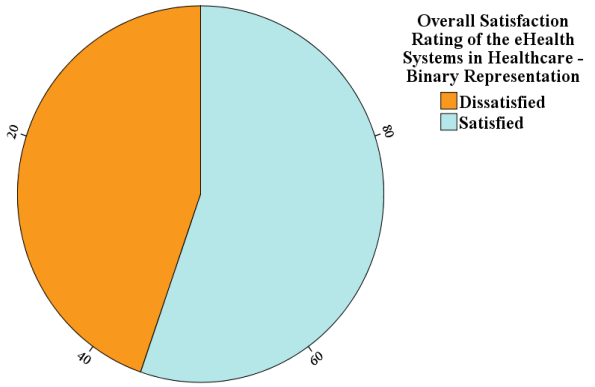

Figure 4. The ORS-EHS as a binary variable

4.3. Identifying Independent and Dependent Variables

A logistic regression was done on the dummy variable converted from the overall satisfaction rating of the eHealth system for patient management and other healthcare services as a dependent variable to explore the effect on the satisfaction of the physicians from different healthcare levels as there were different functionalities available of the system.

4.4. Regression Analysis

In this regression, the predictors with more than two options, i.e., more complex categorical (nominal) variables were transformed into indicator variables “0” or “1”, as in, “yes” or “no” variables that would indicate the applied grouping. Each physician received a “1” for only one of these, and all others were set to “0”. Whereas the ordinal variable predictors were presented as a numerical scale to be included in the model.

4.4.1. Logistic Regression

By converting the scaled dependent variable the ORS-EHS into a binary variable in which, 0-5=”Dissatisfied” and 6-10=”Satisfied”, a logistic regression was done to measure the ORS-EHS from the above-presented hypothesis and to see if there was a difference in satisfaction between PSH physicians. The model was tested for “1” or “Satisfied” and “0” or “Dissatisfied” in this case.

Figure 4 shows the ORS-EHS as either satisfied or dissatisfied.

Additionally, the variable age was recorded by age group variable which included groups of under 35, 35-44, 45-54, 55-64, 65-74, 75, and over according to the Organization for Economic Co-operation and Development [31] for better multiple logistic regression analysis. As such, most of the participants were between the ages of 45 and 54 years (27,3%), and almost identical split were between 55 and 64 years (24,9%), and between 35 and 44 years (24,3%). The majority (55,3%) were satisfied with the system’s usage as presented in Figure 4. Furthermore, according to the split of physicians, 70,3% were PrimC and 29,7% were secondary care physicians (SecC), as such, the difference in satisfaction can be examined (Figure 1 and Table 1).

Simple Logistic Regression Analysis

In the executed crosstabulation between the dependent variable the ORS-EHS and the Healthcare level of the physician, there were no differences between the actual and the expected count, furthermore, by looking at the Pearson Chi-Square and Phi and Cramer’s V significance value of 0,417 which was above the p-value of 0,05 indicating that there was no effect or significance, as in no relationship between these two variables. The data suggests that there was no correlation between PrimC or SecC and the overall rating of satisfaction with the system. This means that the participant being either a PrimC or SecC would not have any effect on the ORS-EHS.

This can be also confirmed from the simple logistic regression analysis between these two variables, in which, the relationship was not statistically significant with a p-value of 0,417>0,05, also shown in the overall p-value=0,416>0,05 for the simple logistic regression model. When looking at the odds ratios, SecC had increased odds ratios to be overly satisfied with the system usage for managing patients and other services or 1,210 times (21%) more likely when compared to the PrimC. However, these findings were not statistically significant. This means that it cannot be sure that these findings were not a result of an error, chance, or other factor. Furthermore, looking at the Nagelkerke R-squared value, which was 0,002, suggests that the independent

variable included in the regression analysis explained 0,2% of the variation seen in the ORS-EHS.

Multiple Logistic Regression Analysis

To explore this further, a multiple logistic regression analysis was done on the same independent variable above and additionally included other explanatory variable factors in the model. This would show which of the variables has the largest effect on the dependent variable and introduce control for the effect of the other variables in the model. When a variable is "controlled", it is included in the model so that its impact on the outcome variable or variables can be calculated and statistically separated from the impact of the independent variable. Only nominal and ordinal variables were included in the model. Before the multiple logistic regression analysis, a bivariate correlation was done for individual check of the significance and by comparing the correlation of the dependent variable the ORS-EHS with the other independent variables and by comparing the values of Pearson Correlation-R it can be checked how strong was that relationship for the dependent variable with the independent variables presented in Table 7. For the remainder of the independent variables, there was no statistical significance.

Table 7. Relationships of the dependent variable with the independent variables by comparing the values of Pearson Correlation-R

Independent variable	Significance (<0,05)	R	Relationship
Initial satisfaction when started to work in the eHealth system for the first time	0,000	0,308	positive moderate
Physicians' viewpoints on the satisfaction of the majority of the patient population regarding the eHealth system	0,000	0,346	positive moderate to strong
Current satisfaction with using the eHealth system	0,000	0,448	positive almost strong
Viewpoint of the workflow process currently established to manage patients	0,000	0,447	positive almost strong
Consistent technical issues often encountered while working in the eHealth system	0,000	0,260	negative weak to moderate
The health authorities often helped or technical support was provided when encountered technical issues while working in the eHealth system	0,000	0,202	positive weak to moderate
Introduction to security measures related to the protection of sensitive data of the patients in the system	0,000	0,194	positive weak to moderate
Viewpoints on the adaptation and functioning of eHealth system during COVID-19 pandemic	0,000	0,442	positive almost strong
The current eHealth system needs improvements with important system functionalities	0,000	-0,304	negative moderate
The workflow organization of the eHealth system needs to be improved, changed, or upgraded	0,000	-0,311	negative moderate
More help was required from the health authorities and the collaboration between both sides needed to be improved/increased	0,006	-0,142	negative weak
The eHealth system currently has unnecessary modules not required for the physicians' work, i.e., they were never or rarely used	0,000	-0,211	negative weak to moderate
Quality of the eHealth system according to user experience	0,000	0,501	positive strong
High-speed Internet connection or experience difficulties in connecting	0,010	-0,136	negative weak
Internet connection quality at the medical facility	0,002	0,164	positive weak to moderate
The eHealth system was being upgraded or maintained on a regular basis	0,000	0,188	positive weak to moderate
During upgrade/maintenance phase the eHealth system was often disabled/blocked	0,001	-0,177	negative weak to moderate
The eHealth system often has system blockages and/or crashes during work time on the system	0,000	-0,216	negative weak to moderate
Frustration when experiencing system crashes and/or blockages while working in the system	0,000	-0,233	negative weak to moderate
Hours spent daily working in the eHealth system influenced the ability for professional improvement and job performance of the physicians	0,003	-0,153	negative weak to moderate

Pearson's Chi-Square values for all of the above-mentioned relationships between the dependent variable and the individual independent variables were below the 0,05 threshold, meaning the relationship was statistically significant, which meant that the difference seen between the dependent variable and each of the independent variables was 95% not likely due to luck, chance or error (or there was a less than 5% chance the variance observed was due to luck, chance or error). In other words, there was likely a reason why a variation was occurring.

After adding in other explanatory variables in the multiple logistic regression model, such as demographic factors, factors of satisfaction, factors of context, factors concerning actionable opportunities, and controllable and non-controllable factors, by looking at the odds ratios, the SecC had decreased odds ratios to be overly satisfied with the eHealth system usage for managing patients and other services or 0,498 times (50,2%) less likely when compared to the PrimC. However, these findings were not statistically significant. This means it cannot be sure that these findings

were not a result of an error, chance, or other factor. Furthermore, looking at the Nagelkerke R-squared value, which was 0,858, suggests that the independent variables included in the multiple logistic regression analysis model explained 85,8% of the variation seen in the ORS-EHS. Furthermore, by looking at the overall P-value of the multiple logistic regression model which was P=0,000<0,05, meaning that the model was statistically significant, and as such, it was confirmed that there was sufficient evidence to reject the null hypothesis which the ORS-EHS will not be affected by the other variables in this study in favour of the alternative Ha.

5. Discussion

This study explored the ORS-EHS. Furthermore, as there are different requirements in using the system between PSH, it led to variable satisfaction among the types of physicians in the various healthcare levels.

The system presented a novelty in the technological world with the goal to strengthen overall healthcare and improve physician-patient communication (Table 2). Adding to this, it comes with new opportunities and features for managing patients (Tables 3–5) [32, 33].

The implemented eHealth system "Moj Termin" had the potential to grow with many improvements with the main goal to lessen the physicians' burden in doing additional administrative work and raise the overall satisfaction of the patients [33]. Considering the working experience of the medical personnel presents the perfect testing environment on how to make further improvements (Table 1). The physicians as the system's users are knowledgeable on what was missing or required to be implemented into the current infrastructure [34]. Implementation of an eHealth system would surely add to the modification of the workflow process of the MedP, leading to some medical personnel being dissatisfied with its usage due lack of consistency of other professionals in filling the patients' information and data [21]. Many MedP were not satisfied with how much time they had to spend on administrative work to input data into the system instead of practicing medicine [23]. This leads to increased levels of unnecessary stress at their workplace in fear of losing, or not improving their medical capabilities [24]. Government officials and the medical authorities have the power to approve systems integrations, not having to worry too much about the safety and quality of the sensitive information of the patients [32]. Furthermore, other developing countries that were trying to improve their overall healthcare could benefit from this study's findings as it was administered to PSH (Figure 1).

Lack of IT infrastructure at health facilities was identified as presented in other studies (Table 5 and 7) [20, 25, 26, 27, 35]. Furthermore, training on systems' usage was necessary for the new generations of MedP (Table 5).

There were also non-controllable factors that influenced the level of satisfaction in using the system (like, time spent daily working on the system by the physicians instead of dedicating to patients and practicing medicine) (Table 6, 7, and Figure 2) [36]. Additionally, system blockages or crashes and the technical support personnel initiating updates during work hours led to frustration for the end-users and reduced their satisfaction level (Table 6 and 7) [37].

The findings revealed that satisfaction was more lacking from the PrimC than from the SecC. The PrimC were not satisfied with the limitations in an overview of the patient's health records and the provided free scheduling terms of the specialists. They were wasting time by checking the free schedules for referrals and were lacking communication with secondary and tertiary care. The general practitioners' viewpoints on improving the healthcare services and features of the system were significant for further development [38]. Additionally, during the COVID-19 pandemic, all the physicians pointed out the practical use of eHealth for patient management, and with their help the disease spread was reduced to a minimum (Tables 3 and 7). In overall satisfaction rating in using the system for patient management and other services, the participants of this study were satisfied with the opportunities and possibilities of such technological advancements in healthcare (Figure 4 and Table 3).

Considering these results, when designing or improving the existing functionalities of the systems in the future, the requirements of security and privacy issues in Healthcare 4.0 should be considered [39].

6. Conclusion

This study identified several factors that influenced the overall satisfaction in using an eHealth system for patient management in R.N. Macedonia. The participant's opinions were very important in the overall satisfaction of healthcare on a national level. As a developing country in this area, and to keep pushing forward and improving, the need to collaborate with MedP was necessary. This was their work field, and they knew best from experience what needed to be changed or what was missing in the system.

These uncovered results need to be seriously considered by the medical authorities and the policymakers to achieve further advancements and evolve eHealth systems like "Moj Termin", and similar. The findings highlight the need for better security and privacy safeguards during eHealth systems usage. Integration of privacy and data security into the national healthcare and medical information systems has significant impact on user interaction and perception. Thus, continuous structuring, analysis, improvement, and monitoring are required. This field belongs to the MedP and they can provide the best insights into successful system usage. The satisfaction level of the physicians, especially during pandemic times, like COVID-19, was crucial for further improvements and developments of overall healthcare.

6.1. Limitations and Future Work

One of the limitations of this study was the focus on the eHealth system "Moj Termin" usage in R.N. Macedonia with the eHealth digital infrastructure still in its early phases of

development. The system holds all the health data regarding the electronic referrals and prescriptions for the patients as its main core. This provides new ways for data analytics in healthcare and implicates improvements in using the large amount of data that is being collected. Further research is required to explore a cross-country comparison that would steadily lead towards new improvement opportunities.

Secondly, the sample used in this study was limited to only PSH physicians and cannot provide the full representation of all physicians. As such, further research is needed to additionally explore the boundaries of the different eHealth systems that are functioning in other more developed countries, research the views of a much larger population of technical and MedP on the topic at hand, how to provide additional upgrades to the system, and which directions for proper development of the eHealth systems should be taken. Adding to this, an investigation of data interoperability standards for analysing user satisfaction would be necessary, as the operation of these systems is impacted even with a small modification in one of these protocols that may fulfil the needs of healthcare providers in terms of functionality.

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