

Original Article



# Primary health care physicians' perception of electronic health records adoption in Timor-Leste: a cross-sectional study

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Conflict of Interest

The authors declare that they have no competing interests.

Author Contributions

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## ABSTRACT

**Background:** This study aimed to identify the factors affecting the successful operation of electronic health records (EHRs) during the initial pilot implementation period from 2015 to 2017. The EHR system in Timor-Leste was first launched in 2015 after the VI Constitutional Government introduced the “Saúde na Família” initiative. In January 2019, the system was discontinued after being disrupted by a political impasse between 2017 and 2018. The new Minister of Health reactivated the adoption of the EHR system as of August 2020.

**Methods:** This study included a cross-sectional survey. The questionnaire covered benefits, barriers, and satisfaction categories along with sociodemographic variables.

**Results:** Statistically significant differences between age groups were noted for the benefits, perceived barriers (such as the ability to use computers), and overall satisfaction of the EHR system. The slope of the benefit category ( $\beta = 0.497$ ,  $t = 11.361$ ) was a statistically significant predictor of satisfaction with EHR system implementation. However, the slope of the barrier category had a negative statistical significance for satisfaction ( $\beta = -0.086$ ,  $t = -1.794$ ). Satisfaction with the EHR system was influenced by its perceived benefit and reduced perceived barriers due to individuals' utilization of the information and communication technology system.

**Conclusion:** Continuous political commitment to health policy, financial support, friendly end-user applications, improved quality of Internet service, and a positive attitude toward the system were crucial for its successful implementation.

**Keywords:** Electronic health records; Perception; Personal satisfaction; Timor-Leste

## INTRODUCTION

In 1960, Dr. Lawrence L. Weed introduced the notion of utilizing electronic health records (EHRs) in the medical field with the core objective of recording all patients' data. In 2000, owing to the evolution of the Internet and widespread utilization of Web software, many countries began to implement EHR systems. On February 17, 2009, former President Barack Obama's mandate for the American Recovery and Reinvestment Act of 2009, which included









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**Table 3.** The benefits of EHR implementation (n = 149)

Benefits of EHR adoption	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean ± SD
Provides quick and reliable access to scientific research	98 (65.8)	51 (34.2)	0 (0.0)			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
Provides 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
Makes it easy to transfer data	98 (65.8)	46 (30.9)	3 (2.0)	2 (1.3)		4.6 ± 0.6
Provides access to practice standards	74 (49.7)	72 (49.3)	3 (2.0)			4.5 ± 0.5
Enables follow-up by patients	100 (67.1)	46 (30.9)	3 (2.0)			4.7 ± 0.5
Makes it easier to schedule patients' regular visits	91 (61.1)	56 (37.6)	2 (1.3)			4.6 ± 0.5
Enables tracking of 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
Improves the quality of care	92 (61.7)	54 (36.2)	3 (2.0)			4.6 ± 0.5
Improves the feeling of professionalism	95 (63.8)	45 (30.2)	8 (5.4)	1 (0.7)		4.6 ± 0.6
Contributes to health professional's ability to make patient care decisions	91 (61.1)	52 (34.9)	6 (4.0)			4.6 ± 0.6
Improves communication between health professionals and patients	79 (53.0)	62 (41.6)	8 (5.4)			4.5 ± 0.6
Improves 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
Reduces duplication of 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
Makes e-prescribing easier and faster	82 (55.0)	60 (40.3)	7 (4.7)			4.5 ± 0.6

Values are presented as numbers (%).  
SD = standard deviation; EHR = electronic health record.

**Table 4.** The barriers to EHR implementation (n = 149)

Barriers to EHR implementation	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean ± SD
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
Decreases interaction between health professionals and patient	22 (14.8)	36 (24.2)	24 (16.1)	56 (37.6)	11 (7.4)	3.0 ± 1.2
Increases health professional workloads	15 (10.1)	32 (21.5)	42 (28.2)	52 (34.9)	8 (5.4)	3.0 ± 1.1
Difficult to provide data security	5 (3.4)	24 (16.1)	39 (26.2)	63 (42.3)	18 (12.1)	2.6 ± 1.0
Consumes more time than a paper-based system	25 (16.8)	39 (26.2)	31 (20.8)	45 (30.2)	9 (6.0)	3.2 ± 1.2
Frequent system malfunctions	58 (38.9)	63 (42.3)	21 (14.1)	6 (4.0)	1 (0.7)	4.2 ± 0.9
Costly	39 (26.7)	56 (37.6)	39 (26.2)	12 (8.1)	3 (2.0)	3.8 ± 1.0
Need for frequent modifications as technology advances	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
Instructions for EHR 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

Values are presented as numbers (%).  
SD = standard deviation; EHR = electronic health record.

that the quality of their work has improved (n = 74, 49.7%, mean ± SD = 4.3 ± 0.7) even though more than 51% (n = 76) were satisfied with EHRs in primary health care. Participants responded neutrally to the statement that their performance had improved (n = 37, 24.8%, mean ± SD = 4.0 ± 0.8), as shown in **Table 5**.

**The relationship between benefits and barriers to satisfaction**

There was a strong positive relationship between participants' ratings of satisfaction regarding EHR utilization and its perceived benefit (r = 0.708, P ≤ 0.001) and vice versa. There was also a significant correlation between time spent using EHR (r = 0.178, P = 0.03) and location of computer use (r = 0.211, P = 0.01). There was no statistically significant relationship between satisfaction and age (r = 0.007, P = 0.94), workplace (r = 0.004, P = 0.97), the username (r = 0.055, P = 0.50), and having their own computers (r = 0.016, P = 0.85). The results showed that there was a weak significant negative correlation between benefits and barriers (r = -0.14, P = 0.07), as shown in **Table 6**.

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**Table 5.** Satisfaction with EHR implementation (n = 149)

Satisfaction with EHR implementation	Strongly agree	Agree	Neutral	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 the 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 improved owing to the EHR.	62 (41.6)	66 (44.3)	20 (13.4)	1 (0.7)	4.3 ± 0.7
I feel my performance has improved owing to the EHR.	42 (28.2)	66 (44.3)	37 (24.8)	4 (2.7)	4.0 ± 0.8
I feel patient safety has improved owing to the EHR.	77 (51.5)	58 (38.9)	14 (9.4)		4.4 ± 0.7
I feel the communication between health professionals has improved owing to the EHR.	60 (40.3)	70 (47.0)	19 (12.8)		4.3 ± 0.7
Quality improvement in providing health services.	72 (48.3)	67 (45.0)	10 (6.7)		4.4 ± 0.6
I feel more comfortable using an EHR than a paper-based one.	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 healthcare	76 (51.0)	63 (42.3)	9 (6.0)	1 (0.7)	4.4 ± 0.6

Values are presented as numbers (%).

SD = standard deviation; EHR = electronic health record.

**Table 6.** Correlation between satisfaction and related factors (n = 149)

Item	Satisfaction	Sex	Age	Years of practice	Workplace	Username	Time spent using EHR	Have own computer	Place using computer	Computer ability	Benefit	Barrier
Satisfaction	1.000											
Sex	-0.028	1.000										
Age	0.007	-0.276 <sup>b</sup>	1.000									
Years of practice	0.936	0.001		1.000								
Workplace	-0.076	-0.078	-0.197 <sup>a</sup>		1.000							
Username	0.357	0.343	0.016			1.000						
Time spent using EHR	0.004	-0.034	0.045	-0.262 <sup>b</sup>			1.000					
Have own computer	0.965	0.681	0.586	0.001				1.000				
Location of computer use	0.055	0.026	0.125	-0.112	0.152	1.000			1.000			
Computer ability	0.504	0.751	0.129	0.175	0.064					1.000		
Benefit	0.178 <sup>a</sup>	-0.038	0.042	-0.122	0.146	0.182 <sup>a</sup>	1.000				1.000	
Barrier	0.030	0.650	0.614	0.137	0.075	0.026						1.000
	0.016	-0.096	-0.131	0.070	0.053	-0.077	-0.048	1.000				
	0.848	0.245	0.110	0.396	0.525	0.349	0.562		1.000			
	0.211 <sup>b</sup>	-0.166 <sup>a</sup>	-0.111	-0.015	0.127	0.176 <sup>a</sup>	0.159	0.245 <sup>b</sup>		1.000		
	0.010	0.043	0.177	0.852	0.124	0.032	0.053	0.003			1.000	
	-0.064	-0.204 <sup>a</sup>	-0.034	-0.006	0.051	0.028	0.163 <sup>a</sup>	0.016	0.037	1.000		
	0.438	0.013	0.684	0.941	0.538	0.731	0.047	0.844	0.653		1.000	
	0.708 <sup>b</sup>	-0.018	-0.052	-0.108	0.096	-0.018	0.152	0.014	0.148	0.002		1.000
	0.000	0.830	0.532	0.191	0.242	0.831	0.064	0.869	0.071	0.982		
	-0.210 <sup>b</sup>	0.034	-0.032	0.132	-0.022	-0.082	-0.144	-0.138	-0.095	-0.153	-0.144	1.000
	0.010	0.679	0.696	0.108	0.790	0.322	0.079	0.094	0.249	0.063	0.079	

EHR = electronic health record.

<sup>a</sup>Correlation is significant at the 0.05 level (2-tailed); <sup>b</sup>Correlation is significant at the 0.01 level (2-tailed).

**Factors influencing EHR satisfaction**

According to the multiple regression analysis, the R<sup>2</sup> for the overall model was 54%, with an adjusted R<sup>2</sup> of 51%. As shown in **Table 7**, the participants' satisfaction and other factors had a positive slope, such as age (B = 0.520, t = 0.656, P = 0.51), username (B = 0.741, t = 0.634, P = 0.53), time spent using EHR (B = 0.521, t = 0.991, P = 0.32), and location of computer use (B = 0.980; t = 1.669, P = 0.09). The variable benefit (B = 0.497, t = 11.361, P ≤ 0.001) had a statistically significant impact on satisfaction with EHR implementation (R<sup>2</sup> = 51.0%). Multiple linear analysis revealed that these predictor variables were not statistically significant predictors of the model (P > 0.05). The model reported a significant effect of variation in satisfaction with EHR utilization by the linear combination of predictor variables. It can be concluded that the participants' satisfaction was not statistically impacted by other variables, except for that of perceived benefit.

**Table 7.** Factors influencing EHR satisfaction (n = 149)

Item	B	SE	$\beta$	t	Sig.	VIF
(Constant)	6.879	7.200		0.955	0.341	
Sex	-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
Years of practice	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
Location of computer use	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
$R^2 = 0.545$			$Adj. R^2 = 0.508$			

EHR = electronic health record; SE = standard error; VIF = variance inflation factor.

## DISCUSSION

This study's findings indicated that not all sociodemographic characteristics were associated with the perception of benefits, barriers, and satisfaction related to the implementation and utilization of the EHR system. The age of the respondents showed statistical significance in perceptions of benefit. This is consistent with the findings of Jung et al.<sup>10</sup> who indicated that younger professionals had a more positive attitude toward technological changes than older ones. Regarding the barriers, the findings signaled a statistically significant difference in the level of computer literacy, which was consistent with the rapid umbrella review by Fennelly et al.<sup>11</sup> which revealed that technological literacy is one of the major factors influencing EHR implementation. Therefore, training provided before EHR utilization would be helpful for successful EHR implementation.<sup>12</sup>

The positive behavior toward EHR adoption among medical doctors results from the perceived benefit, as highlighted by this study and further supported by Shiferaw and Mehari.<sup>13</sup> Just over 3-quarters of respondents agreed that using EHR decreases paper-based documentation, which was consistent with the results of previous research.<sup>14</sup> In line with previous studies, easy access to information from past medical records and patients' data and analysis was found to enable better quality care delivery outcomes.<sup>15,17</sup> The findings of the present study were also in line with Ganiga et al.,<sup>15</sup> Casey et al.,<sup>18</sup> and Willis et al.<sup>19</sup> with regard to EHR allowing a reduction in the duplication of patient health information and quicker data-sharing and documenting compared to paper-based reports.

The negative perceptions of EHR may be influenced by the short duration of its implementation, less time spent on EHR utilization, and respondents' poor technological literacy. Consequently, the continuum of capacity-building support for electronics use needs to be offered. Furthermore, EHR implementation during medical school would be advantageous in reducing paper-based health status documentation.<sup>20-22</sup>

The present study's findings regarding general physicians' perceptions of EHR implementation at the primary health care level in Timor-Leste suggest that EHR decreases paper-based documentation, leads to quality health care, enables easy access to patient's health records, enables patient follow-ups, reduces duplication of patient health information, and allows faster data transfer. The satisfaction with EHR was influenced by the benefits perceived while utilizing the system and by a reduction in barriers to its use. Political



commitment, financial support, user-friendly applications, improved quality of Internet service, and a positive attitude toward EHR were crucial for successful implementation. The findings of this study will contribute to the Ministry of Health of Timor-Leste by enlightening healthcare leaders on the necessary strategies for facilitating successful engagement in health reform and developing a strategic plan based on evidence. Hence, the Timorese population will benefit from a holistic, comprehensive, and innovative healthcare service.

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## REFERENCES

1. ARRA economic stimulus package. <https://www.healthitanswers.net/about/about-arra/>. Updated 2020. Accessed March 15, 2022.
2. Report of the third global survey on eHealth. <https://apps.who.int/iris/handle/10665/252529>. Updated 2016. Accessed March 15, 2022.
3. Jacob PD. Management of patient healthcare information: healthcare-related information flow, access, and availability. In: Gogia S, editor. *Fundamentals of Telemedicine and Telehealth*. London, UK: Academic Press; 2020, 35-57.
4. Thate J, Rossetti SC, McDermott-Levy R, Moriarty H. 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):124-31.  
[PUBMED](#) | [CROSSREF](#)
5. Global observatory for eHealth. <https://www.who.int/observatories/global-observatory-for-ehealth>. Updated 2015. Accessed August 10, 2020.
6. Health in the Family Program now covers 94% of households. <http://timor-leste.gov.tl/?p=18043&lang=en>. Updated 2017. Accessed March 15, 2022.
7. Timor Leste's political impasse. <https://pursuit.unimelb.edu.au/articles/timor-leste-s-political-impasse>. Updated 2018. Accessed March 15, 2022.
8. Electronic registration of the Family Health Program. [https://www.mj.gov.tl/jornal/public/docs/2019/serie\\_2/SERIE\\_IL\\_NO\\_3.pdf](https://www.mj.gov.tl/jornal/public/docs/2019/serie_2/SERIE_IL_NO_3.pdf). Updated 2019. Accessed March 15, 2022.
9. Secginli S, Erdogan S, Monsen KA. Attitudes of health professionals towards electronic health records in primary health care settings: a questionnaire survey. *Inform Health Soc Care* 2014;39(1):15-32.  
[PUBMED](#) | [CROSSREF](#)
10. Jung SY, Lee K, Lee HY, Hwang H. Barriers and facilitators to implementation of nationwide electronic health records in the Russian Far East: a qualitative analysis. *Int J Med Inform* 2020;143:104244.  
[PUBMED](#) | [CROSSREF](#)
11. Fennelly O, Cunningham C, Grogan L, Cronin H, O'Shea C, Roche M, et al. Successfully implementing a national electronic health record: a rapid umbrella review. *Int J Med Inform* 2020;144:104281.  
[PUBMED](#) | [CROSSREF](#)
12. Alshome F, Temsah MH, Al-Eyadhy A, Bashiri FA, Househ M, Jamal A, et al. Satisfaction and perceived usefulness with newly-implemented electronic health records system among pediatricians at a university hospital. *Comput Methods Programs Biomed* 2019;169:51-7.  
[PUBMED](#) | [CROSSREF](#)
13. Shiferaw KB, Mehari EA. Modeling predictors of acceptance and use of electronic medical record system in a resource-limited setting: using modified UTAUT model. *Inform Med Unlocked* 2019;17:100182.  
[CROSSREF](#)
14. Zandieh SO, Yoon-Flannery K, Kuperman GJ, Langsam DJ, Hyman D, Kaushal R. Challenges to EHR implementation in electronic- versus paper-based office practices. *J Gen Intern Med* 2008;23(6):755-61.  
[PUBMED](#) | [CROSSREF](#)

15. Ganiga R, Pai RM, Manohara Pai MM, Sinha RK. 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):176-80.  
[PUBMED](#) | [CROSSREF](#)
16. Kight CE, Bouche JM, Curry A, Frankenfield D, Good K, Guenter P, et al. Consensus recommendations for optimizing electronic health records for nutrition care. *J Acad Nutr Diet* 2020;120(7):1227-37.  
[PUBMED](#) | [CROSSREF](#)
17. Strudwick G, Booth R. Quality improvement in vascular access care through the use of electronic health records. *J Vasc Access* 2016;21(1):30-4.  
[PUBMED](#) | [CROSSREF](#)
18. Casey MH, Turner B, Edwards L, Williams M. Improving efficiency using electronic medical record rounding report & sign-out report. *J Pediatr Health Care* 2020;34(6):535-41.  
[PUBMED](#) | [CROSSREF](#)
19. Willis SJ, Cocoros NM, Randall LM, Ochoa AM, Haney G, Hsu KK, et al. Electronic health record use in public health infectious disease surveillance, USA, 2018-2019. *Curr Infect Dis Rep* 2019;21(10):32.  
[PUBMED](#) | [CROSSREF](#)
20. Zavodnick J, Kouvatso T. Electronic health record skills workshop for medical students. *MedEdPORTAL* 2019;15:10849.  
[PUBMED](#) | [CROSSREF](#)
21. Wallach PM, Foster LM, Cuddy MM, Hammoud MM, Holtzman KZ, Swanson DB. 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):705-11.  
[PUBMED](#) | [CROSSREF](#)
22. Sungur C, Songur L, Çiçek AÇ, Top M. Correction of patient medical record errors through a file control method. *Health Policy Technol* 2019;8(4):329-36.  
[CROSSREF](#)