ORIGINAL ARTICLE

Usability of the Citizen's Electronic Record and its association with the Burnout Syndrome dimensions

Marla Ariana Silva[1], Nayara Evangelista[1], Anna Luiza Costa Monteiro de Castro[1], Richardson Miranda Machado[1], Tarcísio Laerte Gontijo[1], Dárlinton Barbosa Feres Carvalho[2], Eliete Albano de Azevedo Guimarães[1]

ABSTRACT

Objective: To analyze the usability of the Citizen's Electronic Record and its association with the Burnout Syndrome dimensions. **Methods:** A descriptive and analytical cross-sectional epidemiological study carried out between 2020 and 2021 with 139 professionals working in family health and oral health teams. The System Usability Scale score and the Maslach Burnout Inventory were used for data collection. The descriptive analyses were presented in the form of a frequency table, including median and quartiles. To measure associations between the Burnout Syndrome dimensions and the usability degree of the Citizen's Electronic Record, we used the Chi-square, Mann-Whitney and Kruskal-Wallis tests. **Results:** The System Usability Scale mean score indicated marginal usability of the Citizen's Electronic Record (60.1±13.8). The best evaluated quality attributes were ease of learning, efficiency and satisfaction. There was a statistically significant association between the usability degree of the Citizen's Electronic Record and the training variable (p=0.005). The depersonalization dimension of the Burnout Syndrome was associated with the professional category (p=0.027). There was no difference in the three Burnout Syndrome dimensions when comparing the different acceptance levels of the System Usability Scale score (p>0.05). **Conclusion:** Usability of the Citizen's Electronic Record showed advances in the quality of the software's functionalities and it was found that it has not generated exhaustion signs or symptoms in health professionals.

Keywords: Electronic health records, Health information technology, Professional burnout, Health personnel, Primary health care.

INTRODUCTION

The Citizen's Electronic Record (CER) is a software component of the Primary Health Care Unified Health e-System (e-SUS APS) strategy that enables individualized record-keeping and supports the entire unit workflow, including professionals' schedules, list of appointments, citizen record history, home care, unit production export, and report generation[1-2]. With the implementation of this technological innovation, it is possible to enhance the care provided to the population, expand the clinical capacity of healthcare professionals, optimize information management costs, share information among healthcare professionals, systematize health information recording, integrate decision support tools in healthcare service delivery, and create an information platform where it is possible to extract healthcare team results[3]. However, studies indicate that there are challenges to overcome, such as the constant software updates, insufficient infrastructure conditions, and professional resistance regarding the use and adoption of technology[4-5].

The use of technological innovations has been associated as one of the poten-

[1]Federal University of São João Del-Rei, Divinópolis (MG), Brazil

[2]Federal University of São João Del-Rei, São João Del-Rei (MG), Brazil

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tial causal factors for Burnout Syndrome (BS), also known as professional burnout syndrome[6-7]. This syndrome is defined as a psychosocial phenomenon that results from the inability to adapt and cope with constant stressors to which the professional is exposed. Such incapacity causes persistent suffering in the daily work routine[8]. And it is characterized by three dimensions, namely exhaustion, depersonalization, and reduced personal accomplishment. Emotional exhaustion can be understood as a lack of energy accompanied by a feeling of emotional depletion. Depersonalization is characterized by emotional insensitivity, maintaining affective detachment from colleagues and clients. Reduced personal accomplishment is evidenced by feelings of personal and professional inadequacy, with a greater tendency toward negative self-assessment[9].

There is evidence that stress and professional burnout have increased with the implementation of information technologies in the routine of services[10-11]. Technical limitations, such as system slow performance, slow login, and a combination of slowness, network issues, and interoperability problems[12], are some of the stress-inducing factors resulting from the technology functionalities[13]. Therefore, analyzing the quality of technological functionalities becomes a security requirement for the use and adoption of technologies and even for human safety[14].

Among the functionalities, usability is an attribute of quality that assesses the ease of use of user interfaces based on five components: learnability, efficiency, memorability, errors, and satisfaction[15]. Studies that assessed quality standards of technological innovation functionalities identified issues related to the use, adoption, and usability of health information systems[16-17].

The complexity of a technological product, considering the local work reality, can expose healthcare professionals to stressors and high emotional tension when making immediate decisions. Poor usability of a technology is a factor that can exacerbate professional burnout and fatigue[17]. In this context, evaluating the usability of the CER associated with BS means understanding influencing factors, as well as quality issues that can affect efficiency, memorability, error reduction, ease of learning, and satisfaction, potentially exposing healthcare professionals to BS stressors. Furthermore, this knowledge is essential in the development of effective measures to promote the usability of the CER within the e-SUS APS strategy context. This study aimed to analyze the level of usability of the CER and its association with the dimensions of BS.

METHOD

A descriptive and analytical cross-sectional epidemiological study[18] conducted in the Primary Health Care services of the West Health Macro-region in the state of Minas Gerais between 2020 and 2021. The aforementioned macro-region has a population of 1,194,156 inhabitants, a vast territorial extension of 31,543 square kilometers, a medium-high Human Development Index (HDI), and a diversified economy[19]. This territory comprises 53 municipalities, 345 Family Health Teams (FHTs) (84.2% coverage), and 136 Oral Health Teams (OHT) (79.3% coverage)[20].

The selection of participating municipalities was based on the report provided by the Primary Care Health Information System (PHCIS), which informs the type of application in which the care was recor-

ded – in this study, the municipalities that recorded care in the CER. Out of the 35 selected, 29 authorized the research, and six municipalities were considered losses as they did not respond to the previously made contacts.

From the 29 municipalities, a total of 132 FHT and 103 OHT were selected for the study based on the following inclusion criteria: teams that have the CER implemented and in operation, with professionals capable of operating the software and available to answer the questions. Units that had only implemented the CDS software or those without the operational capacity for the CER at the time of the research were excluded, as well as traditional Basic Health Units (BHUs), as the objective of this study was to analyze the usability attribute and its association with BS in the context of FHT and OHT.

The sample size calculation for the participants in this study followed the recommendations of Hair et al.[21], which suggest that the number of respondents should be 3 to 5 per item and preferably greater than 100 respondents. Considering that the data collection instrument consists of 44 questions, the sample should consist of a minimum of 132 and a maximum of 220 respondents.

The research included professionals (physicians, nurses, nursing technicians or assistants, dentists, and dental health technicians or assistants) who were part of the FHTs and OHTs. Community Health Workers (CHWs) were excluded since they do not use the electronic record in their work practice for recording health information but only for report generation. The CER is only used by CHWs for synchronizing the information recorded in the application, allowing it to integrate with the health information of users[1].

Data were collected between November 2020 and March 2021, through access to a link to a questionnaire created in Google Forms. Data collection via email or the Internet is a recent procedure, but it has advantages since questionnaires are easily distributed, and data collection and processing are conducted quickly. For the respondents, there is the convenience of answering the questions when they find it suitable and without the need for a face-to-face meeting[22].

The online form sent was divided into three parts. The first part consisted of 12 questions about the participants' characteristics (profession, professional bond, level of education, age, gender, type of electronic record used, impressions of the appointments, how long they have been using the CER, municipality of operation, health unit, working environments, and whether they were trained to use the CER). This was based on the assumption that depending on the users' characteristics, differences could be observed in the overall perception and quality patterns of the CER.

In the second part, to measure the usability of the software, the questions from the System Usability Scale (SUS)[23] questionnaire were used, which had been translated into Portuguese by Tenório et al.[24]. This instrument consists of 10 questions that allow obtaining an overall view of users' perceptions of the usability of the CER software. The questionnaire includes questions about the quality components of a system, such as ease of learning, efficiency, memorability, error minimization, and satisfaction.

The third part of the form was used to analyze the presence of BS among the participants. BS was measured using a standardized and validated questionnaire, the Maslach Burnout Inventory (MBI-HSS), under license from Mind Garden, Inc. (Menlo Park, CA). This questionnaire consists of 22 questions that assess professional burnout in three dimensions: emotional exhaustion, depersonalization, and reduced personal accomplishment[25].

The characterization of the professionals in the FHTs and OHTs was done considering both qualitative and quantitative variables. The qualitative data were represented in the form of a frequency table. The quantitative variables underwent the Shapiro-Wilk test, indicating the non-normality of the data. As a result, the descriptive statistics were presented in the form of median and quartiles.

To analyze the questions regarding usability quality standards, a Likert scale was used[23]. The following options on the Likert scale were considered: strongly disagree (1 point), disagree (2 points), neither agree nor disagree (3 points), agree (4 points), and strongly agree (5 points). To express their level of satisfaction, participants selected one of the 5 statements, where "Strongly Agree" represents the highest level of agreement, and "Strongly Disagree" represents the highest level of disagreement. The range of each question, which varies from 1 to 5, was calculated through the arithmetic mean[24].

Calculation of the SUS score, which represents the final usability score of the system (CER), was derived from the individual sum of the answers given. For odd-numbered questions, i.e., questions 1, 3, 5, 7 and 9, 1 is subtracted from the scale position marked by the respondent. For questions 2, 4, 6, 8 and 10, the scale value is subtracted from 5. Finally, to obtain the final value that classified the system's usability (SUS score), the count of each question was summed and multiplied by 2.5[23].

The SUS score value ranges from 0 (zero) to 100 (one hundred) and classifies usability in terms of acceptance and quality level[26]. Regarding acceptance, a score from 0 to 50 is considered unacceptable, from 50 to 70 is marginal or somewhat acceptable, and above 70 is considered acceptable. Regarding quality, an adjective is assigned to usability. Around 20.3 is considered the worst imaginable, around 35.7 is considered poor, around 50.9 is considered fair or so-so, around 71.4 is good, around 85.5 is excellent, and around 90.9 is considered the best imaginable (Figure 1)[26].

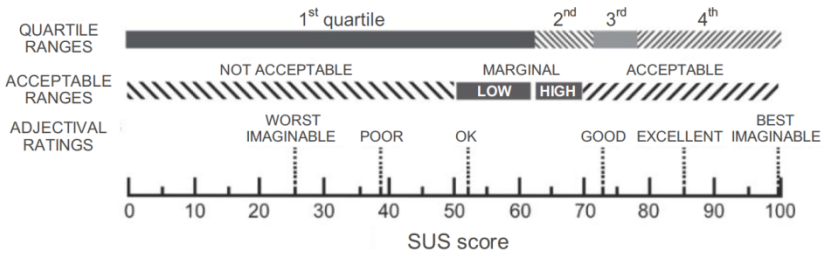

Figure 1: Scoring scale of the System Usability Scale (SUS)[23].

To analyze BS, the American version was used, in which the frequency of answers is evaluated through a scoring scale ranging from 0 to 6. That is, 1 for never, 2 for a few times a year, 3 for a few times a month, 4 to indicate a few times a week, 5 for daily, and 6 for every day[27].

The association between SUS score acceptance of the CER and the variables training, gender, schooling and professional category was assessed using the Chi-square test. The comparison of scores in the three dimensions of BS (exhaustion, depersonalization, and reduced personal accomplishment) with the variables training, gender, education, and professional category was conducted using the Mann-Whitney test. The comparison of scores in the three dimensions of BS with SUS score acceptance was performed using the Kruskal-Wallis test. The analyses were conducted using IBM SPSS version 25 with a significance level of 5%.

This research followed the ethical principles for research involving human subjects established in Resolution No. 466/2012 and was approved by the Research Ethics Committee (REC) under Opinion No. 4,523,507[28].

RESULTS

Table 1 summarizes the characteristics of the 139 professionals who participated in this study. More than half (59.7%) were nursing professionals (assistants, technicians, and nurses). There was a predominance of female participants (85%), and the age range varied from 23 to 68 years old (median = 35). Regarding the schooling level, 40.2% of them have completed graduate studies (both *lato* and *stricto sensu*), and 41.0% are civil servants. When analyzing the experience of using the CER, it was observed that 87% have been using the CER for 6 months or more, and 76.2% feel prepared to use the software. It is noteworthy that 56.8% of respondents stated that they use both the CER and the physical (paper) medical records simultaneously. Regarding the practice of printing appointments, 82.7% do not print the appointments recorded in the CER.

Table 1

Characterization of professionals from Family Health and Oral Health teams (n=139) in the West Health Macro-region of Minas Gerais, 2020-2021.

Variables	n	%
Profession		
Nursing Assistant/Technician	30	21.6
Oral Health Assistant/Technician	12	8.6
Dentist	29	20.9
Nurse	53	38.1
Physician	15	10.8
Schooling level		
High School	34	24.5
Specialization	54	38.8

Undergraduate degree	49	35.3
Master's degree	2	1.4
Age (years old) Median (Q1-Q3)	35	(29-40)
Gender		
Female	118	84.9
Male	21	15.1
What type of medical record do you use?		
Electronic medical record	58	41.7
Physical (paper) medical record	2	1.4
Both	79	56.8
Do you print the appointments?		
No	115	82.7
Yes	24	17.3
How long have you been using the CER? (in months) Median (Q1-Q3)	12	(8-24)
Professional contract		
Civil service	57	41.0
Permanent contract by time	45	32.4
Temporary	37	26.6
Environments in which you work at the basic health unit*		
Consulting room (medical, dental, nursing)	118	84.9
Wound care room	71	51.1
Vaccination room	64	46.0
Reception	42	30.2
Other	39	28.1
Have you been trained to use the CER?		
I have not been trained, and I do not feel prepared.	9	6.5
I have not been trained, but I feel prepared.	21	15.1
Yes, I have been trained, and I feel prepared.	85	61.2
Yes, I have been trained, but I do not feel prepared.	24	17.3

*Question with multiple response options.

The mean SUS score obtained (60.1±13.8) indicated marginal usability of the CER, with a result close to the threshold (Q2=62.3) that separates acceptance between marginal high and low, which means there are usability issues. The quality attributes of the CER most positively evaluated by professionals were ease of learning, efficiency, and satisfaction.

In Table 2, when analyzing the existence of an association between the variables training, gender, education, and professional category with the degree of CER usability, it was observed that there is no difference in results between the variables gender (p=0.126), education (p=0.968), and professional category (p=0.377) with the SUS score. The variable "training" (p=0.005) showed a statistically significant association with the SUS score.

Table 2

SUS score acceptance of the Citizen's Electronic Record according to the variables training, gender, education, and professional category of healthcare professionals in the Family Health and Oral Health teams of the Minas Gerais West Region, 2020-2021.

Variables	SUS *score* CER			p-value
	Acceptable	Marginal acceptance	Not acceptable	
Training				
Yes	27.5%	45.9%	26.6%	0.005
No	0.0%	60.0%	40.0%	
Gender				
Female	20.3%	52.5%	27.1%	0.126
Male	28.6%	28.6%	42.9%	
Training				
Higher Level	21.6%	49.5%	28.9%	0.968
Technical Level	21.4%	47.6%	31.0%	
Professional Category				
Nursing team	24.1%	50.6%	25.3%	0.377
Other professionals	17.9%	46.4%	35.7%	

*Chi-square test.

In Table 3, when analyzing the association between the variables training, gender, education, and professional category with BS, it was observed that there is no difference in the results of the BS dimensions when comparing nursing professionals with other professionals (p>0.05), between non-trained and trained individuals (p>0.05), and between men and women (p>0.05). Professionals with higher education and technical level differ only in the dimension of depersonalization (p=0.027), which implies an indifference towards daily work activities. The highest score is in the group with a higher education level.

Table 3

Comparison of Burnout Syndrome dimensions among the variables training, gender, education, and professional category (Median Q1-Q3) of healthcare professionals in the Family Health and Oral Health teams of the Minas Gerais West Region, 2020-2021.

Variables	Emotional exhaustion	p-value	Depersonalization	p-value	Personal accomplishment	p-value
Training						
Yes	21 (14-25)	0.650	13 (12-16)	0.188	23 (19-26)	0.875
No	18.5 (12.8-25.5)		15 (11-19.3)		23.5 (17.3-27.3)	
Gender						
Female	20 (14-25)	0.991	13 (12-16)	0.369	23 (18.8-26)	0.393
Male	20 (13-26)		15 (12-17)		24 (21-26)	
Training						
Higher Level	20 (15-25)	0.288	14 (12-16)	0.027	24 (20-26)	0.230
Technical Level	20 (10-25)		12 (8.5-15.3)		23 (10.8-24.5)	
Professional Category						
Nursing team	18.5 (14.3-24)	0.292	13 (12-15)	0.227	22 (18.3-24.8)	0.212
Other professionals	21 (14-27)		14 (12-18)		24 (20-26)	

*Mann-Whitney test.

In Table 4, it was observed that there is no difference in the three BS dimensions when comparing different SUS score acceptance levels (p>0.05).

Table 4

Comparison between Burnout Syndrome dimensions (Median Q1-Q3) and SUS score acceptance level (n=139) among healthcare professionals in the Family Health and Oral Health teams of the Minas Gerais West Region, 2020 - 2021.

SUS score	Burnout Syndrome dimensions		
	Emotional exhaustion	Depersonalization	Personal accomplishment
Acceptable	20.5 (13-25.8)	13 (12-15)	24 (20.3-25.5)
Marginal	20.5 (15-24.8)	14 (12-17)	22 (15.5-24)
Not acceptable	18 (13-27)	14 (11-18)	24 (21-29)
p-value	0.986	0.514	0.076

*Kruskal-Wallis test.

DISCUSSION

The use of the CER has great potential to lead to emotional exhaustion, depersonalization and low personal accomplishment in healthcare professionals. In this study, the evaluation of the CER usability allowed identifying that the software is not yet considered satisfactory by the professionals in the Family Health and Oral Health teams, as the SUS score was classified as marginal. However, when compared to the BS dimensions, it was noticed that it has not been generating burnout signs or symptoms in healthcare professionals.

Regarding the characteristics of these participants, there was predominance of females, and more than half of the professionals stated that they use the CER simultaneously with paper medical records, as evidenced in studies conducted in São Paulo, Paraíba and Saudi Arabia[5,29-30]. In a study carried out in New York, the authors reported that healthcare professionals were experiencing higher stress levels due to using the hybrid system (CER and paper medical records)[31].

Training was a determinant for acceptance of the CER in this study. Lack of professional training can lead to communication failures among healthcare team members, impairing the systematization of health information recording in the CER[7]. Therefore, for the CER to be considered an efficient tool for both patient care and the recording of clinical information, it must meet requirements such as training, education, and improvement[5].

The user's first experience is crucial for employing the software, and it is believed that usability standards in the construction of information systems like the CER help overcome resistance from healthcare professionals. Difficulty navigating pages and menus, and non-optimization of the navigation time are attributes unrelated to knowledge and skills that lead to dissatisfied users who do not adopt the technology[12,15], and this condition can create stressors at work, increasing BS[6-7].

The fact that the SUS score for the CER was classified as marginal showed improvements in acceptance of the software's functionalities when compared to previous studies[32-33]. In fact, no association was found between usability of the CER and the BS dimensions. Contrary to a study conducted in the United States with physicians

who used this tool, it showed that several participants presented BS symptoms associated with the usability of a system classified as poor[34].

Other studies that assessed the quality standards of CER functionalities identified that lower levels of SUS scores contribute to BS symptoms among medical professionals[34-35]. Similar findings were discovered in a cross-sectional study conducted with 12,000 nurses, where the authors identified that lower usability scores are associated with higher chances of professionals developing job dissatisfaction symptoms and an intention to leave their job[35].

On the other hand, regarding BS, significant differences were observed between professional education and the depersonalization dimension. Professionals with higher educational levels are more prone to presenting signs and symptoms of the BS dimensions[6,36]. There is diverse evidence of emotional exhaustion, depersonalization and low professional accomplishment in groups with lower schooling levels[37].

It is worth noting that emotional exhaustion refers to the depletion of physical and psychological resources due to emotional strain, resulting in lack of energy and enthusiasm towards work. On the other hand, depersonalization involves interpersonal distancing, with a decrease in emotional involvement at work and development of impersonal and dehumanized attitudes in the treatment of patients and colleagues. Finally, low personal accomplishment at work corresponds to the negative self-assessment dimension and is related to low work productivity and feelings of inefficacy and incompetence, which promote professional dissatisfaction[38-40].

As found in this study, the high scores classified within the "marginal" and "not acceptable" limits in the emotional exhaustion, depersonalization and personal accomplishment BS dimensions, reflect the working conditions to which most professionals are subjected. These conditions include high professional demands, tasks from outside work, excessive working hours and limited time for updates, leisure and social interactions[38-40]. Additionally, healthcare professionals frequently face conflicting situations, such as having to perform administrative tasks and use new technologies, such as the CER, even when they did not choose the administrative area for their professional work. This can be seen as a contributing factor to improving healthcare, but it does not exempt itself from becoming yet another activity that burdens the professionals, thus contributing to the development of BS[39,40].

In this sense, technology should not be reduced to a simplistic concept solely associated with the advent of technological advancements for improving healthcare. It should not be presented merely from a positive perspective by highlighting the introduction of informatics, diagnostic devices and the modernization of procedures. There is also a need to examine the overload of responsibilities that the use of new technologies imposes on healthcare professionals[39]. This fact is evident in PHC, where professionals are in direct contact with the reality of underserved communities, dealing with limited resources to meet demands and facing pressures and requirements inherent to their work. They are also responsible for carrying out basic care and surveillance actions, attending to an increasing demand from users who rely solely on the Unified Health System as their

resource. Therefore, this requires skills and a balanced psychological profile capable of dealing with different users, working in teams and promoting public health policies to improve the quality of life of the population, as well as having to take on administrative tasks, including handling new technological resources like the CER[38-39].

In addition to this, there are low salaries, poor working conditions, lack of social recognition and limited participation in the planning of institutional and public health policies. In this way, healthcare professionals may feel exhausted and disheartened, being at risk of developing BS. As a result, social, physical and psychological problems may occur, such as alcohol or substance abuse, immunosuppression, cardiovascular issues, anxiety, depression, low productivity, absenteeism, a desire to leave the profession and risk of suicide[38-40].

There are also significant repercussions on the healthcare professionals' quality of life associated with the Burnout dimensions, including sociodemographic or family-related factors (loss of sexual libido, infertility, divorces, reduced life expectancy) and those related to work (sick leaves and work absences due to health issues, disability retirements, relationship problems with superiors or colleagues, lack of reciprocity in patient relationships, intention to leave the profession, job dissatisfaction, stress due to excessive responsibilities, role conflicts and overload, a high number of patient encounters, social violence and workplace accidents)[38-40].

The limitation of this study is related to the use of electronic forms as the data collection method. Although it offers many benefits, especially during the pandemic period when the data were collected, it also has some drawbacks, such as an increase in non-response rates or partial answers. Another factor to consider is the object of analysis. Given that the CER in Brazil is an evolving technological innovation, it was assessed in its current production version, taking into account a cross-sectional time frame spanning only a few months. Finally, it is important to emphasize that the results obtained in this study are specific to the municipalities that had the CER implemented and in use. Therefore, it is not intended to generalize the results to all Family Health and Oral Health teams in the Minas Gerais West Region.

CONCLUSION

Usability of the CER showed improvements in the quality of the software's functionalities, and it was found that it has not been generating burnout signs or symptoms in healthcare professionals. For being the first Brazilian study on this topic, this study underscores the need for further research to generate diverse scientific evidence and insights into the relationships between psychological distress among professionals and the software programs used in healthcare services in Brazil.

In this study, the importance of the CER training was observed because, if healthcare professionals have proficiency in the software, they will record information efficiently, resulting in workflow optimization and a reduction in possible BS signs and symptoms, such as depersonalization. Furthermore, software and information technologies are trends in healthcare services, and constant improvement in the use of these resources is necessary to enhance efficiency, ease of use and professional performance.

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M.A.S.: Study conception and design; data extraction, analysis and interpretation; discussion of the results; writing and critical review of the manuscript; approval of the final version of the article.

N.E.: Data extraction, analysis and interpretation.

A.L.C.M.C.: Data extraction, analysis and interpretation.

R.M.M.: Discussion of the results; writing and critical review of the manuscript; approval of the final version of the article.

T.L.G.: Discussion of the results; writing and critical review of the manuscript; approval of the final version of the article.

D.B.F.C.: Discussion of the results; writing and critical review of the manuscript; approval of the final version of the article.

E.A.A.G.: Study conception and design; data extraction, analysis and interpretation; discussion of the results; writing and critical review of the manuscript; approval of the final version of the article; responsibility for all aspects of the content and integrity of the published article.

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Corresponding Author:
Marla Ariana Silva
marla_ariana@hotmail.com

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