



저작자표시-비영리-변경금지 2.0 대한민국

이용자는 아래의 조건을 따르는 경우에 한하여 자유롭게

- 이 저작물을 복제, 배포, 전송, 전시, 공연 및 방송할 수 있습니다.

다음과 같은 조건을 따라야 합니다:



저작자표시. 귀하는 원저작자를 표시하여야 합니다.



비영리. 귀하는 이 저작물을 영리 목적으로 이용할 수 없습니다.



변경금지. 귀하는 이 저작물을 개작, 변형 또는 가공할 수 없습니다.

- 귀하는, 이 저작물의 재이용이나 배포의 경우, 이 저작물에 적용된 이용허락조건을 명확하게 나타내어야 합니다.
- 저작권자로부터 별도의 허가를 받으면 이러한 조건들은 적용되지 않습니다.

저작권법에 따른 이용자의 권리는 위의 내용에 의하여 영향을 받지 않습니다.

이것은 [이용허락규약\(Legal Code\)](#)을 이해하기 쉽게 요약한 것입니다.

[Disclaimer](#)

THE PERCEPTION OF PRIMARY HEALTH
CARE'S PHYSICIANS IN ADOPTION OF
ELECTRONIC HEALTH RECORD-
TIMOR LESTE

BARRETO ADELIA MARIA MONIZ

Graduate School of Public Health

Yonsei University

Department of Global Health Security

Division of Global Health Security Response Program

THE PERCEPTION OF PRIMARY HEALTH
CARE'S PHYSICIANS IN ADOPTION OF
ELECTRONIC HEALTH RECORD-
TIMOR LESTE

Directed by: Professor Sunjoo Kang

A Master's Thesis

Submitted to the Department of Global Health Security,
Division of Global Health Security Response Program
and the Graduate School Public Health of Yonsei University

in partial fulfillment of the
requirements for the degree of

Master of Public Health

BARRETO, ADELIA MARIA MONIZ

December 2020

This certifies that the Master's Thesis
Of Barreto Adelia Maria Moniz is approved.



Thesis Committee Member: Sunjoo Kang



Thesis Committee Member: Hee Chul Oh



Thesis Committee Member: Sang Sook Beck

Graduate School of Public Health

Yonsei University

December 2020

DECLARATION

I, **Barreto Adelia Maria Moniz Barreto**, hereby declare that the research “**The Perception of Primary Health Care’s Physicians in Adoption of Electronic Health Record- Timor Leste**” is submitted as a thesis for my competition of my Master’s Degree of Public Health in Global Health Security Response Program at Yonsei University, Seoul and it fully results of my investigation, all idea, references, and content have been acknowledged. I also certify that the result of this study has not been submitted in any degree and neither currently submitting in a candidate of any degree.



Barreto Adelia Maria Moniz

Seoul, November 16th, 2020

DEDICATION

In memoriam of Mama Amanda, may her soul Rest Peacefully.

To my beloved sons: Na'i Suro and Musolo

To my husband: Jimmi

To my parents: Anacleto and Julieta

To my brothers and sisters,

And to all people who direct and indirectly support me within their pray

***“ Wherever the journey of your life takes you, your heart never be part from your beloved one, and
it is your family”***

ACKNOWLEDGEMENTS

First and foremost, my eternal gratitude to Almighty God and Holy Merry for giving me the strength to culminate in my study and for taking care of my family and me. My appreciation also to the Ministry of Health of Timor Leste and Korea International Cooperation Agency (KOICA) for allowing and allowing me to enrich myself in education for a bright future.

My immeasurable admiration to Yonsei University for the opportunity to be part of the prestigious University, be Yonseian, and be an Eagle who can lead the future. My gratitude to Prof. Lee Myungken (Former Head of GHSA Program), Prof. Han Whiejong (Chief of GSHA Program), Ms. Kim Hayun (TA), Ms. Kim Hwayoung as KOICA coordinator, and all the team member of the Public Health Department.

I also would like to acknowledge my advisors, particularly, Prof. Kang Sunjoo, her dedication, support, guidance, encouragement, and knowledge sharing during the challenging time. My appreciation to my committee members Prof. Ohrr Heechoul and Prof. Sang Sook Beck. My special mention to sister Yeunsoo Yang for guidance, support, time spent on this investigation's success. My sincere thanks to all friends who have been actively supported in thesis writing, immense appreciativeness to all the participants providing their time and effort to be part of this research.

My deepest gratitude goes to my parents Anacleto and Maria Julieta, brothers, and sisters: Titty, (El Guzo, Abot, Dahu, Anay, and youngest brother, Ajhu, and all my nephews, and nieces from Maliana and Same. Thank you for taking care of our beloved K' Khele and Juliet. Also, my profound gratitude especially to my parents and sisters-in-law and their family, for their understanding and support during my study journey. Thank you so much for taking care of my husband and my kids during a difficult time and for supporting me to continue till my last battle.

I offer my special gratitude to the love of my life, my both sons Na' I Suro and Musolo, for being wonderful children, intelligent and, staying healthy during my study process. Their pure love has been the fundamental support and inspiration. And last but not the least, my deepest thanks to my special and favorite person, my lovely husband Jimmi Bruno de Oliveira, for his infinite love, patients, courage,

and the strength given to me during my stay in foreign countries by taking care of my children and my parents. He is not only a husband but also a true friend in good and bad time.

Adelia Barreto

TABLE OF CONTENTS

TABLE OF CONTENTS	i
LIST OF FIGURES	iii
LIST OF TABLES	iv
LIST OF ABBREVIATIONS	v
ABSTRACT.....	vi
CHAPTER I: INTRODUCTION	1
1.1. BACKGROUND.....	1
1.2. PRIMARY HEALTH CARE AND ELECTRONIC HEALTH RECORD IN TIMOR LESTE ..	2
1.3. STUDY OBJECTIVE	4
1.4. RESEARCH QUESTIONS	4
1.5. SIGNIFICANCE OF THE STUDY	5
1.6. PERSONAL INTEREST	5
1.7. HYPOTHESIS	5
CHAPTER II: LITERATURE REVIEW.....	6
2.1. ELECTRONIC HEALTH RECORD	6
2.2. TECHNOLOGY ON IMPLEMENTING EHR.....	8
2.3. BENEFIT OF THE ELECTRONIC HEALTH RECORD	9
2.4. BARRIER OF EHR IMPLEMENTATION	11
2.5. THE SATISFACTION OF EHR UTILIZATION.....	12
2.6. RESEARCH FRAMEWORK OF EHR ADOPTION	12
CHAPTER III: METHODOLOGY	13
3.1. STUDY DESIGN	13
3.2. STUDY POPULATION.....	13
3.3. INSTRUMENT AND VARIABLES	14

3.4.	DATA COLLECTION.....	15
3.5.	DATA ANALYSIS	16
3.6.	ETHICAL CONSIDERATION.....	16
CHAPTER IV: RESULT		17
4.1.	SOCIODEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS.....	17
4.2.	DIFFERENCES OF THE PERCEPTION OF BENEFIT, BARRIER, SATISFACTION AMONG SOCIODEMOGRAPHIC CHARACTERISTICS.....	19
4.3.	THE BENEFIT ON EHR IMPLEMENTATION.....	19
4.4.	THE BARRIER ON EHR IMPLEMENTATION.....	22
4.5.	THE SATISFACTION ON EHR UTILIZATION	22
4.6.	THE RELATIONSHIP BETWEEN SATISFACTION AND RELATED FACTORS	26
4.7.	THE CORRELATION T BETWEEN BENEFIT, BARRIER, AND SATISFACTION	28
4.8.	FACTORS INFLUENCING EHR SATISFACTION	29
CHAPTER V: DISCUSSION		31
5.1.	THE SOCIODEMOGRAPHIC CHARACTERISTICS	31
5.2.	THE PERCEPTION OF BENEFIT, BARRIER, SATISFACTION ACCORDING TO SOCIODEMOGRAPHIC CHARACTERISTICS.....	32
5.3.	THE BENEFIT OF EHR ADOPTION.....	33
5.4.	THE BARRIER OF EHR IMPLEMENTATION	34
5.5.	THE SATISFACTION OF EHR UTILIZATION.....	35
5.6.	LIMITATIONS	36
5.7.	DIRECTIONS FOR FUTURE RESEARCH	36
5.8.	RECOMMENDATIONS	36
CHAPTER VI: CONCLUSION		38
APPENDIX.....		54
	Appendix 1. Ethical Clearance	54
	Appendix 2. Informed Consent	55
	Appendix 3. Questionnaire.....	57

LIST OF FIGURES

Figure 1: Research Framework of EHR adoption.....	12
Figure 2: The Map of Timor Leste.....	13
Figure 3: The Correlation Coefficient between Satisfaction and Benefit.....	28
Figure 4: The Correlation Coefficient between Satisfaction and Barrier.....	28
Figure 5: The Correlation Coefficient between Benefit and Barrier.....	28
Figure 6: Scatter P Plot of Regression Standardized Residual.....	30

LIST OF TABLES

Table 1: Sociodemographic Characteristics Variables	15
Table 2: Social demographic Characteristic	18
Table 3: Perception of Benefit, Barrier, Satisfaction According to – Sociodemographic Characteristics	20-21
Table 4: The Frequency, percentage, and Cronbach’s alpha of the Benefit on EHR Adoption.....	23
Table 5: The Frequency, percentage, and Cronbach’s alpha of Barrier on EHR Implementation.....	24
Table 6: The Frequency, percentage, and Cronbach’s alpha of Satisfaction on EHR Utilization.....	25
Table 7: The Correlation between Satisfaction and other factors related to EHR adoption	27
Table 8: Multiple Regression Analysis of Factors Related to the Satisfaction of EHR Utilization.....	30

LIST OF ABBREVIATIONS

DHS	= District Health Center
eHealth	= Electronic Health
EHR	= Electronic Health Record
ePHRs	= Electronic Personal Health Records
GP	= General Physician
HIT	= Healthcare Information Technology
HIPAA	= Health Insurance Portability and Accountability Act
HIRA	= Health Insurance Review & Assessment
HP	= Health Post
ICT	= Information and Communication Technology
MoH	= Ministry of Health
PHC	= Primary Health Care
SnF	= Saude na Familia
SPSS	= Statistical Package for Social Science
TL	= Timor Leste
UHC	= Universal Health Coverage
WHO	= World Health Organization

ABSTRACT

Introduction:

Electronic health record becomes the 21st-century innovation trend in developing countries. This digital system provides accurate, real data in real-time access, decreases paper-based documentation, enables access to patient's previous health status and easy for follow-up, reduces of health status duplication and, allows accessible data sharing among health professionals in the primary health care setting.

Purpose:

This research aimed to identify and understand the perceptions of primary health care physicians in adopting the electronic health record in the Timor Leste context, specifically to identify benefit, barrier, and satisfaction of this system.

Method:

A cross-sectional online questionnaire survey was based on the study objectives administered to the medical doctor in primary health care level in Timor Leste who, received an electronic health record training and had an opportunity to utilize in the period between 2015 to 2017. The form was composed of 4 sections (sociodemographic information, benefit, barrier, and satisfaction), rated on a five-point Likert-scale. The samples were calculated by G*Power 3.1.9.4. The reliability was tested by Cronbach's alpha. The statistical analysis with $\alpha = .05$, $CI = 95\%$.

Result:

The online questionnaire was distributed among 193 general physicians with, 84.5% responded rates. Most of the participants had young ages that acknowledge the importance of EHR in the primary health care sector. The majority perceived the most benefit of the EHR: decreased paper-based documentation, facilitated accessibility to patient data recorded previously, provided real-time data access, and reduction on health data duplication.

However, barriers remain on the eHealth system indicated by a medical doctor, such as the necessity of frequent revision to technological development, compatibility of web browser, connectivity, and cost in adopting it.

Overall, the physician in primary care settings perceived satisfaction toward the digital system. The eHealth was useful, appropriate, and essential for their work area, improved patient safety, elevated quality care, and enabled better communication among health professionals.

There were statistically significant differences among ages toward benefit, the ability to use computer toward barrier and place using computer toward satisfaction of EHR usage.

The positive slope of the benefit ($\beta = .498$; $t = 11.361$), had a statistically significant predictor on satisfaction on EHR implementation but barrier had negative statistical significance toward satisfaction ($\beta = -.086$; $t = -1.794$). The adjusted ($R^2 = 51.0\%$).

Conclusion:

The satisfaction of EHR was influenced by the benefit perceived while utilizing the system and reducing the barrier. Political commitment, financial support, friendly user application, improved quality of internet connection and had a positive attitude toward EHR were crucial for successful implementation.

Keywords:

Perception, Primary Health Care, Medical Doctor, Saude na Familia, Electronic Health Record, Timor Leste

CHAPTER I:

INTRODUCTION

BACKGROUND

In 1960, primarily introduced the notion to utilize electronic health records (EHR) in the medical world, Larry Weed with the core objective was to record all the patients' data. In 1972's, the government sector and visionary organization were the sectors that showed a positive response when the Institute of Regenstrief, for the first time, elaborated on the EHR but contrary to the physician in private health due to high price.

In the 1990s, when surging the development of the internet, provided a significant impact in the service of electronic health records became readily available comfortable on online data sharing. The EHR was not widely implemented despite several suggestions made by the institutes of Medicine in 1991.

After several years passed, in 2000, due to internet connection and web- software utilization, the electronic health records' implementation became remarkable, and many countries started to adopt it. In Canada, the adoption of electronic health records began in 2001 by Canada Health Infoway [1]. In the USA, in 1996, the incorporation of HIPAA (Health Insurance Portability and Accountability Act) in the United States decided to apply the EHR due to equity, accessibility, safety, and confidentiality the EHR.

The EHR nationwide implementation was initiated by former President Barack Obama's mandate on February 17, 2009 for economic stimulus on the American Recovery and Reinvestment Act of 2009 (ARRA) where included Health Information Technology (HIT) which called HITECH Act. Health Information Technology for Economic and Clinical Health Act. The HITECH Act with an objective to promote and expand eHealth implementation by health providers [2, 3]. Denmark put in action the establishment of the National Patient Registry in 1977, and in 2000 all the comprehensive data were available [4]. Besides that, New Zealand's government took the initiative adopted a 'single' nationwide electronic health record started in 2015 [5].

In Korea, the electronic medical record was legalized in 2003 with other two systems (telemedicine and e-prescription for pharmacy [6], and Korea had been the country with very excellent performance in healthcare Information, and Technology Communication (ICT) and the eHealth application in 2017 reached 96.3% in hospitals and 95.7% in clinics [7].

In 2006, Rwanda and Kenya adopted the electronic health record called OpenMRS, more focused on HIV/AIDS and TB patients. This application was also implemented in Tanzania and Uganda [8].

The adoption of electronic health records had been the innovative adoption worldwide, 66% mostly in developed countries, 52% in the upper-middle-income and 35% in the lower-income countries, and 15% in low-income countries [9].

PRIMARY HEALTH CARE AND ELECTRONIC HEALTH RECORD IN TIMOR LESTE

Timor Leste is one of the newest countries in millennials, with a total population of 1,269,000 million, life expectancy at birth M= 66 and F= 70, and a medical doctor ratio of 0,7/1000 [10]. Timor Leste suffered from 70% of massive infrastructure destruction in 1999. While rebuilding the country after complete independence in 2002, Timor Leste started to rebuild the health system by producing more health professionals and a mostly medical doctor by bilateral cooperation between Cuba and East Timor [11].

As a newborn country in an era of digitalization, East Timor is also concerned about the ICT infrastructure and connectivity however, the digital devices remain challenges for the country. Step by step was done in the national development process, therefore in 2017, at least 97% of the population had been covered by the 3G network [12].

Timor Leste, despite all the challenges, the country committed to achieving the UHC. Thus, on April 29th, 2015, the VI Constitutional Government of Timor Leste launched a program named ‘‘Saude na Familia’’ Program (English: *Health in the Family Program*), and then on July 22nd, 2015, the country launched for the first-time of the utilization of the Electronic Health Records (EHR) Program in Dili (capital of the country) that posteriorly expanded to the other 12 municipalities level [13]. The *Health in the Family Program* was adopted from Cuba's primary health care intervention named

“dispensarización” (which in English means stratification) consisted of 3 types of visits (integral, regular, and epidemiology visited). The main objective was to provide comprehensive primary health care by a house-to-house visit from urban to extremely remote areas.

The implementation of this program fundamentally because of the health facilities’ utilization was more likely beneficial for the better-off community [14]. In Timor Leste, despite a free health care service, the population most likely refused to seek health in the health facilities due to the geographical issue, economic hardship (out of pocket expenditure), and health professional behavior toward the patients [15]. Hence, to fulfill the vision of “*A healthy Timorese in a healthy Timor Leste*”, the government decided to bring health to all population across the country to ensure Universal Health Coverage (UHC) to all in an urban and rural setting with comprehensive package care where 70% of Timorese living in rural area through the dispensarización [16].

The dispensarización (stratification) is a preventive, continuum, dynamic, integral, individual, universal, and in team activities provided by the health worker in primary health care level focus on clinical, epidemiologic, and social sectors.

When visiting the communities' residences, the health professional provided basic primary health care service, promotion, and prevention, including some curative area intervention. During the visiting session, the health workforce team not only gathered personal health status but all the public health information, including family health status, the environment, family income, nutrition status, the utilization of latrines, type of water for daily consumption, level of education, and other determinants of health.

The result of home visits could be finally used to diagnose every individual based on their health diagnostic in 4 different strata. **Group I:** the person whose health condition is healthy. **Group II:** the person with risk or an unhealthy lifestyle. **Group III:** the person with diseases (chronic disease and some infectious disease with a considerable duration). **Group IV:** the disabled person. Based on the stratification group, each person will receive a future visit called the regular visit [17].

Consequently, in 2017, the ‘‘ Saude na Familia’’ program reached 94% of households visited by the health professionals and electronically registered 82% of individual health data [13].

To support the program implementation, the government announced a policy of the EHR in all the territory of Timor Leste were likely applied also to private health care setting (No. 51/2017, December 20th) with dispatch number N.º 08/2018/I/MS [18].

Unfortunately, starting from July 2017- September 2020, Timor Leste suffered from the impasse political [19] were implicated in the eHealth application to be implemented smoothly due to the financial issue as one of them for the program sustainability during that time. Consequently, in January 2019, based on the dispatch number N.º 02/2019/I/VMS, the government decided to ‘‘ stop ’’ implementing of the eHealth system in East Timor [20]. In late August 2020, the adoption of EHR was officially reactivated by the new Minister of Health in her speech right after the nomination. Therefore, based on the reasons mentioned before, this research only applied for 2015- 2017.

STUDY OBJECTIVE

This research’s principal objective was to understand the perception of primary health care physicians in the adoption of the electronic health record in Timor Leste.

The specific aim was to identify the benefit, barriers, and satisfaction of the using of electronic health records in primary health care levels.

RESEARCH QUESTIONS

The central research question was based on the study’s objective to understand the perception of the general physicians’ perception related to the implementation of the electronic health record in Timor Leste, specifically at the primary health care level. Therefore, the sub-questions were:

1. What were the benefits provided by electronic health records in a primary health care setting?
2. What were the barriers to implementing the electronic health record in the Timor Leste context?
3. How did primary health care physicians perceive the satisfaction in adopting the electronic health record?

SIGNIFICANCE OF THE STUDY

The findings of this study would be contributed to the Ministry of Health in informing health care leaders of the leadership strategies necessary for facilitating successful engagement in health reform, provided information to the policymaker, to the health professionals itself as the end-user of the system, to develop a strategic plan based on “evidenced-based” provided by EHR. Hence, the Timorese population could be benefited from a health care service that was holistic, comprehensive, and innovative.

PERSONAL INTEREST

The application of this study was fundamentally founded on the principal investigator's work experiences during the electronic health record implementing. As one of the pioneers and system designers (manually), the development of the guideline, therefore, surged the passion toward the research tittle.

HYPOTHESIS

The acceptance of the general physicians in the adoption of EHR would perceive satisfaction that will be influenced by the benefit of the eHealth system and would be impacted by reducing of the barrier of system implementation.

CHAPTER II:

LITERATURE REVIEW

2.1. ELECTRONIC HEALTH RECORD

On frequent occasions, people understood and defined the electronic medical record (EMR) as the other name of electronic health records (EHR), but it is not. The EMR is the health data information of a person compiled by a medical doctor and other professionals in a similar institution. The EHR is medical health information documented, including the laboratory test result, prescription of medicine utilizing the Healthcare Information Technology (HIT) comprehensively between diverse healthcare institutions [21].

The adoption of electronic health records (EHR) is an innovative initiative the government takes to ensure the security of the population's information. The EHR's existence is a way of interaction between human resources in the health system [22] in achieving the ‘‘Universal Health Coverage’’ [23].

In the pre-implementation level, firstly and foremost, the advocacy and sensibilization, capacity building how to use the application, and extra support from the outer part to fill challenges are needed [24-26]. Therefore, the critical strategy for the successful implementation is the user's engagement fundamentally physicians in the design, customization, and the evaluation of plan strategies to prevent the negative outcome that can respond to the health provider expectation [26-29].

The attitude, behavior, and acceptance of the end-users are crucial in adapting the system [30-33] that includes patients [34]. The agreement on using the EHR is also affected by computer literacy among health worker, professional experiences, and age [32, 35, 36].

In a country like United States, after the HIPAA Act application in 1996 for data security and confidentiality [37], the violations are punishable by fines of \$250,000 and 10 years of incarceration [38]. The government-endorsed health institute for the application of EHR by applying incentives policy; in 2009, whereas part of the Health Information Technology for Economic and Clinical Health

(HITECH) Act, the federal government set aside \$27 billion for the application of the EHR where had positively adopted [39]. Therefore, the country implemented a strong incentive policy to health provider. According to Centers for Disease Control and Prevention (CDC) the EHR Meaningful Use now named as Public Health and Promoting Interoperability Programs. This defined by the utilization of eHealth records in meaningful manner (e-prescribing); the health information shared to increase the quality of care, safety, efficiency, minimizing health disparities, patients and families engagements, better coordination, improve population and public and personal health data protection and confidentiality [40]. Based on the report of 2017, 85.9% office-based physicians using an EMR/EHR system and 79.7 % of office-based physicians had adopted certified health IT [41].

In New Zealand, the government enthusiastically participated in developing healthcare ICT, provided guidelines and policy for better implementation. The country applied standardization on ICT utilization, and health facilities adopted the eHealth system [42].

Australia had adopted the EHR nationally since 2000. In July 2012, launched the Personally Controlled Electronic Health Record (PCEHR) system and started on 2016 known as My Health Record; the country had been worked hard on the development of regulation regarding cybersecurity, which provides a guideline to the patients on how to access and secure their health information. To widely implement the EHR, the policy of the Practice Incentives Program was implemented by the Australian Government [43]. My Health Records is an online information where gather personal information that can be accessed by health providers and individuo himself [44].

In Taiwan, the citizen can choose the health aid type that they need because of the 99.9% National Health Insurance was covered. Therefore, to prevent the overuse and unmet need of health service, the government started to implement the National Electronic Medical Record Exchange Centre (EEC) in November 2009 [45]

In South Korea, in 2010, the EHR implementation was higher than in the US (37.2% vs. 15.1%) but, in 2015, after the HITECH Act, the percentage of EHR adoption was higher in the US (58.1% vs. 75.2%) [46]. However, in 2017 Korea maintained the status of high-rate health care ICT with the

completion of eHealth systems, 96.3% in hospitals and 95.7% in clinics [7]. On the other hand, the Health Insurance Review and Assessment Service (HIRA) existence took Korea to achieve the UHC [47].

Therefore, the lesson learned from previous countries mentioned in the adoption of EHR, the political commitment, and the financial support for the cost of training, maintenance and continuum implementation of the digital system played an important role [32, 48]. Essential points that need to address were the regulations and laws related to accessibility to patients' health data information and data security [49, 50].

Some countries such as Canada, Sweden, United States started implementing ePHRs (electronic personal health records) as a web-based application and patient-centered that enables self-access or authorized access to the health status, securely, helping individuals on self-management [51]. This definition surged after the *Connecting for Health Personal Health Working Group - Markle Foundation, 2003*.

The application of the ePHRs allows patients as the owner of the information to access to their health data because of their optimistic response toward the digital system [52, 53]. Hence, they have the right to access their health information record appropriately that could be obtained through early advocacy, and the knowledge sharing how to manage the information required to prevent misunderstanding and for successful system application [54-57].

2.2. TECHNOLOGY ON IMPLEMENTING EHR

The technology's concern in the health system needs to be integrated and interoperability by the end-users, followed by the standards and regulations. The characteristic of the system requires to be friendly to use and manage, the consistency while be managed, secure to use and to patient data safety and can be accessed anytime and everywhere with IT infrastructure availability were necessary for fruitful implementation [58] [59, 60] [61, 62]. There are three aspects necessary to be discussed in the utilization of electronic health records.

Firstly, the hardware is the physical part of the computer system, such as a screen (phone, monitor, or tablet). It is composed of two: internal hardware (RAM, modem, central processing unit (CPU), sound and video card, power supply, etc.) and external hardware (printer, mouse, projector, keyboard, USB drive, etc.) [63, 64]. The availability of these items are not the primary concern, but its sustainability [58].

Secondly, the software is defined as “instruction” that allows the consumer to navigate the computer, in general, known as an application that can be downloaded in the computer store or via the internet [63, 65].

Thirdly, the internet connection is a revolutionary design of a system that allows different computers from different geographical areas to interlinkage [65]. This connection is influenced by many factors, including people who use it [66], the variety of wired and wireless, the speed of the internet (3G, 4G, 5G), and the fiberoptic [58].

2.3. BENEFIT OF THE ELECTRONIC HEALTH RECORD.

Medical doctors are most likely to be the principal user of electronic health records while aiding the patient this may because of the benefit sensed on the EHR adoption. This activity can provide a valid code if linked to the International Diseases Code (ICD) for a better diagnostic [67].

The application of EHR fortify the primary health care service [68], encouragement in designing plans [69], elevate the accessibility and excellent support to implement various strategic plans [70]. The EHR supports the detection of affected people with severe diseases [71], provides better coordination, data sharing and improves clinical’s judgment among health institutions [72]. In health facilities environment, the EHR elevate the quality of health services delivery [73] and enables patients “follow-up” [74, 75].

Besides that, a proper digital record of health status is essential in a surveillance system that can be a warning system to the numbers of infections occurred in a health facility [76, 77], provide data on incidence and prevalence of any disease in a specific community[78], also can be utilized as a

notification system and reminder for public health level and clinicians for better preparedness, detection, and the response of any threat [79-81].

However, the electronic health record considered as a tool to monitor the high-risk populations related to their lifestyle [82, 83], allow mental health care improvement, elevate maternal-child care, specific disease monitoring [84-86], and can be used as a baseline for the future strategic plan to another institute in future research and clinical trial process [87-91].

Moreover, the benefit also goes to others health technical staff such as radiologist in time-saving on reporting any result [92], laboratories department to control and monitoring testing request and service [93], support pharmacists to stockpiling of medicine needed by health facilities, and to calculate the dosage [94, 95]. For instance, nurses are also the beneficiary of the system while aiding patients [31] and in the emergency department to do the quick screening to specific patients and very useful in an exceptional momentum [96, 97].

At an administration level, through the electronic health record, health facilities managers can know the duration of a physician spent his/her time in a workplace in a different department [98-100]. The EHR allows prompt report and data distributing [101] and provide information for a better strategic plan for the upcoming approaches such as patients' care activities and bureaucracy [102, 103]

In primary health care service level, the electronic health record is crucial to elevate the quality service due to a comprehensive database; based on the group (stratification) a patient belongs to as well as the diseases [104], communicating information among the vast number of health professionals [105]. User's abilities on technology, organization leadership endorse, and a friendly technology increase the perception of its positiveness [106].

On the other hand, patients also are beneficiaries of the electronic health record adoption on forecasting the upcoming health condition and disease gravity [107]. Patients can receive health literacy by accessing EHR related to diseases affected [108], but their concern the data security remains [109]. Furthermore, the early introduction of EHR in academics will add a point on the positiveness of students

toward the system and their skill in the recording and toward medicine and innovation technology implemented in the health system [110] [111] [112, 113]. Finally, the EHR is merely beneficial to the health sector and other government institutions [114, 115].

2.4. BARRIER OF EHR IMPLEMENTATION

The health professional initiatives and behavior on accepting the innovative change was one of the factors to apply the electronic health record (EHR) in a health facility [116] besides the inappropriate quality of infrastructure, interaction, low application advancement [117], lack of political commitment, technology literacy, administrative issues and financial cost for the sustainability and incentives were driver factors to reject the program implementation [46, 118, 119]. The policy and standard regulation on adopting the EHR also affecting how the end-users agreed on applying it [106].

The concern of end-users about the patients' data confidentiality found in many works of literature related to the data security and confidentiality of the patients' health record where the data gathered which essential to be manipulated by authorized persons due to the content of the sensitive information were included health status, diagnostics, treatment, and all the laboratories results [120, 121]. Physicians were aware of the accessibility of the patients' data by illegal people will abuse the data then bring negative implications to health data confidentiality [122]. Because when users and patients are losing confidence in it, the EHR system will threatening eHealth implementation [123].

Another barrier was the decrease in the health provider, and health consumers' interaction affected by adopting the application [49, 124, 125]. The time consuming on the health data record, workload considered as obstacles [126, 127] and variety level of skill between physician with less and high experiences, training on using EHR and the type of services provided [128-131] that finally implicate patients' safety in the diagnostic process, prescribing treatment, and adverse event on treatment decided by the physician [132]. Other barriers mentioned in the World Health Organization survey on cost-effectiveness, demand, legal, standard, and policy'' [133].

2.5. THE SATISFACTION OF EHR UTILIZATION

Diverse country is implementing the EHR to improve the health care performance [134]. Therefore, its application has supported health professionals in their experiences aiding people, reduces cost, and elevates community health [135]. Consequently, the medical doctor satisfaction and usefulness perceived toward electronic health records related to the training received previously impacted providing good quality care [126, 136]. When they applied the system in their workplace, they sensed the pleasure of using EHR because this system supported them ease to culminate in their duty [137] and data recording [130] with an updated software [138] and by including the end-user in designing it [139].

2.6. RESEARCH FRAMEWORK OF EHR ADOPTION

According to lumen on the introduction of psychology, perception is the sensorial ability to realize, organize, interpret, and consciously experience all the information gathered from the environment [140]. The study framework showed us how the interrelation between the medical doctor and the variables of benefit, barriers, and satisfaction thus, how those variables influenced each other. When the medical doctor perceived the benefit, satisfaction raised and impacted the reduction of the barrier then driven the user's positiveness to implement the EHR [31, 141]. Otherwise, when the physicians perceived a barrier, they will directly be affected by the satisfaction of EHR utilization were also affected the benefit sensed on the application utilization [142]. Therefore, medical doctor behavior, attitude, acceptance, and decision in adopting the EHR [126, 143].

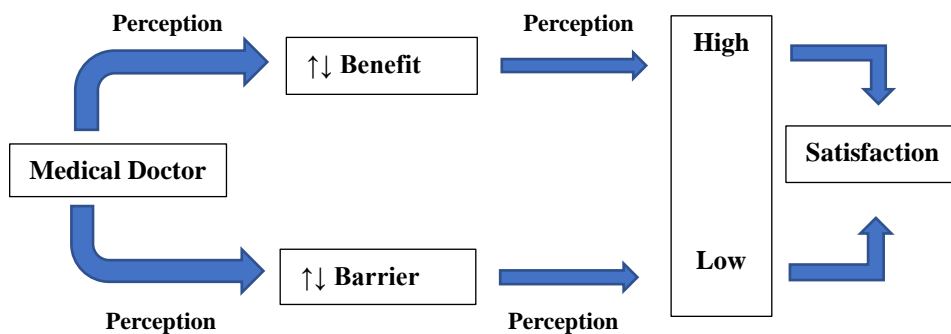


Figure 1: Research Framework: Correlation Between Perception of Benefit Barrier and Satisfaction on EHR.

CHAPTER III:

METHODOLOGY

3.1. STUDY DESIGN

The cross-sectional study, online survey research was to identify the perception of the medical doctor in a primary health care setting in the whole territory of Timor Leste with a total population of 1.269.000 [10], where the health system of the country is composed of 4 regions, 1 National Hospital consider as Tertiary Level, 5 Referral Hospitals (Secondary Level), and 13 District Health Services (DHS), 71 Community Health Center (CHC) and 344 Health Post (HP). This research participants were the health professional workers in the health post, community health center, and district health service, which are classified as Primary Health Care Sector, which is distributed in the whole territory of Timor Leste as shown in the figure (Figure 2).

3.2. STUDY POPULATION

This research applied to the medical professional in the primary health care level in Timor Leste who had been worked under the Ministry of Health of Timor Leste, previously received training in electronic health records (EHR) and had the opportunity to utilize the digital system during 2015-2017 were eligible for this study. Voluntarily accepted to sign the informed consent by clicking “accept” prior continue to participate. The questionnaire was translated to Tetum as the national language. The



convenience sampling method was utilized in this research. The sample size was calculated with G*Power 3.1.9.4, using F test (effect size = 0.15, alpha error = 0.05, power = 0.95). The result determined a minimum of 129 participants required to conduct the investigation although 193 were

recruited considering the dropout rate. After the completed questionnaire was received, a preprocessing step was conducted to exclude participants were not match the inclusion criteria. The sample size was 149 participants.

Figure 2. The map of Timor Leste. Source: [144]. Accessed: 29th/09/20

3.3. INSTRUMENT AND VARIABLES

An online questionnaire was created using an online google form adopted from the study done by *Seçginli, Semra, & Monsen, 2013* [145]. Based on the Oxford Languages definition, a benefit is an advantage or profit gained from something. A barrier is a circumstance or obstacle that prevents movements or access. Moreover, satisfaction is a fulfillment of one's wishes, expectations, or needs, or the pleasure derived from this [146].

The variables composed by the sociodemographic variable, as shown in (Table 1) and closed-ended questions, were applied to the benefit (21 items), barrier (12 items), and satisfaction (12 items), and all the items were posted in the questionnaire attached in (Appendix 3). These (benefit, barrier, and satisfaction) where every statement was measured with the Likert-Scale (5 degrees); 5= strongly agree, 4= agree, 3=neutral, 2= disagree, and 1= strongly disagree.

The "reliability" of the variables (benefit, barrier, and satisfaction) perceived by the respondents was calculated the Cronbach's Alpha score. The benefit was reliable with a scale of .96, barrier with a scale of .88, and satisfaction with a scale of 0.95.

Table 1. Sociodemographic Characteristics

Characteristic	Subitem
1. Gender	M (1), F (2)
2. Age	25-30 (1), 31-35 (2), 35-40 (3)
3. Year of graduation	
4. Year Practicing as a Medical doctor	3-6 (1), 7+ (2)
5. Area of workplace	HP (1), CHC (2), DHS (3)
6. Current workplace Name	
7. Has s a username	No (1), Yes (2)
8. Time spent using EHR daily	Little (1), Enough (2), Many (3)
9. Previous EHR use experience	No (1), Yes (2)
10. Has own computer	No (1), Yes (2)
11. Place using computer	Home (1), Workplace (2), Home & Workplace (3)
12. Training in the EHR system	No (1), Yes (2)
13. The ability to use a computer (writing, internet explorer, and installation of application)	Bad (1), Enough (2), Good (3)

3.4. DATA COLLECTION

The survey was sent directly to the participants via Messenger and WhatsApp were; at the same time, the researcher explained the purpose of the study to the participants, the objective of inform consent, and data collection applications to avoid misunderstanding before starting the survey and required 7-10 minutes. However, ten medical doctors had been piloted to seek the comprehensiveness and the clarity of the questions. During the pilot session, none of the participants required support to answer the question in the questionnaire. Therefore, two days after the pilot, the questionnaire was distributed for data collection from September 21st till the October 8th, 2020. After participants filled out the questionnaire, the result directly collected into the spreadsheet and downloaded to be analyzed.

3.5. DATA ANALYSIS

Data received from the online survey google form were directly gathered and inserted in Microsoft Excel spreadsheets, downloaded, then coded and analyzed statistically using SPSS 25.0. Participants were not met; the inclusion criteria were excluded from the analysis. Descriptive statistics such as frequency, percentages, means, and standard deviation were used to describe the respondents' demographics characteristics. The t-test and ANOVA test were used to seek the differences among sociodemographic characteristics toward variable of benefit, barrier, and satisfaction. Cronbach's alpha analyzed the internal reliability of the measures and Pearson's Correlation to identify the correlation between dependent (satisfaction) and independent variables (sociodemographic characteristics, benefit, and barrier). Finally, the multiple linear regression analysis to identify the predictors' variables relationship with the dependent variable. The statistical significance was set to p -value $< .05$. The 95% Confidence Interval was significantly accepted.

3.6. ETHICAL CONSIDERATION

The ethical approval to conduct this research deliberated by the Yonsei Medical Center Research Review Committee, Institute Review Board (IRB) with registration number 2020-2142-002, and approved number Y- 2020- 0117, on 4th September 2020 till 3rd March 2021. (Appendix 1). The participants' acceptance was obtained when click "accepted" before continued to fill out the questionnaire.

CHAPTER IV:

RESULT

The questionnaire was distributed among general physicians in primary health care in Timor Leste with a responded rate of 84.5% completed responses among 193 where 44 did not respond, 7 excluded for not matched with the criteria, and 7 late on responses.

4.1. SOCIODEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS.

The total of the sample calculated $n=149$ ($M=51.7\%$ and $F=48.3\%$). All those samples received EHR training and had experienced in using EHR between 2015- 2017. Among them the majority with age between 31-35 years old (71.8% , $Mean \pm SD = 34 \pm 0.5$), most likely practiced as medical doctor between 3-6 years ($n=105$, 70.5% , $Mean \pm SD = 6.0 \pm 0.5$).

Among the respondents, the highest frequency worked in a community health center ($n=87$, 58.4%). However, 31.5% ($n=47$) worked in health posts, as shown in (Table 2).

Total participants mostly had username to access the EHR application ($n=129$, 86.6%), and who did not have the username represent ($n=20$, 13.4%). The majority spent less than 2 hours using the EHR system ($n=66$, 44.3%) followed with ($n=54$, 36.2%) spent enough time despite some respondents had own computer ($n=90$, 60.4%). The place where frequently used a computer was in the workplace and home ($n=68$, 45.6%) and overall had good ability in computer management ($n=98$, 65.8%) as shown in the below table (Table 2).

Table 2. Sociodemographic Characteristics
(N= 149)

Items		<i>f</i>	(%)	Mean ± SD
Gender	M	77	51.7	
	F	72	48.3	
Age	25-30	16	10.7	33.6 ± 2.23
	31-35	107	71.8	
	36-40	26	17.4	
Year Practicing as Medical doctor:	3 to 6	105	70.5	2.3 ± 0.45
	7+	44	29.5	
Area of workplace:	Health Post	47	31.5	
	Community Health Center	87	58.4	
	District Health Services	15	10.1	
Has a username:	Yes	129	86.6	
	No	20	13.4	
Time spent using EHR daily:	Little (2h)	66	44.3	
	Enough (2-4)	54	36.2	
	Many (4-6/more)	29	19.5	
Has own computer:	Yes	90	60.4	
	No	59	39.6	
Place using a computer:	Home	21	14.1	
	Workplace	60	40.3	
	Home and Workplace	68	45.6	
The ability to use a computer (writing, internet explorer, and installation of application):	Bad	3	2	
	Enough	48	32.2	
	Good	98	65.8	

* *f* = Frequency

4.2. DIFFERENCES OF THE PERCEPTION OF BENEFIT, BARRIER, SATISFACTION AMONG SOCIODEMOGRAPHIC CHARACTERISTICS

The participants (N=149) sociodemographic according to the perception of the benefit, barrier, and satisfaction of EHR implementation in primary health care level among general physicians as shown in the table below (Table 3). Related to the benefit perceived using EHR, we found statistically significant only in the age ($t= 3.30, p= .04$). However, participants' ability to use a computer (writing, internet explorer, and installation of application) were statistically significant toward barrier of EHR implementation ($t= 4.80, p<.001$). In contrast participants satisfaction was only statistically different on the place of using a computer ($t= 3.41, p= .003$). See (Table 3).

4.3. THE BENEFIT ON EHR IMPLEMENTATION

Since all the variable of benefit were designed with a positive declaration tendency on the benefit, scale 5 means strongly agree and scale 1 means strongly disagree. The participants were most likely had a positive response to the EHR utilization as shown in (Table 4). Overall 149 respondents perceived the benefit of the electronic health implementation with highest frequency and percentage strongly agree and agree in item such as: decreased paper-based documentation ($n= 114, 76.5\%, Mean+SD = 4.7\pm 0.5$), easy access to information from past medical records ($n= 109, 73.2\%, Mean+SD = 4.7\pm 0.5$), provide access to patients' data and analysis ($n= 103, 69.1\%, Mean+SD = 4.7\pm 0.5$), enabling patients follow up ($n= 100, 67.1\%, Mean+SD = 4.7\pm 0.5$), reduction of duplication on patient health information ($n= 100, 67.1\%, Mean+SD = 4.6 \pm 0.5$). However, less than 100 respondents accepted the items such as provides quick and reliable access to scientific research, provides better data, and make it easy to transfer data with similar frequencies and percentages ($n= 98, 65.8\%$), but differed between Mean+SD. The full result showed in (Table 4).

Table 3: Perception of Benefit, Barrier, Satisfaction According to Sociodemographic Characteristics

(N= 149)

Characteristic	Benefit			Barrier			Satisfaction			
	Mean+S D	t/F	p	Mean+S D	t/F	p	Mean+S D	t/F	p	
Gender										
M	96.5 ± 9.3	0.21	0.83	39.7 ± 8.8	-	0.41	0.68	53.3 ± 7.0	0.34	0.73
F	96.1 ± 8.8			40.2 ± 7.7				52.0 ± 6.0		
Age										
25-30	93.6 ± 9.2	3.30	0.04 *	43.8 ± 8.3	2.80	0.06	0.06	51.1 ± 6.6	0.40	0.67
31-35	97.5 ± 8.5			39.0 ± 7.8				52.4 ± 6.5		
36-40	93.2 ± 9.6			41.5 ± 9.5				51.7 ± 6.8		
Year Practicing as Medical doctor:										
3 to 6	97.5 ± 8.0	1.04	0.33	38.2 ± 8.4	-	1.74	0.08	52.8 ± 6.7	0.70	0.4
7+	96.0 ± 9.2			40.8 ± 8.2				52.0 ± 6.5		
Area of workplace:										
Health Post	95.0 ± 9.7	0.74	0.48	39.7 ± 6.1	0.61	0.54	0.54	51.5 ± 7.3	1.24	0.3
Community Health Center	96.8 ± 8.5			40.5 ± 9.2				52.8 ± 5.8		
District Health Services	97.5 ± 8.6			38.0 ± 8.0				50.3 ± 7.8		
Has a username:										
Yes	96.2 ± 8.7	0.21	0.83	39.7 ± 8.2	1.00	0.32	0.32	52.3 ± 6.4	-0.67	0.5
No	96.7 ± 10.6			41.7 ± 8.8				51.2 ± 7.6		

Time spent using EHR daily:			1.98	0.14		2.09	0.13		2.49	0.09
	Little (-2h)	95.2 ± 8.9			41.5 ± 8.0			50.9 ± 7.0		
	Enough (2-4)	96.1 ± 9.5			38.7 ± 8.4			52.8 ± 6.0		
	Many (4-6/more)	99.1 ± 7.4			38.9 ± 8.4			53.8 ± 6.4		
Has own computer:			-0.17	0.87		1.67	0.09		-0.19	0.85
	Yes	96.4 ± 9.1			39.1 ± 8.0			52.2 ± 6.3		
	No	96.2 ± 8.7			41.4 ± 9.0			52.0 ± 6.8		
Place using computer:			1.70	0.18		0.73	0.48		3.41	0.03*
	Home	93.4 ± 10.0			41.9 ± 7.7			49.5 ± 7.1		
	Workplace	96.0 ± 8.5			40.5 ± 7.4			51.6 ± 6.6		
	Home and Workplace	97.5 ± 8.8			39.3 ± 9.1			53.4 ± 6.5		
The ability to use a computer (writing, internet explorer, and installation of application):			1.90	0.15		4.80	0.01*		0.76	0.47
	Bad	105.0 ± 0.0			54.0 ± 5.2			65.7 ± 3.0		
	Enough	95.1 ± 7.9			40.3 ± 7.9			52.3 ± 5.8		
	Good	96.5 ± 9.4			39.4 ± 8.2			52.0 ± 6.9		

* p-value= < .05

The measurement of the benefit, barrier, and satisfaction was in total scores of the statements in Likert-scales.

4.4. THE BARRIER ON EHR IMPLEMENTATION

Generally, respondents' attitudes related to the barrier recapitulated in (Table 5). The participants selected the most challenged items on EHR implementation with strongly agree and agree on statements such as: needs frequent revision to technological development ($n=76$, 51.0 %, $Mean+SD = 4.2\pm0.8$), compatibility of web browser ($n=73$, 49.0 %, $Mean+SD = 3.8\pm0.9$), is "down" frequently ($n=63$, 42.3 %, $Mean+SD = 4.2\pm0.9$), and its costly ($n=56$, 37.6 %, $Mean+SD = 3.8\pm1.0$).

Nevertheless respondents also perceived disagreement with statement: it is difficult to provide data security in EHRs ($n=63$, 42.3%, $Mean+SD = 2.68\pm1.0$), instruction of use ($n=57$, 38.3%, $Mean+SD = 2.9\pm1.0$), decrease interaction between health professional and patient ($n=56$, 37.6 %, $Mean+SD = 3.0\pm1.2$) and increase health professional workloads ($n=52$, 34.9 %, $Mean+SD = 3.0 \pm 1.0$) as shown in (Table 5).

4.5. THE SATISFACTION ON EHR UTILIZATION

The research participants also perceived satisfaction in using EHR, as summarized in the table below (Table 6). Overall, respondents strongly agree and agree on declarations: the EHR is useful and EHR is an important system for primary health care level had the same result of 59.1%, from 88 participants ($Mean+SD = 4.5 \pm 0.6$), then followed by similar results on two items such as patients' safety has improved due to EHR, and using the EHR would be proper for a doctor in primary health care area ($n=77$, 51.5 %, $Mean+SD = 4.4 \pm 0.7$).

Less than 50% percentage of the participants were agreed with the statement such as the quality of work has improved due to EHR ($n=74$, 49.7 %, $Mean+SD = 4.3 \pm 0.7$). However, more than 51% of the participants ($n=76$) were satisfied with the EHR in primary health care.

On The other hand, the participants responded neutrally in the statement mentioned that their performance has been improved due to EHR ($n=37$, 24.8%, $Mean+SD = 4.0 \pm 0.8$). The full result showed in (Table 6).

Table 4. The Frequency and Percentage of Benefit on EHR Adoption

Item:						(N= 149)
	Strongly agree *	Agree *	Neutral *	Disagree*	Strongly disagree*	Mean ± SD
Provides quick and reliable access to scientific research	98 (65.8%)	51 (34.2)				4.7 ± 0.5
Enables easy access to information from past medical records	109 (73.2%)	39 (26.2)	1 (0.7%)			4.7 ± 0.5
Provide access to patients' data and analysis	103 (69.1%)	43 (28.9)	3 (2.0%)			4.7 ± 0.5
Provides better data	98 (65.8%)	49 (32.9%)	2 (1.3%)			4.6 ± 0.5
Make it easy to transfer data	98 (65.8%)	46 (30.9%)	3 (2.0%)	2 (1.3%)		4.6 ± 0.6
Provide access to practice standards	74 (49.7%)	72 (49.3%)	3 (2.0%)			4.5 ± 0.5
Enabling Patients follow up	100 (67.1%)	46 (30.9%)	3 (2.0%)			4.7 ± 0.5
Patients regular visit	91 (61.1%)	56 (37.6%)	2 (1.3%)			4.6 ± 0.5
Enables following test results	68 (45.6%)	68 (45.6%)	13 (8.7%)			4.3 ± 0.6
Saves time in documenting health data	92 (61.7%)	50 (33.6%)	6 (4.0%)	1 (0.7%)		4.6 ± 0.6
Decreases paper-based documentation	114 (76.5%)	31 (20.8%)	3 (2.0%)	1 (0.7%)		4.7 ± 0.5
Improve the quality of care	92 (61.7%)	54 (36.2%)	3 (2.0%)			4.6 ± 0.5
Improve the feeling of professionalism	95 (63.8%)	45 (30.2%)	8 (5.4%)	1 (0.7%)		4.6 ± 0.6
Contributes to health professionals' ability to make patient care decisions	91 (61.1%)	52 (34.9%)	6 (4.0%)			4.6 ± 0.6
Improve communication between health						4.5 ± 0.6
Professional and patients	79 (53.0%)	62 (41.6%)	8 (5.4%)			4.6 ± 0.6
Improve communication between health professionals	96 (64.4%)	47 (31.5%)	5 (3.4%)		1 (0.7%)	4.6 ± 0.6
Reduces medical error	78 (52.3%)	55 (36.9%)	15 (10.1%)	1 (0.7%)		4.4 ± 0.7
Reduction of duplication in patient health information	100 (67.1%)	45 (30.2%)	4 (2.7%)			4.6 ± 0.5
Accuracy and timely access	97 (65.1%)	47 (31.5%)	3 (2.0%)	2 (1.3%)		4.6 ± 0.6
Disease surveillance and monitoring	97 (65.1%)	50 (33.6%)	2 (1.3%)			4.6 ± 0.5
Made e-prescribing easier and faster	82 (55.0%)	60 (40.3%)	7 (4.7%)			4.5 ± 0.6

*(f, %) = Frequency and percentage

Table 5. The Frequency and Percentage of Barrier on EHR Implementation

(N= 149)

Item:	Strongly agree *	Agree *	Neutral *	Disagree *	Strongly disagree *	Mean ± SD
Is too complicated and not user friendly	13 (8.7%)	33 (22.1%)	44 (29.5%)	49 (32.9%)	10 (6.7%)	3.0 ± 1.1
Compromises patient safety	45 (30.2%)	54 (36.2%)	17 (11.4%)	25 (16.8%)	8 (5.4%)	3.7 ± 1.2
Decrease interaction between health professional and patient	22 (14.8%)	36 (24.2%)	24 (16.1%)	56 (37.6%)	11 (7.4%)	3.0 ± 1.2
Increase health professional workloads	15 (10.1%)	32 (21.5%)	42 (28.2%)	52 (34.9%)	8 (5.4%)	3.0 ± 1.1
It is difficult to provide data security in EHRs	5 (3.4%)	24 (16.1%)	39 (26.2%)	63 (42.3%)	18 (12.1%)	2.6 ± 1.0
Consume more time than paper-based system	25 (16.8%)	39 (26.2%)	31 (20.8%)	45 (30.2%)	9 (6.0%)	3.2 ± 1.2
Is "down" frequently	58 (38.9%)	63 (42.3%)	21 (14.1%)	6 (4.0%)	1 (0.7%)	4.2 ± 0.9
Is costly	39 (26.7%)	56 (37.6%)	39 (26.2%)	12 (8.1%)	3 (2.0%)	3.8 ± 1.0
Needs frequent revision to technological development	53 (35.6%)	76 (51.0%)	16 (10.7%)	3 (2.0%)	1 (0.7%)	4.2 ± 0.8
Compatibility of web browser	25 (16.8%)	73 (49.0%)	43 (28.9%)	6 (4.0%)	2 (1.3%)	3.8 ± 0.9
Instruction of use	14 (9.4%)	30 (20.1%)	38 (25.5%)	57 (38.3%)	10 (6.7%)	2.9 ± 1.1
Comprehensiveness	9 (6.0%)	36 (24.2%)	45 (30.2%)	50 (33.6%)	9 (6.0%)	3.0 ± 1.0

*(f & %) = Frequency and percentage

Table 6. The Frequency and Percentage of Satisfaction on EHR Utilization

Item:						(N= 149)
	Strongly agree *	Agree *	Neutral *	Disagree*	Strongly disagree *	Mean ± SD
I feel EHR is useful	88 (59.1%)	54 (36.2%)	7 (4.7%)			4.5 ± 0.6
I feel EHR is an important system for the primary health care level	88 (59.1%)	53 (35.6%)	8 (5.4%)			4.5 ± 0.6
I feel EHR is worth the time and effort required to use it	68 (45.6%)	70 (47.0%)	10 (6.7%)	1 (0.7%)		4.4 ± 0.6
I feel the quality of my work has improved	59 (39.6%)	74 (49.7%)	14 (9.4%)	2 (1.3%)		4.3 ± 0.7
I feel the quality of information has been improved due to EHR	62 (41.6%)	66 (44.3%)	20 (13.4%)	1 (0.7%)		4.3 ± 0.7
I feel my performance has been improved due to EHR	42 (28.2%)	66 (44.3%)	37 (24.8%)	4 (2.7%)		4.0 ± 0.8
I feel patient safety has improved due to EHR	77 (51.5%)	58 (38.9%)	14 (9.4%)			4.4 ± 0.7
I feel the communication between health professional has improved due to EHR	60 (40.3%)	70 (47.0%)	19 (12.8%)			4.3 ± 0.7
Quality improvement in providing health service	72 (48.3%)	67 (45.0%)	10 (6.7%)			4.4 ± 0.6
I feel more comfortable to use EHR than paper-based	60 (40.3%)	66 (44.3%)	20 (13.4%)	3 (2.0%)		4.2 ± 0.6
I think using the EHR would be proper for a doctor in my area	77 (51.7%)	55 (36.9%)	17 (11.4%)			4.4 ± 0.7
Overall, I am satisfied with the EHR in primary health care	76 (51.0%)	63 (42.3%)	9 (6.0%)	1 (0.7%)		4.4 ± 0.6

*(f & %) = Frequency and percentage

4.6. THE RELATIONSHIP BETWEEN SATISFACTION AND RELATED FACTORS

The participants result analyzed on the correlation test showed a very positively strong relationship correlation between participants rating of satisfaction on the utilization of EHR and the benefit perceived when implemented it ($r = .708, p = < .001$) and vice versa. There was significance correlation found on time spent using EHR ($r = .178, p = .03$) and place using computer ($r = .211, p = .01$).

However, negative relationship statistically resulted within satisfaction and barrier ($r = -.210, p = .01$) and other variables such as sex ($r = -.028, p = .73$), practice year ($r = -.076, p = 0.36$), and computer ability ($r = -.064, p = .44$).

There was no statistically relationship discovered within satisfaction and age ($r = .007, p = 0.94$), workplace ($r = .004, p = 0.97$), username ($r = .055, p = .50$), and have own computer ($r = .016, p = .85$).

The respondents revealed they had a weak significant negative correlation between benefit and barrier ($r = -.14, p = .07$), as shown in (Table 7).

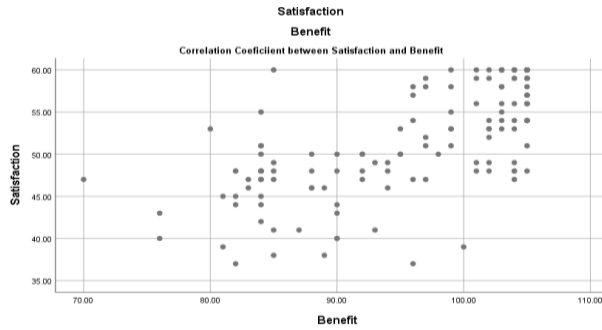
Table 7. Correlation Between Satisfaction and Related Factors
N= 149

Item	Satisfaction	Sex	Age	Practice Year	Workplace	Username	Time Spent Using EHR	Have Own Computer	Place Using Computer	Computer Ability	Benefit	Barrier
Satisfaction	1											
Sex	-0.028	1										
Age	0.007	-.276*	1									
Practice Year	0.936	0.001		1								
Workplace	-0.076	-0.078	-.197*		1							
Username	0.357	0.343	0.016			1						
Time Spent Using EHR	0.004	-0.034	0.045	-.262**			1					
Have Own Computer	0.965	0.681	0.586	0.001		0.152		1				
Place Using Computer	0.055	0.026	0.125	-0.112	0.152				1			
Computer Ability	0.504	0.751	0.129	0.175	0.064					1		
Benefit	.178*	-0.038	0.042	-0.122	0.146	.182*					1	
Barrier	0.030	0.650	0.614	0.137	0.075	0.026						1
	0.016	-0.096	-0.131	0.070	0.053	-0.077	-0.048					
	0.848	0.245	0.110	0.396	0.525	0.349	0.562					
	.211**	-.166*	-0.111	-0.015	0.127	.176*	0.159	.245**				
	0.010	0.043	0.177	0.852	0.124	0.032	0.053	0.003				
	-0.064	-.204*	-0.034	-0.006	0.051	0.028	.163*	0.016	0.037			
	0.438	0.013	0.684	0.941	0.538	0.731	0.047	0.844	0.653			
	.708**	-0.018	-0.052	-0.108	0.096	-0.018	0.152	0.014	0.148	0.002		
	0.000	0.830	0.532	0.191	0.242	0.831	0.064	0.869	0.071	0.982		
	-.210**	0.034	-0.032	0.132	-0.022	-0.082	-0.144	-0.138	-0.095	-0.153	-0.144	
	0.010	0.679	0.696	0.108	0.790	0.322	0.079	0.094	0.249	0.063	0.079	

*. Correlation is significant at the 0.05 level (2-tailed).

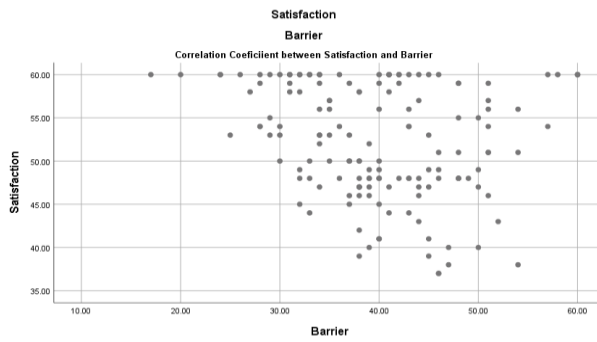
**. Correlation is significant at the 0.01 level (2-tailed).

4.7. THE CORRELATION T BETWEEN BENEFIT, BARRIER, AND SATISFACTION



The participants' satisfaction and the benefit recognized were positively correlated, as shown in the figure above (Figure 3). The more benefit perceived; the higher satisfaction sensed on eHealth information employment.

Figure 3. The Correlation between Satisfaction and Benefit



The respondent's perception of satisfaction and benefit negatively correlated with the barrier utilizing HER, as shown in the figures above (Figures 4 & 5).

Figure 4. The Correlation between Satisfaction and Barrier

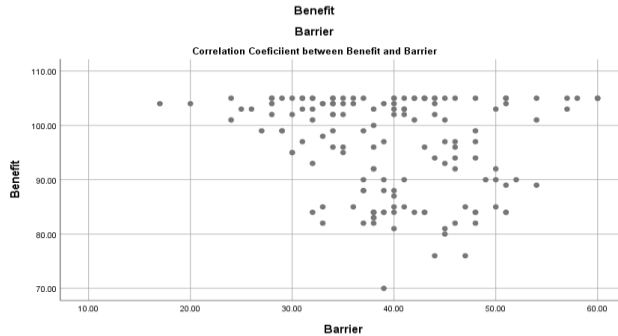


Figure 5. The Correlation between Benefit and Barrier

4.8. FACTORS INFLUENCING EHR SATISFACTION

Multiple regression analyses were conducted to identify the factors that were independently related to satisfaction using EHR. The variance inflation factors (VIFs) were found not to be multicollinearity problem because the VIFs were 1.080- 1.242 (smaller than 10 but larger than 0.1 based on references value).

The participants satisfaction and others factor shown in (Table 8) where had a positive slope such as: age ($B = .520$; $t = 0.656$, $p = 0.51$), username ($B = 0.741$; $t = 0.634$, $p = 0.53$), and time spent using EHR ($B = 0.521$; $t = 0.991$, $p = 0.32$), place using computer ($B = 0.980$; $t = 1.669$, $p = .09$).

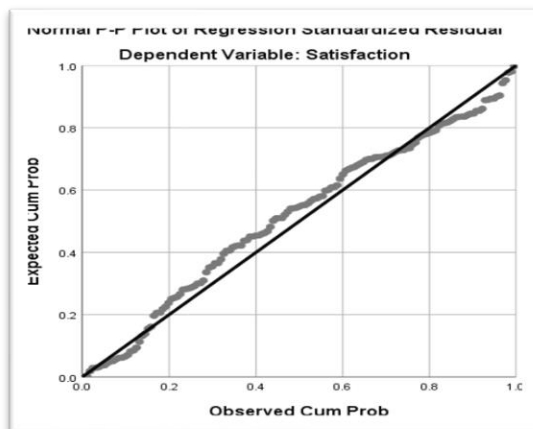
The variable benefit ($B = .497$; $t = 11.361$, $p = <.001$), was statistically significant impact on satisfaction on EHR implementation ($R^2 = 51.0\%$).

Multiple linear regression was calculated to predict the satisfaction of end-users based on the predictors. The multiple linear analysis result revealed that those predictor variables were not statistically significant predictors to the model ($p > .05$). The R^2 for the overall model was 54% with an adjusted $R^2 = 51\%$; a large size effect was reported by the model of variation in satisfaction on EHR utilization by the linear combination of predictors variables. We can conclude that the participants' satisfaction was not statistically impacted by other variables except the benefit perceived.

Table 8. Factors Influencing EHR Satisfaction N= 149

Item	B	Std. Error	β	t	Sig.	VIF
(Constant)	6.879	7.200		0.955	0.341	
Gender	-0.055	0.836	-0.004	-0.066	0.948	1.242
Age	0.520	0.794	0.042	0.656	0.513	1.242
Practice Year	0.157	0.877	0.011	0.179	0.858	1.179
Workplace	-0.920	0.654	-0.086	-1.406	0.162	1.126
Username	0.741	1.168	0.039	0.634	0.527	1.128
Time Spent Using EHR	0.521	0.526	0.061	0.991	0.323	1.133
Have Own Computer	-0.242	0.817	-0.018	-0.296	0.768	1.136
Place Using Computer	0.980	0.587	0.106	1.669	0.097	1.220
Computer Ability	-1.143	0.758	-0.091	-1.508	0.134	1.108
Barrier	-0.086	0.048	-0.109	-1.794	0.075	1.105
Benefit	0.498	0.044	0.680	11.361	0.000*	1.080
		R² = .545.	Adj. R² = .508			

* Statistically significant



The respondent's satisfaction toward the electronic health record was positively distributed, as shown in the figure above (Figure 6), analyzed by Multi Regression Analysis; adjusted $R^2 = 51\%$.

Figure 6. Scatter P Plot of Regression Standardized Residual

CHAPTER V:

DISCUSSION

The implementation of the electronic health record is a pathway to achieve universal health coverage. Based on the report shared by WHO, the developed and upper-middle countries are most likely in a higher percentage to adopt the EHR compare to the lower-income countries [147]. However, both have the same purpose for a better-quality health care service delivery [148-150].

The EHR must not compromise the quality of service, patients' center, and the security of patients' information, which were crucial that could be monitored and regulated by the law and policy [151].

Timor Leste is a developing country that adopted EHR in 2015. According to the WHO 2015 e-health report, Timor Leste has no EHR implementation record in the primary health care level [152].

This research was a cross-sectional study utilized an online questionnaire survey using google form between 21st September to 8th October 2020. Various studies were conducted concerning the utilization of EHR in diverse countries, however not in Timor Leste. Hence, this study was conducted after the first-time implementation of EHR in Timor Leste to understand the primary health care physicians' perception on eHealth application.

5.1. THE SOCIODEMOGRAPHIC CHARACTERISTICS

The total participants of this investigation were 149. M represented= 51.1% and F= 48.3%, and the majority have young ages between 31-35 years. The average years of practicing as a medical doctor were 6 years.

The respondents were most likely worked in the Community Health Center (CHC) compare to the Health Post and District Health Service. However, the respondents spent on average in using EHR was 1.75. the majority had their computer and most frequently used the computer in the home and workplace. The respondents had good computer ability, such as writing ability, internet explorer, and installation of the application.

This finding indicated that the participants were mostly in the young age (71.8%) and young medical doctor tent to accept innovative changes differ from elder age as found in the study done by Gagnon et al., 2014 [[153](#)].

This study also found that 65.8% of the participants had a good ability to manage computers. This result was similar to the study done by Zayyad & Toycan, 2018, and a systematic review by Gesulga et al., 2017 [[116](#), [118](#)] mentioned that IT literacy had a significant influence on the EHR adoption. Thus, the need for more capacity building training to enrich their ability and alongside the need for continuous IT support was an essential factor, as suggested by Samadbeik et al., 2020 [[154](#)].

5.2. THE PERCEPTION OF BENEFIT, BARRIER, SATISFACTION ACCORDING TO SOCIODEMOGRAPHIC CHARACTERISTICS.

Our finding indicated that not all sociodemographic characteristics associated with the perception of the benefit, barriers, and satisfaction. However, there was a statistically significant difference in age among participants' perception of benefit. This coherent with Jung, S. Y., et al. (2020) study was indicated that users with young ages had a more positive attitude toward technology changes than older professionals [[117](#)].

Regarding the barriers, our finding signaled statistically difference in the ability to use computers such as writing, internet explorer and installation of the application were consistent to the rapid umbrella review by Fennelly, O. et al. (2020) revealed that technology literacy as one of the major factor which influenced in the EHR implementation [[32](#)] also the training provided before the EHR utilization would be helpful for the successful implementation [[126](#)]

Another finding in this study suggested a statistical difference in the place using computers toward satisfaction. This research discovery was consistent with the investigation of Mills, S. (2019), declared that the place of using computer used to be factor that affect professional's satisfaction toward the EHR utilization. The application can be accessed and managed everywhere and anytime, which provides patients data readiness and comprehensive information for better patients aiding [[101](#)]. This result may be influenced by the more diversity of place using HER, and the benefit perceived more satisfaction using EHR.

5.3. THE BENEFIT OF EHR ADOPTION

The positive behavior toward electronic health record (EHR) adoption among medical doctors because of the benefit perceived revealed by this study and supported by Shiferaw& Mehari, 2019 findings [30].

The respondents were strongly agreed and agreed in the benefit provided using eHealth decreasing paper-based documentation (76.5%) were parallel with the results of the research applied by Zandieh et al., 2008 [155]. However, this study found that the electronic record enabled easy access to information from past medical records (73.2%), provided access to patients' data, and analysis (69.1%) where supported by Strudwick & Booth, 2016 and Ganiga et al., 2020, indicated that the EHR could be utilized as a tool in supporting access to patients health documentation for better quality care delivery outcome [62, 156].

Moreover, the finding of this research cited that EHR enabled patients to follow- up (67.1%). The same results also found by Kight et al., 2020 and Rayner et al., 2020 indicated that EHR facilitated continuum care of patients in primary health care after being attended in a health facility where provided evidence-based plans for future care [74, 157].

Another finding in this study showed that EHR benefits the reduction of duplication of the patient health information (67.1%). Thus, consistent with Mills', 2019 investigation, and Oyugi et al., 2020 described that EHR in the improvement of patients' documentation while reducing repetition and improving data gathered [101, 158].

Our study resulted that the EHR provided better data and made it easy to transfer data that represented 65.8% and saved time in documenting health data. These results were coherent as research was done by Casey, Turner, Edwards, & Williams, 2020, and Ganiga et al., 2020 and others suggested EHR data sharing and documenting indicated to be quicker compared to paper-based report [62, 159, 160]

Half of the participants agreed that using EHR reduced medical error found in this study supported by the previous study done by King, Patel, Jamoom, & Furukawa, 2014, and Y.-T. Park & Han, 2017 mentioned that EHR was a warning system and sent notification to the health professional if there were inaccurate prescriptions of the medicine to the patients [7, 161].

This study also found that EHR enabled the following test results consistent with the study of Deeds et al., 2020, and Petersen et al., 2020 [97, 162] indicated that EHR made easier on laboratory test result collection and reporting for better in aiding patients. This survey had a similar finding to a study done by Kauppinen, Ahonen, & Timonen, 2017, the eHealth system made e-prescribing easier and faster, safer, and better supervision [163].

Somehow, some studies resulted from different findings. The study of Momenipour & Pennathur, 2019 suggested that EHR consumed more time in health data recording and increased medical error, according to Furlow, 2020 [125], [127]. These findings may be due to users' perception, which may be affected by an external factor and internal factor (attitude, acceptance of use, etc.)

Therefore, the result of this investigation signaled the respondents' positiveness toward EHR implementation that will have a massive impact on Timor Leste's health data information system.

5.4. THE BARRIER OF EHR IMPLEMENTATION

This research found several obstacles to eHealth record implementation that found uniform the various study cited. For instance, respondents were agreed on the needs of frequent revision to technological development 51.0% were coherent with the study applied in Russian far East by Jung et al., 2020, found that an insufficient system development environment as one of the obstacle in EHR adoption [59, 117, 164].

This survey finding indicated that the compatibility of web browser (49.0%) as one of the barriers which had the same results as a study done by Tavares & Oliveira, 2018 survey on “*New Integrated Model Approach to Understand the Factors That Drive Electronic Health Record Portal Adoption*” in Portugal [165]. Therefore, the web application browser influenced by user-centered design, and device type were crucial in eHealth's appropriateness [166, 167].

Another barrier found in this study was the EHR cost (37.6%). This result was coherent to Gesulga et al., 2017, and a rapid umbrella review by Fennelly et al., 2020a [32, 118], concerned about the financial resource. This barrier is one of the biggest challenges detected since primary EHR was adopted. Nevertheless, the Austrian et al. 2020 study found that the EHR's had a positive clinical and financial impact [168].

Additionally, the connectivity (42.3%) was selected as the obstacle of the EHR implementation. This finding was found similar finding to the result of Dave et al., 2020, Alsohime et al., 2019 mentioned that the EHR's downtime due to the internet connection would affect patient care. This issue was the major concern for the developing country in the adoption of EHR as a result found in a systematic review by Leonard, E. et al. (2020). [[169](#), [170](#)].

This study signaled considerable attention on the user-friendly application, as found by Aldosari et al., 2018 suggested that the ease to use application reduced the negative attitude to adopt the system, which could elevate the benefit perceived by the users [[31](#)].

However, the study found disagreement on EHR cannot provide patients data confidentiality with the rate of finding (42.3 %) This had constant study found by Keshta & Odeh, 2020 [[49](#)], where the legislation application and policy could prevent this disaster and by applying the blockchain system to the software [[32](#), [171](#), [172](#)].

The uncertain of EHR guideline (38.3%) found in this research to be one of the barriers to EHR adoption was had a coherent result with the study done by Murphy, D. R., et al. (2019) was the unclear information to manage and to access were included in the barrier of EHR usage [[150](#)]. This survey also found that the EHR decrease interaction between patients and health professionals (37.6%) and increase health professional workloads (34.9%) were similar, as mentioned in Furlow's (2020) article and Hayes, D., Jr. (2019) [[127](#), [173](#)].

This result may influence by the short time of EHR implementation, less time spending on EHR utilization, and respondents' technology literacy. Consequently, the continuum of the capacity-building support on electronics necessarily needed to be offered. The application of EHR during medical school would be very advantageous in reducing paper- based health status documentation [[174-176](#)].

5.5. THE SATISFACTION OF EHR UTILIZATION

The significance discovered related to the respondent's satisfaction using the eHealth system found that the use of EHR and as a crucial application for primary health care level (59.1%) were coherent with Messino, P. J. et al. (2020) mentioned that EHR increased the coverage of basics service provided in primary health care level [[177](#)], and the same result by Deeds, S. A., et al. (2020)

signaled that the system utilizations was proper for a medical doctor in the basic level care and improve patient safety (51.5%) which important in special cases like COVID-19 pandemic was the EHR template prompts categorization of patients by stability and suspicion and reduction of 40% of the medical error prescription according to Fernández-Oliveira, C. et al. (2020) in their investigation [97, 178]. Another finding was the EHR improved quality of health service (49.7%) as found by Alsohime, F. et al. (2019) on their research were indicated that the EHR utilization had an impact on increased health care performance [126], and overall, the respondents satisfied with the eHealth system represented 51.0%. Based on the study by Sieja, A. et al. (2019) confirmed that the physicians found satisfaction on EHR adoption in their clinic due to an excellent service provided by them in their facility [136].

5.6. LIMITATIONS

In fact, in the process of investigation related to this topic, the researcher recognized some limitations:

1. Among 193 questionnaires distributed, 7 respondents replied late, and 44 not replied.
2. The EHR literature that was found mostly focused on the medical health data only; there has not been abundant literature found on EHR that incorporates the public health aspect.
3. Low participation rate from a medical doctor with an age range from 25- 30 and 36-40.
4. Overall, participants had a young age may have health ICT partialities.

5.7. DIRECTIONS FOR FUTURE RESEARCH

1. After implementing the EHR in all stages it is necessary to apply research to other health professionals in different categories to identify their perception of electronic health record implementation.
2. After 5 years of EHR implementation, the reinvestigation of medical doctor perception on EHR will be necessary for better understanding.

5.8. RECOMMENDATIONS

1. Based on the finding revealed by this study, we would like to suggest to the government as the decision-maker, the commitment to sustainability, and the continuum implementation of EHR as an excellent decision taken to achieve the Universal Health Coverage.

Nevertheless, addressing all the barriers mentioned on the results is crucial for better impact [32, 179].

2. The creation of the patients' data security Act.
3. The adoption of EHR is vital for health organization [62]
4. We recommend maintaining the EHR's positiveness on their professional performance for better services provided to the Timorese population.
5. Optimization of the application was the first step toward higher-quality data and usage.

CHAPTER VI:

CONCLUSION

The research among general physicians' perception of electronic health record implementation in primary health care level in Timor Leste suggested that the EHR decreased paper-based documentation as a way leading to a quality health care, enabling easy access to the patients' health records, enabling patients follow-up, reduction of duplication of the patient health information and allow faster data transfer.

However, the barrier to the implementation of EHR remains existed. The biggest challenges found in this study were the frequent revision of the application, the compatibility of the web browser, internet connectivity, and the application sustainability cost.

The positive outcome revealed in this study was the satisfaction of the end-users experiencing the application usefulness as an essential system in the primary health care level and proper to implement. The EHRR adoption improved health professionals' communication, elevated patient safety, and quality health service improvement. Overall, the general physician was satisfied with the EHR in their level of care.

The sociodemographic characteristics such as age, place using the computer, and the ability to use computers were different among factors influenced by EHR adoption.

Finally, we conclude that the end-user's higher satisfaction and benefit perceived reduces the barrier to the EHR implementation.

REFERENCES

1. Office of the auditor general of Canada, *Electronic Health Records in Canada—An Overview of Federal and Provincial Audit Reports*. 2010.
2. HIPAA, *What is the HITECH Act?* HIPAA, 2020.
3. Answer, H., *ARRA Economic Stimulus Package*. HealthIT Answer, 2020.
4. Eben Harrel, C., *In Denmark's Electronic Health Records Program, a Lesson for the U.S.* TIME, 2009.
5. Information and Data Manager (IDM) Magazine, *NZ announces plan for single national e-health record*. 2015.
6. Chae, Y.M., *National Health Information Systems in Korea*. Asia Pacific Association for Medical Informatics, 2006.
7. Park, Y.-T. and D. Han, *Current Status of Electronic Medical Record Systems in Hospitals and Clinics in Korea*. Healthcare informatics research, 2017. **23**(3): p. 189-198.
8. Allen, C., et al., *Experience in implementing the OpenMRS medical record system to support HIV treatment in Rwanda*. Studies in health technology and informatics, 2007. **129**(1): p. 382.
9. WHO, *Report of the third global survey on eHealth*. World Health Organization, 2016.
10. WHO, *Timor Leste*. World Health Organization, 2020.
11. Anderson, T., *Solidarity aid: the Cuba-Timor Leste health programme*. The International Journal of Cuban Studies, 2008. **1**(2): p. 53-65.
12. (ESCAP), U.N., *Regulatory Policies and ICT Trends: Insights from Timor-Leste*. Asia-Pacific Information Superhighway (AP-IS) Working Paper Series, 2019.
13. Leste, G.o.T., *Health in the Family Program now covers 94% of Households*. Government of Timor Leste, 2017.
14. Guinness, L., et al., *Determinants of health care utilisation: the case of Timor-Leste*. International Health, 2018. **10**(6): p. 412-420.
15. Price, J.A., et al., *"I go I die, I stay I die, better to stay and die in my house": understanding the barriers to accessing health care in Timor-Leste*. BMC Health Services Research, 2016. **16**(1): p. 535.

16. Leste, T.G.o.T., *Program of the Eighth Constitutional Government*. 2020.
17. contributors, E., *Dispensarizacion*. EcuRed, . 2019.
18. Republica, J.d., *Adencare e Adenbox como aplicação de software do RSE da Saúde na Família*. Jornal da Republica, Democratic Republic of Timor Leste, 2018.
19. Poole, D.A., *Timor Leste's Political Impasse*. The University of Melbourne, 2018.
20. Republica, J.d., *Registo Electronico do Programa Saude na Familia*. Jornal da Republica, Democratic Republic of Timor Leste, 2019.
21. Jacob, P.D., *Management of patient healthcare information*. ScienceDirect, 2020.
22. Thate, J., et al., *Identifying best practices in electronic health record documentation to support interprofessional communication for the prevention of central line-associated bloodstream infections*. Am J Infect Control, 2020. **48**(2): p. 124-131.
23. WHO, *Global Observatory for eHealth*. World Health Organization, 2015.
24. Scott, K., et al., *The Development and Evaluation of an Electronic Health Record Efficiency Workshop for Providers*. Appl Clin Inform, 2020. **11**(2): p. 336-341.
25. Jones, M., et al., *An Optimization Program to Help Practices Assess Data Quality and Workflow With Their Electronic Medical Records: Observational Study*. JMIR Hum Factors, 2018. **5**(4): p. e30.
26. McCrorie, C., et al., *Staff expectations for the implementation of an electronic health record system: a qualitative study using normalisation process theory*. BMC Med Inform Decis Mak, 2019. **19**(1): p. 222.
27. Ruppel, H., et al., *Assessment of Electronic Health Record Search Patterns and Practices by Practitioners in a Large Integrated Health Care System*. JAMA Netw Open, 2020. **3**(3): p. e200512.
28. Ericson, L., et al., *Stakeholder consensus on the purpose of clinical evaluation of electronic health records is required*. Health policy and technology, 2017. **6**(2): p. 152-160.
29. Palvia, P., T. Jacks, and W. Brown, *Critical issues in EHR implementation: Provider and vendor perspectives*. Communications of the Association for Information Systems, 2015. **36**(1): p. 36.
30. Shiferaw, K.B. and E.A. Mehari, *Modeling predictors of acceptance and use of electronic medical record system in a resource limited setting: Using modified UTAUT model*. Informatics in Medicine Unlocked, 2019. **17**: p. 100182.

31. Aldosari, B., et al., *Assessment of factors influencing nurses acceptance of electronic medical record in a Saudi Arabia hospital*. Informatics in Medicine Unlocked, 2018. **10**: p. 82-88.
32. Fennelly, O., et al., *Successfully implementing a national electronic health record: a rapid umbrella review*. International Journal of Medical Informatics, 2020. **144**: p. 104281.
33. Tsai, M.-F., et al., *Understanding physicians' adoption of electronic medical records: Healthcare technology self-efficacy, service level and risk perspectives*. Computer Standards & Interfaces, 2019. **66**: p. 103342.
34. Ayanlade, O.S., T.O. Oyebisi, and B.A. Kolawole, *Health Information Technology Acceptance Framework for diabetes management*. Heliyon, 2019. **5**(5): p. e01735.
35. Steininger, K. and B. Stiglbauer, *EHR acceptance among Austrian resident doctors*. Health Policy and Technology, 2015. **4**(2): p. 121-130.
36. Abdulai, A.-F. and F. Adam, *Health providers' readiness for electronic health records adoption: A cross-sectional study of two hospitals in northern Ghana*. Plos one, 2020. **15**(6): p. e0231569.
37. Garner, J.C., *Final HIPAA security regulations: a review*. Manag Care Q, 2003. **11**(3): p. 15-27.
38. Shuren, A.W. and K. Livsey, *Complying with the Health Insurance Portability and Accountability Act. Privacy standards*. Aaohn j, 2001. **49**(11): p. 501-7.
39. Fund, T.C., *The Federal Government Has Put Billions into Promoting Electronic Health Record Use: How Is It Going?* The Commonwealth Fund, 2020.
40. CDC, *Public Health and PRomoting Interoperability Programs*. Center for Disease Control and Prevention, 2020.
41. CDC, *EMR/EHR*. Center for Disease Control and Prevention, 2017.
42. Park, Y.T. and K. Atalag, *Current National Approach to Healthcare ICT Standardization: Focus on Progress in New Zealand*. Healthc Inform Res, 2015. **21**(3): p. 144-51.
43. Government, A., *Digital Health Cyber Security Centre* Australian Government, Australian Digital Health Agency, 2020.
44. OAIC, *My Health Record*. Australian Government, Office of the Australian Information Commissioner, 2020.

45. Li, Y.C., et al., *Building a national electronic medical record exchange system - experiences in Taiwan*. Comput Methods Programs Biomed, 2015. **121**(1): p. 14-20.
46. Kim, Y.-G., et al., *Rate of electronic health record adoption in South Korea: A nation-wide survey*. International Journal of Medical Informatics, 2017. **101**: p. 100-107.
47. Na, S. and S. Kwon, *Building systems for universal health coverage in South Korea*. 2015.
48. Pohlmann, S., et al., *Digitalizing Health Services by Implementing a Personal Electronic Health Record in Germany: Qualitative Analysis of Fundamental Prerequisites From the Perspective of Selected Experts*. J Med Internet Res, 2020. **22**(1): p. e15102.
49. Keshta, I. and A. Odeh, *Security and privacy of electronic health records: Concerns and challenges*. Egyptian Informatics Journal, 2020.
50. Shi, S., et al., *Applications of blockchain in ensuring the security and privacy of electronic health record systems: A survey*. Computers & Security, 2020. **97**: p. 101966.
51. Group, C.f.H.P.H.W., *The Personal Health Working Group: final report*. Markle Foundation, 2003.
52. Soni, H., et al., *State of the art and a mixed-method personalized approach to assess patient perceptions on medical record sharing and sensitivity*. Journal of Biomedical Informatics, 2020. **101**: p. 103338.
53. Novack, G.D. and M.C. Lim, *Retinal Detachment: Patient Perspective and Electronic Health Records*. American Journal of Ophthalmology, 2019. **208**: p. 64-67.
54. van Kuppenveld, S.I., et al., *Real-Time Access to Electronic Health Record via a Patient Portal: Is it Harmful? A Retrospective Observational Study*. J Med Internet Res, 2020. **22**(2): p. e13622.
55. Scandurra, I., et al., *Is 'Patient's Online Access to Health Records' a Good Reform? – Opinions from Swedish Healthcare Professionals Differ*. Procedia Computer Science, 2015. **64**: p. 964-968.
56. Gagnon, M.-P., et al., *Adoption of Electronic Personal Health Records in Canada: Perceptions of Stakeholders*. International journal of health policy and management, 2016. **5**(7): p. 425-433.
57. Alsaifi, A.Y.A. and B.V. Gay, *An overview of electronic personal health records*. Health Policy and Technology, 2018. **7**(4): p. 427-432.

58. Hartvigsen, G., *Chapter 4 - Technology considerations*, in *Fundamentals of Telemedicine and Telehealth*, S. Gogia, Editor. 2020, Academic Press. p. 59-90.
59. Hossain, A., R. Quaresma, and H. Rahman, *Investigating factors influencing the physicians' adoption of electronic health record (EHR) in healthcare system of Bangladesh: An empirical study*. International Journal of Information Management, 2019. **44**: p. 76-87.
60. Lee, Y.-T., et al., *Association between Electronic Medical Record System Adoption and Healthcare Information Technology Infrastructure*. Healthc Inform Res, 2018. **24**(4): p. 327-334.
61. Auefuea, S., et al., *Development of Electronic Home Health Care Record System on Web Applications*. Procedia Computer Science, 2016. **86**: p. 204-207.
62. Ganiga, R., et al., *A Preliminary Study of Real-time Capturing and Sharing of Routine Health Data among the Public Health Professionals*. Indian J Community Med, 2020. **45**(2): p. 176-180.
63. Hope, C., *Hardware*. 2020.
64. Britannica, T.E.o.E., *Hardware*. Encyclopædia Britannica, inc., 2019.
65. Britannica, T.E.o.E., *Internet*. Encyclopædia Britannica, inc., 2020.
66. Afrasiabi, M.H. and R. Guérin, *Exploring user-provided connectivity*. IEEE/ACM Trans. Netw., 2016. **24**(1): p. 542–554.
67. Sun, A.Z., et al., *Identifying Patients with Rare Disease Using Electronic Health Record Data: The Kaiser Permanente Southern California Membranous Nephropathy Cohort*. Perm J, 2020. **24**.
68. Faujdar, D.S., et al., *Field testing of a digital health information system for primary health care: A quasi-experimental study from India*. International Journal of Medical Informatics, 2020. **141**: p. 104235.
69. Ross, J., et al., *Developing an implementation strategy for a digital health intervention: an example in routine healthcare*. BMC Health Services Research, 2018. **18**(1): p. 794.
70. Ross, J., et al., *Factors that influence the implementation of e-health: a systematic review of systematic reviews (an update)*. Implementation Science, 2016. **11**(1): p. 146.

71. Walling, A., et al., *Using the Electronic Health Record to Identify a Cohort of Seriously Ill Patients from a Primary Care Population Across Three Academic Health Systems (FR441C)*. Journal of Pain and Symptom Management, 2020. **59**(2): p. 470-471.
72. Vos, J.F.J., et al., *The influence of electronic health record use on collaboration among medical specialties*. BMC Health Services Research, 2020. **20**(1).
73. De Groot, K., et al., *Use of electronic health records and standardized terminologies: A nationwide survey of nursing staff experiences*. International Journal of Nursing Studies, 2020. **104**: p. 103523.
74. Rayner, J., et al., *Illustrating the patient journey through the care continuum: Leveraging structured primary care electronic medical record (EMR) data in Ontario, Canada using chronic obstructive pulmonary disease as a case study*. International Journal of Medical Informatics, 2020. **140**: p. 104159.
75. He, X., et al., *The design of electronic medical records for patients of continuous care*. Journal of Infection and Public Health, 2019.
76. Soorus, S., et al., *1637: ACCURACY OF AN ELECTRONIC MEDICAL RECORD-BASED SURVEILLANCE TOOL FOR THE DETECTION OF SEPSIS*. Critical Care Medicine, 2020. **48**(1): p. 794.
77. Shappell, C.N. and C. Rhee, *Leveraging electronic health record data to improve sepsis surveillance*. BMJ Qual Saf, 2020.
78. Tarabichi, Y., et al., *A step closer to nationwide electronic health record-based chronic disease surveillance: characterizing asthma prevalence and emergency department utilization from 100 million patient records through a novel multisite collaboration*. J Am Med Inform Assoc, 2020. **27**(1): p. 127-135.
79. Munier-Marion, E., et al., *Outbreaks of health care-associated influenza-like illness in France: Impact of electronic notification*. American Journal of Infection Control, 2017. **45**(11): p. 1249-1253.
80. Miller, J.K., et al., *Statistical outbreak detection by joining medical records and pathogen similarity*. Journal of Biomedical Informatics, 2019. **91**: p. 103126.
81. Martin, P.M., *Pandemic preparedness starts in properly coded electronic health records*. British Journal of General Practice, 2020. **70**(695): p. 278-279.

82. Shoenbill, K., et al., *Identifying patterns and predictors of lifestyle modification in electronic health record documentation using statistical and machine learning methods*. *Prev Med*, 2020. **136**: p. 106061.
83. Silva, C., et al., *Recording of overweight and obesity as a health problem by primary care pediatricians in an electronic medical record*. *Arch Argent Pediatr*, 2020. **118**(2): p. 132-135.
84. Riahi, S., et al., *The Value of Electronic Medical Record Implementation in Mental Health Care: A Case Study*. *JMIR Med Inform*, 2017. **5**(1): p. e1.
85. Miyoshi, N.S.B., et al., *An eHealth Platform for the Support of a Brazilian Regional Network of Mental Health Care (eHealth-Interop): Development of an Interoperability Platform for Mental Care Integration*. *JMIR Ment Health*, 2018. **5**(4): p. e10129.
86. Karema, N., et al., *Using Electronic Medical Record Data to Improve HIV Patient Monitoring, Clinical Decision-Making, and Quality Improvement: Lessons from Rwanda*. *Stud Health Technol Inform*, 2015. **216**: p. 880.
87. Thompson, C.A., et al., *Population-Based Registry Linkages to Improve Validity of Electronic Health Record-Based Cancer Research*. *Cancer Epidemiol Biomarkers Prev*, 2020. **29**(4): p. 796-806.
88. Valik, J.K., et al., *Validation of automated sepsis surveillance based on the Sepsis-3 clinical criteria against physician record review in a general hospital population: observational study using electronic health records data*. *BMJ Qual Saf*, 2020.
89. McCowan, C., et al., *Using electronic health records to support clinical trials: a report on stakeholder engagement for EHR4CR*. *BioMed research international*, 2015. **2015**.
90. Kim, E., et al., *The Evolving Use of Electronic Health Records (EHR) for Research*. *Seminars in Radiation Oncology*, 2019. **29**(4): p. 354-361.
91. Nordo, A.H., et al., *Use of EHRs data for clinical research: Historical progress and current applications*. *Learning health systems*, 2019. **3**(1): p. e10076.
92. Wildman-Tobriner, B., et al., *Moving Radiology Workflow to the Electronic Health Record: Quantitative and Qualitative Experience From a Large Academic Medical Center*. *Acad Radiol*, 2020. **27**(2): p. 253-259.

93. Kurant, D.E., et al., *Creation and Use of an Electronic Health Record Reporting Database to Improve a Laboratory Test Utilization Program*. Appl Clin Inform, 2018. **9**(3): p. 519-527.
94. Rough, K., et al., *Predicting Inpatient Medication Orders From Electronic Health Record Data*. Clin Pharmacol Ther, 2020.
95. Vinks, A.A., et al., *Electronic Health Record-Embedded Decision Support Platform for Morphine Precision Dosing in Neonates*. Clin Pharmacol Ther, 2020. **107**(1): p. 186-194.
96. Sha, B.E., et al., *Evolution of an Electronic Health Record Based–Human Immunodeficiency Virus (HIV) Screening Program in an Urban Emergency Department for Diagnosing Acute and Chronic HIV Infection*. The Journal of Emergency Medicine, 2019. **57**(5): p. 732-739.
97. Deeds, S.A., et al., *Leveraging an electronic health record note template to standardize screening and testing for COVID-19*. Healthcare, 2020. **8**(3): p. 100454.
98. Sinsky, C.A., et al., *Metrics for assessing physician activity using electronic health record log data*. J Am Med Inform Assoc, 2020. **27**(4): p. 639-643.
99. Sebok-Syer, S.S., et al., *Elucidating system-level interdependence in electronic health record data: What are the ramifications for trainee assessment?* Med Educ, 2020.
100. Arndt, B.G., et al., *Tethered to the EHR: primary care physician workload assessment using EHR event log data and time-motion observations*. The Annals of Family Medicine, 2017. **15**(5): p. 419-426.
101. Mills, S., *Electronic Health Records and Use of Clinical Decision Support*. Critical Care Nursing Clinics of North America, 2019. **31**(2): p. 125-131.
102. Huber, M.T., et al., *Utilizing the Electronic Health Record to Improve Advance Care Planning: A Systematic Review*. American Journal of Hospice and Palliative Medicine®, 2017. **35**(3): p. 532-541.
103. Glicksberg, B.S., K.W. Johnson, and J.T. Dudley, *The next generation of precision medicine: observational studies, electronic health records, biobanks and continuous monitoring*. Human Molecular Genetics, 2018. **27**(R1): p. R56-R62.
104. Robson, J., K. Boomla, and S.A. Hull, *Progress in using the electronic health record to improve primary care*. Br J Gen Pract, 2020. **70**(692): p. e215-e220.

105. Gheorghiu, B. and S. Hagens, *Measuring interoperable EHR adoption and maturity: a Canadian example*. BMC Medical Informatics and Decision Making, 2016. **16**(1): p. 8.
106. Fennelly, O., et al., *Successfully implementing a national electronic health record: a rapid umbrella review*. International Journal of Medical Informatics, 2020: p. 104281.
107. Miotto, R., et al., *Deep Patient: An Unsupervised Representation to Predict the Future of Patients from the Electronic Health Records*. Scientific Reports, 2016. **6**(1): p. 26094.
108. Brown, S.-A.N., H. Jouni, and I.J. Kullo, *Electronic health record access by patients as an indicator of information seeking and sharing for cardiovascular health promotion in social networks: Secondary analysis of a randomized clinical trial*. Preventive Medicine Reports, 2019. **13**: p. 306-313.
109. Entzeridou, E., E. Markopoulou, and V. Mollaki, *Public and physician's expectations and ethical concerns about electronic health record: Benefits outweigh risks except for information security*. Int J Med Inform, 2018. **110**: p. 98-107.
110. Ravert, P., K. Whipple, and S. Hunsaker, *Academic Electronic Health Record Implementation: Tips for Success*. Clinical Simulation in Nursing, 2020. **41**: p. 9-13.
111. Hammoud, M.M., et al., *Medical student experiences with accessing and entering patient information in electronic health records during the obstetrics-gynecology clerkship*. American Journal of Obstetrics and Gynecology, 2020. **223**(3): p. 435.e1-435.e6.
112. Berndt, M. and M.R. Fischer, *The role of electronic health records in clinical reasoning*. Ann N Y Acad Sci, 2018. **1434**(1): p. 109-114.
113. Mollart, L., et al., *Introduction of patient electronic medical records (EMR) into undergraduate nursing education: An integrated literature review*. Nurse Education Today, 2020. **94**: p. 104517.
114. Pathak, N., et al., *Validity of using UK primary care electronic health records to study migration and health: a population-based cohort study*. The Lancet, 2019. **394**: p. S75.
115. Grasso, C., et al., *Using sexual orientation and gender identity data in electronic health records to assess for disparities in preventive health screening services*. International Journal of Medical Informatics, 2020. **142**: p. 104245.
116. Zayyad, M.A. and M. Toycan, *Factors affecting sustainable adoption of e-health technology in developing countries: an exploratory survey of Nigerian hospitals from the perspective of healthcare professionals*. PeerJ, 2018. **6**: p. e4436.

117. Jung, S.Y., et al., *Barriers and facilitators to implementation of nationwide electronic health records in the Russian Far East: A qualitative analysis*. International Journal of Medical Informatics, 2020. **143**: p. 104244.
118. Gesulga, J.M., et al., *Barriers to Electronic Health Record System Implementation and Information Systems Resources: A Structured Review*. Procedia Computer Science, 2017. **124**: p. 544-551.
119. Pohlmann, S., et al., *Digitalizing health services by implementing a personal electronic health record in Germany*. 2020.
120. Dorgham, O., et al., *Enhancing the security of exchanging and storing DICOM medical images on the cloud*. International Journal of Cloud Applications and Computing (IJCAC), 2018. **8**(1): p. 154-172.
121. Chen, C.-L., et al., *A secure electronic medical record authorization system for smart device application in cloud computing environments*. Human-centric Computing and Information Sciences, 2020. **10**: p. 1-31.
122. Miotto, R., et al., *Deep patient: an unsupervised representation to predict the future of patients from the electronic health records*. Scientific reports, 2016. **6**(1): p. 1-10.
123. Kruse, C.S., et al., *Security techniques for the electronic health records*. Journal of medical systems, 2017. **41**(8): p. 127.
124. Sulmasy, L.S., A.M. López, and C.A. Horwitch, *Ethical Implications of the Electronic Health Record: In the Service of the Patient*. J Gen Intern Med, 2017. **32**(8): p. 935-939.
125. Momenipour, A. and P.R. Pennathur, *Balancing documentation and direct patient care activities: A study of a mature electronic health record system*. International Journal of Industrial Ergonomics, 2019. **72**: p. 338-346.
126. Alsohime, F., et al., *Satisfaction and perceived usefulness with newly-implemented Electronic Health Records System among pediatricians at a university hospital*. Computer Methods and Programs in Biomedicine, 2019. **169**: p. 51-57.
127. Furlow, B., *Information overload and unsustainable workloads in the era of electronic health records*. The Lancet Respiratory Medicine, 2020. **8**(3): p. 243-244.
128. Paré, G., et al., *Electronic health record usage behaviors in primary care medical practices: A survey of family physicians in Canada*. International Journal of Medical Informatics, 2015. **84**(10): p. 857-867.

129. Maloney, S.R., et al., *Surgery Resident Time Consumed by the Electronic Health Record*. Journal of Surgical Education, 2020. **77**(5): p. 1056-1062.
130. Hariyati, R.T.S., et al., *Usability and satisfaction of using electronic nursing documentation, lesson-learned from new system implementation at a hospital in Indonesia*. International Journal of Healthcare Management, 2018.
131. Verma, G., et al., *Analyses of electronic health records utilization in a large community hospital*. PloS one, 2020. **15**(7): p. e0233004.
132. Graber, M.L., et al., *Electronic Health Record-Related Events in Medical Malpractice Claims*. J Patient Saf, 2019. **15**(2): p. 77-85.
133. WHO, *Third Global Survey on eHealth*. World Health Organization, 2015.
134. Kruse, C.S. and A. Beane, *Health information technology continues to show positive effect on medical outcomes: systematic review*. Journal of medical Internet research, 2018. **20**(2): p. e41.
135. Sheikh, A., H.S. Sood, and D.W. Bates, *Leveraging health information technology to achieve the "triple aim" of healthcare reform*. Journal of the American Medical Informatics Association, 2015. **22**(4): p. 849-856.
136. Sieja, A., et al., *Optimization Sprints: Improving Clinician Satisfaction and Teamwork by Rapidly Reducing Electronic Health Record Burden*. Mayo Clinic Proceedings, 2019. **94**(5): p. 793-802.
137. Duarte, J.G. and R.S. Azevedo, *Electronic health record in the internal medicine clinic of a Brazilian university hospital: Expectations and satisfaction of physicians and patients*. International Journal of Medical Informatics, 2017. **102**: p. 80-86.
138. Wiemann, C.M., A.C. Hergenroeder, and B.E. Sanchez-Fournier, *250. Electronic Medical Record-Based Transition Planning Tool for Children & Youth With Special Health Care Needs: A Continuous Quality Improvement Project to Increase Provider Satisfaction and Preference*. Journal of Adolescent Health, 2015. **56**(2, Supplement 1): p. S128.
139. Drexler, D., *Using a Nursing Professional Governance Approach to Improve Nurse Satisfaction and Participation With Health Information Technology*. Nurse Leader, 2020. **18**(3): p. 276-280.
140. lumen, *Introduction to Psychology*. lumen, 2020.

141. Ayaz, A. and M. Yanartaş, *An analysis on the unified theory of acceptance and use of technology theory (UTAUT): Acceptance of electronic document management system (EDMS)*. Computers in Human Behavior Reports, 2020. **2**: p. 100032.
142. Mosweu, O., K.J. Bwalya, and A. Mutshewa, *A probe into the factors for adoption and usage of electronic document and records management systems in the Botswana context*. Information development, 2017. **33**(1): p. 97-110.
143. Venkatesh, V., et al., *User acceptance of information technology: Toward a unified view*. MIS quarterly, 2003: p. 425-478.
144. Worldometer, *Map of Timor Leste (Physical)*. 2020.
145. seçginli, S., E. Semra, and K. Monsen, *Attitudes of health professionals towards electronic health records in primary health care settings: A questionnaire survey*. Informatics for health & social care, 2013. **39**.
146. Language, O., *Oxford Language and Google*. Oxford Language, 2020.
147. WHO, *Analysis of third global survey on eHealth based on the reported data by countries, 2016*. World Health Organization, 2016.
148. Ayaad, O., et al., *The role of electronic medical records in improving the quality of health care services: Comparative study*. International Journal of Medical Informatics, 2019. **127**: p. 63-67.
149. Wong, M.C., et al., *The Perceptions of and Factors Associated With the Adoption of the Electronic Health Record Sharing System Among Patients and Physicians: Cross-Sectional Survey*. JMIR Med Inform, 2020. **8**(5): p. e17452.
150. Murphy, D.R., et al., *Barriers and facilitators impacting reliability of the electronic health record-facilitated total testing process*. International Journal of Medical Informatics, 2019. **127**: p. 102-108.
151. De Pietro, C. and I. Francetic, *E-health in Switzerland: The laborious adoption of the federal law on electronic health records (EHR) and health information exchange (HIE) networks*. Health Policy, 2018. **122**(2): p. 69-74.
152. WHO, *Global Observatory for eHealth*. World Health Organization, 2016.
153. Gagnon, M.-P., et al., *Electronic health record acceptance by physicians: Testing an integrated theoretical model*. Journal of Biomedical Informatics, 2014. **48**: p. 17-27.



154. Samadbeik, M., et al., *Education and Training on Electronic Medical Records (EMRs) for health care professionals and students: A Scoping Review*. International Journal of Medical Informatics, 2020. **142**: p. 104238.
155. Zandieh, S.O., et al., *Challenges to EHR implementation in electronic-versus paper-based office practices*. Journal of general internal medicine, 2008. **23**(6): p. 755-761.
156. Strudwick, G. and R. Booth, *Quality Improvement in Vascular Access Care Through the Use of Electronic Health Records*. Journal of the Association for Vascular Access, 2016. **21**(1): p. 30-34.
157. Kight, C.E., et al., *Consensus Recommendations for Optimizing Electronic Health Records for Nutrition Care*. Journal of the Academy of Nutrition and Dietetics, 2020. **120**(7): p. 1227-1237.
158. Oyugi, B., et al., *Improving the management of hypertension and diabetes: An implementation evaluation of an electronic medical record system in Nairobi County, Kenya*. International Journal of Medical Informatics, 2020. **141**: p. 104220.
159. Casey, M.H., et al., *Improving Efficiency Using Electronic Medical Record Rounding Report & Sign-Out Report*. Journal of Pediatric Health Care, 2020.
160. Willis, S.J., et al., *Electronic Health Record Use in Public Health Infectious Disease Surveillance, USA, 2018-2019*. Curr Infect Dis Rep, 2019. **21**(10): p. 32.
161. King, J., et al., *Clinical benefits of electronic health record use: national findings*. Health services research, 2014. **49**(1pt2): p. 392-404.
162. Petersen, J.D., et al., *Clinical Decision Support for Hyperbilirubinemia Risk Assessment in the Electronic Health Record*. Academic Pediatrics, 2020. **20**(6): p. 857-862.
163. Kauppinen, H., R. Ahonen, and J. Timonen, *The impact of electronic prescriptions on medication safety in Finnish community pharmacies: A survey of pharmacists*. International Journal of Medical Informatics, 2017. **100**: p. 56-62.
164. Mahalli, A.E., *Adoption and barriers to adoption of electronic health records by nurses in three governmental hospitals in Eastern Province, Saudi Arabia*. Perspectives in health information management, 2015. **12**(Fall).
165. Tavares, J. and T. Oliveira, *New Integrated Model Approach to Understand the Factors That Drive Electronic Health Record Portal Adoption: Cross-Sectional National Survey*. Journal of medical Internet research, 2018. **20**(11): p. e11032-e11032.

166. Neubeck, L., et al., *Development of an integrated e-health tool for people with, or at high risk of, cardiovascular disease: The Consumer Navigation of Electronic Cardiovascular Tools (CONNECT) web application*. International Journal of Medical Informatics, 2016. **96**: p. 24-37.
167. Drews, F.A., J.R. Zadra, and J. Gleed, *Electronic health record on the go: Device form factor and Fitts' law*. International Journal of Medical Informatics, 2018. **111**: p. 37-44.
168. Austrian, J.S., et al., *The Financial and Clinical Impact of an Electronic Health Record Integrated Pathway in Elective Colon Surgery*. Appl Clin Inform, 2020. **11**(1): p. 95-103.
169. Dave, K., R.J. Boorman, and R.M. Walker, *Management of a critical downtime event involving integrated electronic health record*. Collegian, 2020. **27**(5): p. 542-552.
170. Leonard, E., I. de Kock, and W. Bam, *Barriers and facilitators to implementing evidence-based health innovations in low- and middle-income countries: A systematic literature review*. Evaluation and Program Planning, 2020. **82**: p. 101832.
171. Sharma, Y. and B. Balamurugan, *Preserving the Privacy of Electronic Health Records using Blockchain*. Procedia Computer Science, 2020. **173**: p. 171-180.
172. Benil, T. and J. Jasper, *Cloud based security on outsourcing using blockchain in E-health systems*. Computer Networks, 2020. **178**: p. 107344.
173. Hayes, D., Jr., *Electronic Health Record and Physician Burnout*. Am J Med Qual, 2019. **34**(4): p. 416.
174. Zavodnick, J. and T. Kouvatso, *Electronic Health Record Skills Workshop for Medical Students*. MedEdPORTAL, 2019. **15**: p. 10849.
175. Wallach, P.M., et al., *Electronic Health Record Use in Internal Medicine Clerkships and Sub-internships for Medical Students Graduating from 2012 to 2016*. J Gen Intern Med, 2019. **34**(5): p. 705-711.
176. Sungur, C., et al., *Correction of patient medical record errors through a file control method*. Health Policy and Technology, 2019. **8**(4): p. 329-336.
177. Messino, P.J., et al., *A method for measuring the effect of certified electronic health record technology on childhood immunization status scores among Medicaid managed care network providers*. Journal of Biomedical Informatics, 2020. **110**: p. 103567.
178. Fernández-Oliveira, C., et al., *Impact of introducing assisted electronic prescription on paediatric patient safety*. Anales de Pediatría (English Edition), 2020. **93**(2): p. 103-110.

179. Taylor, D.N., *A Literature Review of Electronic Health Records in Chiropractic Practice: Common Challenges and Solutions*. *Journal of Chiropractic Humanities*, 2017. **24**(1): p. 31-40.

APPENDIX

Appendix 1. Ethical Clearance

 <p>연세의료원 연구심의위원회 Yonsei University Health System, Institutional Review Board 서울특별시 서대문구 연세로 50-1 (우) 03722 Tel. 02 2228 0454, Fax. 02 2227 7888 Email. irb@yuhs.ac</p>		
심 의 일 자	2020년 9 월 4 일	
결 수 번 호	2020-2142-002	
과 제 승 인 번 호	Y-2020-0117	
연세의료원 연구심의위원회의 심의 결과를 다음과 같이 알려 드립니다.		
Protocol No.		
연구 제목	동티모르에서 전자보건의료 도입에 대한 일차보건의료기관 의사들의 인식 조사	
연구 책임자	Barreto, Adelia Maria Moniz / Yonsei University Yonsei University	
의 료 자	(학)연세대학교	
연구 예정 기간	2020.09.04 ~ 2021.03.03	
지속심의 빈도	12개월마다	
과 제 승 인 일	2020.09.04	
위험 수준	Level 1 최소위험	
심의 방법	신속	
심의 유형	질의답변 + 계획변경	
심의 내용	<p>- I am conducting research on "THE PERCEPTION OF PRIMARY HEALTH CARE'S PHYSICIANS IN ADOPTION OF ELECTRONIC HEALTH RECORD- TIMOR LESTE." The principal objective of this research is to understand the perception of primary health care physicians in the adoption of the electronic health records in Timor Leste by identifying the benefits, barriers, and satisfaction of the utilization of electronic health records in primary health care level.</p> <p>You are requested to fill out the questionnaire from sections 1 to 4 accordingly. The entire process should last 7 to 10 minutes to fill. Your invaluable input to this research will be highly appreciated.</p> <p>- [변경후]대상자 모집 문건 : Recruitment documents 삭제 - [변경후]대상자 모집 문건 : Recruitment documents 추가</p>	
심의 위원 회	연세의료원 IRB	
합 의 위 원	연세의료원 IRB 신속심의회자	
Ver 5.0 / 누락 출력 횟수	1	YUHS IRB [2020-05-24] 1/3
		

심 의 결 과 승인
심 의 의 견 -

※ 연세의료원 연구심의위원회의는 생명윤리 및 안전에 관한 법률을 준수합니다.
연구책임자 및 연구담당자가 IRB 위원인 경우, 해당 위원은 위 연구의 심의과정에 참여하지 않았습니다.

연세의료원
연구심의위원회
위원장 

Ver 5.0 / 누락 출력 횟수	1	YUHS IRB [2020-05-24] 2/3
		

*** 유의사항 ***

1. **연세대학교 연구실의원칙 규정 준수**
연구제일지키키는 모든 연구관련자들이 규정을 이행할 수 있도록 엄격하여 주시기 바랍니다.
2. **이의신청**
연구자는 실험결과에 이의가 있을 경우 이의신청을 통해 심의관련 하연계제가 가능합니다. 관련 절차에 대한 의견과 충분한 근거를 제출하여 주시기 바라며, 자료 미흡 또는 근거가 불충분할 경우 연구자에게 추가 자료를 요청할 수 있습니다.
3. **질의답변**
승인 통보받지 않은 과정은 연구를 진행할 수 없습니다. 시정승인 또는 보완 결과를 받은 과정은 관련 절차에 대한 답변서와 그에 따른 변경 및 수정된 자료를 심의일로부터 6개월 이내에 제출하여야 합니다.
4. **대상자 동의**
IRB 승인을 받은 동의서를 사용하여야 하며, 강제 혹은 부당한 영향이 없는 상태에서 충분한 설명에 근거하여 동의절차가 진행되어야 합니다. 또한, 대상자에게 연구참여여부를 고려할 수 있도록 충분한 시간을 제공하여야 합니다. 대상자 보립공고문을 사용하는 경우에는 보립공고문과 게시방법에 대해 IRB의 사전 승인을 받아야 합니다.
5. **중간보고**
관련 법령에 따라 연구의 승인 유효기간은 최대 1년을 넘을 수 없습니다. 변경이 필요한 실험 실행 단계에 따라 승인 만료일 최소 6주전에 중간보고를 제출하여 승인 유효기간을 갱신하여야 합니다.
6. **계획변경**
연구진행 시, 대상자 보호를 위해 불가피한 경우를 제외하고 연구절차, 대상자 수 등 IRB로부터 승인받은 내용에 변경이 있을 경우에는 반드시 IRB의 승인을 득한 이후에 적용할 수 있으며, 대상자 보호를 위해 취해진 응급상황에서의 변경도 즉시 IRB에 보고하여 주시기 바랍니다.
7. **안전성 정보 보고**
대상자의 안전이나 임상연구에 부정적인 영향을 미칠 수 있는 새로운 정보에 대해 신속히 IRB에 보고하여야 합니다.
8. **종료보고**
대상자의 관찰이 종료되고 자료 수집이 완료된 후 20일 이내에 보고하여야 합니다.
9. **결과보고**
중료보고 이후, 자료분석 결과에 대해 보고하여야 합니다.
10. **내부검열 시 협조 요청**
대상자 보호와 계획서 및 관련 규정 준수를 확인하기 위해 검열을 실시하는 경우, 원활한 검열결과 진행을 위해 연구진행과 관련된 서류를 준비하고 협조하여 주시기 바랍니다.

Ver 5.0 / 누적 출력 횟수 1

YUHS IRB [2020-05-24] 3/3

Appendix 2. Informed Consent

Inform Consent

Principal Investigator: dr. Barreto, Adelia Maria Moniz

Co-Principal Investigator: Prof. Sunjoo Kang

Organization: Yonsei University, South Korea

Sponsor: None

Title of Study: **THE PERCEPTION OF PRIMARY HEALTH CARE'S PHYSICIANS IN ADOPTION OF ELECTRONIC HEALTH RECORD- TIMOR LESTE.**

To fulfill one of the criteria to complete my Master's Degree, it is recommended to write a thesis, therefore, I would like to apply a research related to the topic mentioned above. Firstly, my high appreciation and my gratitude to all colleagues who voluntarily to participate in this survey. This survey will take 7-10 minute to fill all the questionnaire. All the information we obtain will remain strictly confidential, that only can be accessed by principal and co-principal investigator and your answers and name will never be revealed. Your seriousness in responding is highly recommended.

If you consent voluntarily to be a participant in the study, please click **"Agree"**

Thank you for your collaboration!

VALID DURATION
 2020-09-04 ~ 2021-03-03
 Y U H S I R B

Vamos a la lucha

Questions Responses 100



Section 1 of 6

Persepsaun Médiku Jerál Atensaun Primária iha Adopsaun Rejistu Saúde Eletróniku (RSE) iha Timor Leste.

Prinsipal Investigadór: dr. Adelia Maria Moniz Barreto
Co-Prinsipal Investigadór: Prof. Sunjoo Kang
Organizasaun: Yonsei University, Korea Sul
Título peskija: PERSEPSAUN MÉDIKU JERÁL ATENSAUN PRIMARIA IHA ADOPSAUN REJISTU SAÚDE ELEKTRÓNIKU (RSE) IHA TIMOR-LESTE.

Oras ne'e dadaun ha'u hala'o hela estudo iha Korea Sul, Program "Global Health Security- Response Program", Majestrau Saúde Pública. Hanesan Timor oan, utilizador no pionér ba programa ne'e rasik, ha'u iha interese atu realiza estudo ho título nebeeé temi iha leten nomós hanesan kriteria ida hodi bele remata ha'u nia estudo majestradu.

Estudo ne'e nia rezultadu sei fo kontribuisaun nebe'e sei benefisia Ministério Saúde, fornese informasaun hodi tulun Na'i-Ulun sira hodi foti desizaun, ba profesional saúde rasik hodi hirak ne'ebe utiliza sistema ne'e bele foti desizaun, planu serbisu bazeia ba evidencia ("evidence based") hodi nune'e povu Timor Leste bele benefisiu husi servisu saúde ne'ebe holistiku, komprehensivu no atualizadu.

Uluk nanain, ha'u nia apresiasaun no gratidaun ba belun profesional (Médiku) nivel atensaun primária nebe'e voluntariamente hakarak participa iha survey ida ne'e. Survey ne'e nia durasaun minutu 7-10 hodi bele kompleta kuestionér tur mal. Informasaun hotu nebe ami obtén sei hela hanesan informasaun konfidensial, e investigadora prinsipal no co-investigadora mak sei bele aseu. Respostas e identidade respondente nian sei la revela. Survey ne'e hetan ona aprovasaun husi Yonsei Medical Center Research Review Committee, Institute Review Board (IRB), número: 2020-2142-002.

Ita bo'ot nia seriedade hodi responde survey ne'e rekomena tebes. Agradece Wa'in ba ita-bo'ot nia kolaborasaun!

Nota: Ba informasaun klaru no klean liu tan kona-ba estudo ne'e, halo favor kontakta:
E-mail: adeliambbarreto@gmail.com
Telf & Wa: (+82) 010-8072-9496

Se ita-bo'ot klik "Aseita" hatudu katak ita-bo'ot konsiente e voluntariamente hakarak atu participa iha estudo ne'e to'o remata.

Aseita

After section 1 Continue to next section

Section 2 of 6

Informed consent of the research in Tetum

Appendix 3. Questionnaire

1. Sociodemographic Characteristics

Characteristics	Subitem
1. Sexo <i>Gender</i>	M, F M, F
2. Idade <i>Age</i>	
3. Tinan graduasaun <i>Year of graduation</i>	
4. Tinan hala'õo pratika nudar mediku <i>Year Practicing as Medical doctor</i>	
5. Area servisu atual <i>Area of workplace</i>	Posto Saude, Sentru Saude Komunitariu, Servisu Saude Munisipal <i>Health Post, Community Health Center, District Health Servide</i>
6. Naran fatin servisu atual <i>Current workplace Name</i>	
7. Iha '' username'' <i>Has s a username</i>	Sim, Lae <i>Yes, No</i>
8. Tempo uza RSE lor-loron <i>Time spent using EHR daily</i>	Ituan (-2h), naton, barak <i>Little (-2h), Enough (2-4h), Many (4-6 or +)</i>
9. Iha esperiensiã uza RSE antes <i>Previous EHR use experience</i>	Sim, Lae <i>Yes, No</i>
10. Iha komputadora rasik <i>Has own computer</i>	Iha, Laiha <i>Yes, No</i>
11. Fatin uza komputadora <i>Place using computer</i>	Uma, servisu fatin, uma & servisu fatin <i>Home, Workplace, Home & Workplace</i>
12. Simu treinamentu uza RSE <i>Training in EHR system</i>	Sim, Lae <i>Yes, No</i>
13. Abilidade uza komputadora (ejemplo: hakerek, explora internet, instalaun aplikasaun) <i>The ability using computer (writing, internet explorer and installation of application)</i>	Ladiak, Naton, Diak <i>Bad, Enough, Good</i>

2. Benefisiu adopta/ uza Rejistu Saúde Electroniku

The statements for the barriers of the electronic health record implementation

	Aceita tebes Strongly Agree	Ace ita Agr ee	Neu tral Netr al	La Aseit a Disag ree	La aseita liu Strongly disagree
Sistem Rejistu Saúde Electroniku: Elecronic Health Record System:					
Fornese asesu lais no seguru ba studo sientifiku <i>Provides quick and reliable access to scientific research</i>					
Fornese asesu facil ba informasaun rejistu mediku pasado nian <i>enables easy access to information from past medical records</i>					
Fornese asesu ba data paciente nian no analiza <i>provide access to patients' data and analysis</i>					
Fornese dados nebeé diak liu <i>provides better data</i>					
Fasilita atu transfere dados entre nivél atensaun (primaria, sekundaria e tersiaria) <i>make it easy to transfer data between health care levels (primary, secondary, and tertiary)</i>					
Fornese dados hodi pratica ho standar <i>provide access to practice standards</i>					
Permite "follow-up" ba pacientes <i>Enabling Patients follow up</i>					
Permite paciente hala' o visita regular <i>patients regular visit</i>					
Permite "follow-up" rezultadu teste ijame <i>enables following test results</i>					
Habadak tempu iha dokumentasaun dados Saude nian <i>saves time in documenting health data</i>					
Hamenus dokumentasaun ho surat-tahan <i>decreases paper-based documentation</i>					
Melhora qualidade de atensaun <i>improve the quality of care</i>					
Hasa'e sentidu profesionalismo <i>improve the feeling of professionalism</i>					
Kontribui ba professional saude nia abilidade atu foti desizaun relaciona ho paciente nia saude <i>contributes to health professionals' ability to make patient care decisions</i>					
Melhora komunikasaun entre profesional Saude no paciente <i>improve communication between health professional and patients</i>					
Melhora komunikasaun entre profesional Saude rasik <i>improve communication between health professionals</i>					
Hamenus erro médiku <i>reduces medical error</i>					
Reduz duplikasaun ba informasaun Saude paciente nian <i>Reduction of duplication in patient health information</i>					
Akuradu no bele assesu iha kualker tempo <i>Accuracy and timely access</i>					
Benefisia iha vigilancia no monitorizasaun moras <i>Disease surveillance and monitoring</i>					
Facil liu no lais liu atu prescribe ai-moruk <i>Made e-prescribing easier and faster</i>					

3. Barreira utiliza Rejistu Saude Electroniku

The statements for the barriers of the electronic health record implementation

Sistem Rejistu Saude Electroniku: Electronic Health Record System:	Aceita tebes Strongly Agree	Aceita Agree	Neutral Netral	La Aseita Disagree	La aseita liu Strongly disagree
Formlariu iha sistema dijital komplikadu liu e la fácil atu uza <i>is too complicated and not user friendly</i>					
Compromete seguridade pasiente nian <i>compromises patient safety</i>					
Hamenus interaksaun entre pessoal Saude no pasiente <i>decrease interaction between health professional and patient</i>					
Amenta servisu ba pessoal saude <i>increase health professional workloads</i>					
Defisil atu fornese seguridade dadus iha RSE <i>it is difficult to provide data security in EHRs</i>					
Konsumu tempu barak liu kompara ho surat-tahan <i>consume more time than paper-based system</i>					
Dala barak "down" (lakon koneksaun) <i>is "down" frequently</i>					
Kustu makaás liu <i>is costly</i>					
Presija revizaun frekvente ba dezemvolvimentu teknolojía <i>needs frequent revision to technological development</i>					
Compatibilidade ba web browser <i>compatibility of web browser</i>					
Instrukasaun atu uza la klaru <i>instruction of use not clear</i>					
Iha difikuldade atu komprende lalais sistema dijital Comprehensiveness					

4. Satisfaksaun Wainhira Utiliza Rejistu saude Electroniku

Statements for the satisfaction of utilization of electronic health record

Satisfaksaun husi utilizador Rejistu Saúde Electroniku <i>User satisfaction on electronic health record utilization</i>	Aceita tebes <i>Strongly Agree</i>	Aceita <i>Agree</i>	Neutral <i>Netral</i>	La Aseita <i>Disagree</i>	La aseita liu <i>Strongly disagree</i>
Ha'ú senti RSE neé útil tebes <i>I feel EHR is usefull</i>					
Ha'ú senti RSE ne'e sistema importante ba nivel atensaun primaria <i>I feel EHR is an important system for primary health care level</i>					
Ha'ú senti RSE valoriza tempo no rekere esforso atu uza <i>I feel EHR is worth the time and effort requiered to use it</i>					
Ha'ú senti qualidade prestasaun saúde ha'ú nia melhora <i>I feel the quality of my work has improved</i>					
Ha'ú senti katak qualidade informasaun melhora tamba RSE <i>I feel the quality of information has been improved due to EHR</i>					
Ha'ú senti ha'ú nia performansia servisu nian melhora tamba RSE <i>I feel my performance has been improved due to EHR</i>					
Ha'ú senti seguridade dadus paciente nia melhora <i>I feel patient data safety has improved due to EHR</i>					
Ha'ú senti komunikasaun entre pessoal Saude nian melhora <i>I feel the communication between health professional has improved due to EHR</i>					
Melhora qualidade ba prestasaun saude <i>Quality improvement in providing health service</i>					
Ha'ú senti comfortable liu uza RSE compara ho surat-tahan <i>I feel more comfortable to use EHR than paper-based</i>					
Ha'ú hanoin uza RSE apropiado liu ba Médico hotu iha haú nia área (atensaun primaria) <i>I think using the EHR would be proper for a doctor in my area (primary care)</i>					

En jerál, ha' u satisfaz ho RSE iha atensaun primaria <i>overall, I am satisfied with the EHR in primary health care</i>					
--	--	--	--	--	--