

Usability of the eSUS Feedback system by managers of Primary Health Care units

Usabilidade do sistema eSUS Feedback por gestores de Unidades Básicas de Saúde

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ABSTRACT Studies to evaluate the effectiveness, safety, and impact of digital health technologies are needed the increasing use of these health interventions in primary care. Brazilian Primary Health Care units (UBS) managers evaluated the usability and user experience of the eSUS Feedback digital management system. This cross-sectional observational study applied the System Usability Scale and the User Experience Questionnaire to a sample of 37 and 35 participants, respectively. The research was conducted between May and June 2024, covering mainly the Northeast. Usability was evaluated with an average score of 77.5, classifying the system as acceptable and excellent. The user experience was rated as positive overall, except in the innovation category, which was neutral. The results highlight the importance of digital technologies in PHC management, suggesting that eSUS Feedback is a viable, efficient, and reliable tool. However, it is necessary to improve this innovation and record user feedback. The implementation of digital health management systems is essential for care coordination and information management, aligned with the recommendations of the World Health Organization's Global Digital Health Strategy 2020-2025.

KEYWORDS Primary Health Care. Health management. Digital technology. Medical informatics.

RESUMO Com a utilização crescente de intervenções em saúde digital na Atenção Primária à Saúde (APS), estudos são necessários para avaliar a efetividade, a segurança e o impacto de tais tecnologias. Avaliaram-se a usabilidade e a experiência do usuário do sistema digital de gestão eSUS Feedback por gestores de unidades básicas de saúde no Brasil. Estudo observacional transversal em que foram aplicados o System Usability Scale e o User Experience Questionnaire a uma amostra de 37 e 35 participantes respectivamente. A pesquisa foi realizada entre maio e junho de 2024, abrangendo principalmente a região Nordeste. A usabilidade foi avaliada com pontuação média de 77,5, classificando o sistema como aceitável e excelente. A experiência do usuário foi avaliada como positiva geral, exceto na categoria inovação, que foi neutra. Os resultados destacam a importância das tecnologias digitais na gestão da APS, sugerindo que o eSUS Feedback é uma ferramenta viável, eficiente e confiável. No entanto, são necessários o aprimoramento dessa inovação e o registro de retorno dos usuários. A implementação de sistemas digitais de gestão em saúde é fundamental para a coordenação de cuidados e gestão de informações, alinhando-se às recomendações da Estratégia Global de Saúde Digital 2020-2025 da Organização Mundial da Saúde.

PALAVRAS-CHAVE Atenção Primária à Saúde. Gestão em saúde. Tecnologia digital. Informática médica.

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Introduction

Health Information and Communication Technologies (ICTs) have significant potential to connect, synthesize, and share relevant information to improve care delivery, reduce administrative and operational costs for health systems, and enable new models of care delivery and management^{1,2}. The 66th World Health Assembly in 2013 pointed out that the appropriate use of ICTs is essential to increase the level of engagement of health service users in self-care, increase the quality and efficiency of healthcare, support sustainable financing of health systems, and promote universal access³.

The 2030 Agenda for Sustainable Development Goals (SDGs) highlights the spread of ICTs and global interconnectivity as means to accelerate human progress, reduce digital inequities, and improve the health-related SDGs. The World Health Organization's (WHO) Global Digital Health Strategy 2020-2025 encouraged nations to develop and consolidate national e-Health strategies and evidence-based digital interventions to benefit people in an ethical, safe, reliable, equitable, and sustainable manner⁴.

In Primary Health Care (PHC), digital technologies facilitate care coordination, user information management, multidisciplinary team integration, performance monitoring, clinical decision support, and the overcoming of access barriers⁵⁻⁷. The implementation of digital systems can transform how services are delivered, supporting managers in population health management and decision-making based on better-quality information⁸.

In Brazil, public and private sector managers identify the delay in adopting new technologies that could improve organizational processes as challenges and weaknesses in healthcare management. Furthermore, studies point to a technological deficit and a lack of adequate management and planning tools in PHC^{9,10}.

Digital technologies are used in Brazilian municipalities to support management, leveraging Artificial Intelligence (AI) for data

analysis and decision-making, generating alerts and reports that contribute to efficient management¹¹. The eSUS Feedback tool is an AI-powered healthcare management dashboard that assists with data visualization and helps professionals and managers monitor and evaluate PHC. Also available in a mobile version, it integrates with eSUS-AB. It facilitates the management of healthcare information for monitoring strategic actions and performance indicators under the new federal PHC co-financing model¹².

Given the growing need to incorporate digital technologies into healthcare, studies evaluating the effectiveness and safety of such tools are required. The use of digital health interventions also requires studies to understand the technology's actual impact on health and investigate the human factors related to perceived use^{13,14}. Although digital technologies have been increasingly used in PHC, there are still gaps in the validation and use of these solutions in PHC management¹⁵. Thus, this study aims to evaluate the usability and user experience of the eSUS Feedback digital management system among Brazilian PHC unit (UBS) managers.

Material and methods

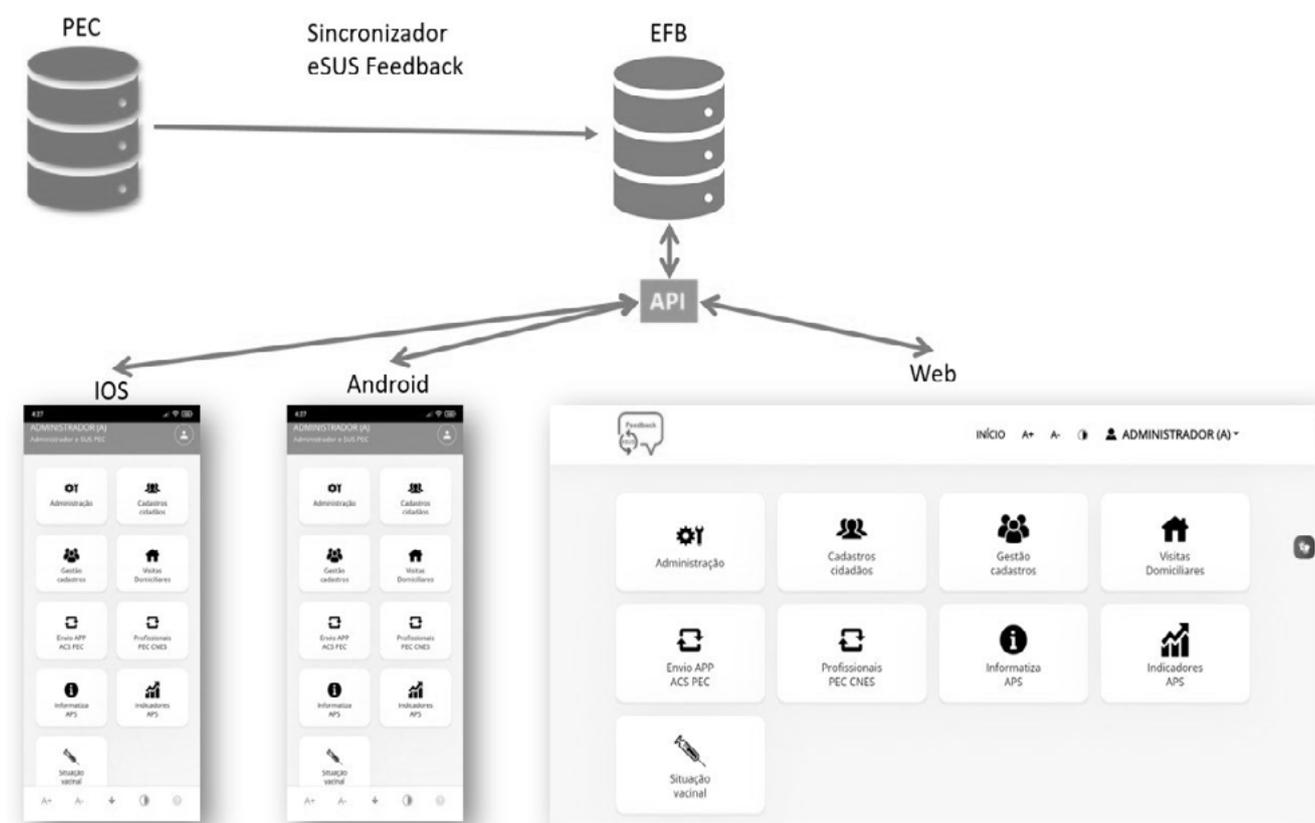
This observational, cross-sectional study evaluated the usability and user experience of eSUS Feedback by PHC managers and involved professionals from different Brazilian regions – the Northeast (35), North (1), and Southeast (1).

The digital health management system adopted in PHC was eSUS Feedback, a business intelligence and health data visualization tool that helps identify users, track health conditions, monitor indicators, manage records, generate reports, and meet the requirements for federal PHC co-financing. This system aims to improve the organization of services and contribute to Monitoring and Evaluation (M&E) practices in PHC.

To democratize access to information, eSUS Feedback offers apps for iPhone and Android, in addition to being accessible via computers or tablets. Access is granted via login and password, in compliance with the General Data Protection Law (LGPD)¹⁶, with access control managed by the Municipal Health Secretariat. The web, Android, and iOS applications use

an Application Programming Interface (API) that communicates with the eSUS Feedback database, which is updated daily through an Extraction, Transformation, and Load (ETL) process. This process reads data from the e-SUS PEC database or the Municipal Centralizer. *Figure 1* below illustrates this system's architecture.

Figure 1. eSUS Feedback architecture



Source: Prepared by the authors.

We assessed usability and user experience to ensure the system's effectiveness as a tool to support the management process. This procedure was conducted using the System Usability Scale (SUS)¹⁷, a widely recognized and reliable method for quickly measuring how people perceive the usability of several systems, including

hardware, websites, mobile applications, and clinical systems^{18,19}. The SUS consists of a 10-item questionnaire, each rated on a 5-point Likert scale, with 1 representing 'totally disagree' and 5 representing 'totally agree'.

Two groups completed the instruments, and 37 participants completed the SUS. The SUS

scoring system was calculated as per Brooke²⁰; for odd-numbered items, 1 was subtracted from the crude score, and 5 was subtracted from the crude score for even-numbered items. After conversion, the sum of the adjusted scores was multiplied by 2.5, obtaining each participant's SUS score. Based on the final SUS score, the system was classified into three acceptability categories: Unacceptable (0-49), Marginal (50-69), and Acceptable (70-100). Furthermore, we adopted a qualitative concept ranging from 'Worst imaginable' (0-25) to 'Best imaginable' (86-100)²¹.

Thirty-five participants evaluated user experience through the User Experience Questionnaire (UEQ), a valid and reliable 26-item instrument with a seven-point semantic differential rating scale. These items cover six user experience scales: attractiveness (overall impression of the product), efficiency (user's impression of goal achievement), perspicuity (user's impression of ease of understanding), reliability (user's feelings of security and control over interaction with the interface), stimulation (impression that the system is enjoyable to use), and innovation (impression that the product design is innovative and creative). UEQ scores range from -3.0 to 3.0. Scores below -0.8 indicate a negative experience, between -0.8 and 0.8 indicate a neutral experience, and above 0.8 indicate a positive experience²².

We used a minimum sample of 30 judges, selected purposely and non-probabilistically, as a parameter. Professionals and managers from the Family Health Strategy who had used eSUS Feedback for at least six months and responded to the submitted survey form were included. Professionals who had used the system for less than six months and those who did not agree to the Informed Consent Form (FICF) were excluded from the study. Tullis and Stetson²³ evidenced that reliable results can be obtained in the SUS with a sample of 8 to 12 users. The UEQ manual states that at least

20-30 respondents are needed to obtain reliable results²⁴.

Data were collected by sharing the link to complete the research questionnaire via WhatsApp, which included the TCLE, a judge characterization form, the SUS, and the UEQ. Thus, 38 responses were obtained for usability and 35 for user experience, characterized by age, gender, academic qualification, origin, seniority, and field of professional activity, as well as participation in scientific events in the last two years. After cleaning and removing data that did not meet the criteria, one SUS response was eliminated, totaling 37 participants. Data were collected from May to June 2024. The form was sent weekly, up to twice a week, to municipal administrations and directly to professionals using the system.

Data were tabulated in Microsoft Office Excel[®] and then exported to SPSS version 29 for statistical analysis (absolute frequency and percentage for qualitative variables; mean and standard deviation for quantitative variables). Numerical variables were expressed as a measure of central tendency (mean). Categorical variables were presented as absolute and relative frequencies.

This study followed the ethical principles of human research, as established by Resolution N^o 466/201225 of the National Health Council. The Research Ethics Committee of the Federal University of Delta do Parnaíba approved the project under N^o 6.701.047 (CAAE 77070423.1.0000.0192).

Results

Assessing the usability of the eSUS Feedback system

In the study, 37 participants evaluated the usability of eSUS Feedback. All were primary care professionals: 29 (78.4%) women, 35 (94.6%) nurses, and 94.6% were predominantly from the Northeast. Regarding qualifications, 32

professionals had a specialization (86.5%), and five had a Master's degree (13.5%). The mean age of participants was 37.9 years, ranging from 23 to 60. The mean service seniority was 12.1 years, with a minimum of 1 year and a maximum of 26 years. Approximately 75.7% of the participants worked in healthcare, 10.8% in management, and 13.5% combined both roles.

We performed a statistical analysis of the responses obtained through the SUS questionnaire to assess the application's usability, quality, and end-user satisfaction. The mean results obtained for each participant and the total average score (77.5) on a scale of 0 to 100 are shown in *table 1*.

Table 1. Scores obtained from user evaluations using the SUS

Participant	SUS Score	Participant 2	SUS Score 2
12	100	8	77.5
28	100	22	77.5
29	100	37	75
7	97.5	13	72.5
18	92.5	20	72.5
19	92.5	31	72.5
30	92.5	5	70
35	92.5	16	70
25	90	21	70
14	85	24	70
17	85	26	70
36	85	11	67.5
3	82.5	15	65
33	82.5	27	62.5
2	80	4	60
6	80	9	57.5
10	80	32	55
23	80	34	52.5
1	77.5		
Average			77.5

Source: Prepared by the authors.

We analyzed the average individual score of participants' responses on a scale ranging from worst to best to categorize and rate usability. As can be seen in *table 2*, per the usability evaluation criteria, one user rated the system as 'average' (40-52), 14 rated it as

'good' (53-74), 13 as 'excellent' (75-85), and 9 as the 'best imaginable' (86-100). Regarding the average (77.5), eSUS Feedback was classified as an acceptable system and was rated as 'excellent'.

Table 2. Categorization and classification scale of eSUS Feedback usability

Categorization scale	Frequency		Usability adjective
	N	%	
0-25	0	0	Worst imaginable
26-39	0	0	Poor
40-52	1	2.7	Average
53-74	14	37.8	Good
75-85	13	35.1	Excellent
86-100	9	24.3	Best imaginable
Total SUS score: 77,5 (excellent)			

Source: Prepared by the authors.

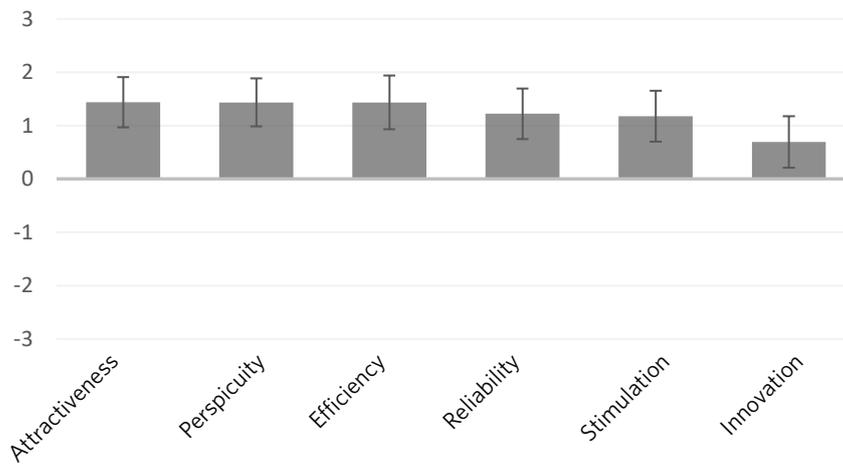
User experience evaluation

The user experience with eSUS Feedback was measured by 35 participants who entered the demographic data of 25 female and 10 male evaluators. The mean age was 36.4 years, with a minimum of 22 and a maximum of 60 years. Most were nurses (88.6%), predominantly from the Northeast (97.1%), and had worked in PHC for an average of 11 years, with a minimum of 1 year and a maximum of 25 years. Approximately 91.4% were specialists, two evaluators had Master's degrees, and one

evaluator had a doctorate. Around 51.4% reported working in healthcare, 20% worked in management, and 28.6% combined both roles.

Regarding the averages of the categories assessed with the UEQ, the results showed that users had a positive experience with the system. However, the innovation category evidenced a neutral experience. Attractiveness had a mean score of 1.438, perspicuity 1.436, efficiency 1.436, reliability 1.221, stimulation 1.179, and innovation 0.693. The overall results of the UEQ scale are shown in *graphs 1 and 2*.

Graph 1. Mean value of the UEQ scales and variance

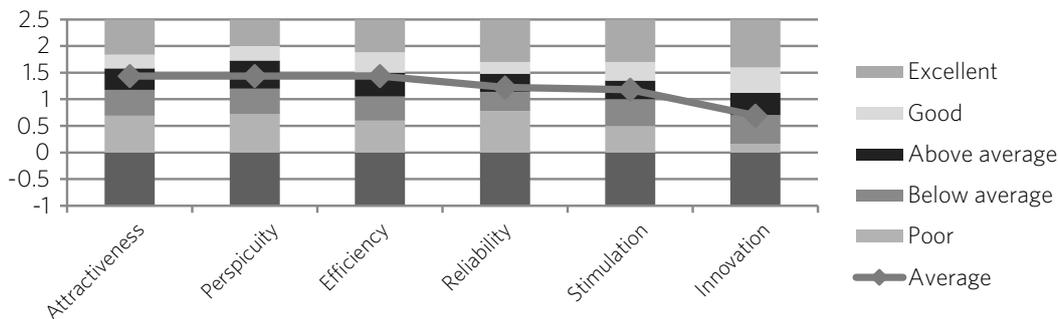


Source: Prepared by the authors.

Unlike the SUS, the UEQ does not produce an overall user experience score. When analyzing each category separately, we found that the highest mean score was for attractiveness,

with a mean of 1.438, and the lowest score was for innovation, with a mean of 0.693. The benchmark contains data from over 400 different product evaluations using the UEQ.

Graph 2. Benchmark of the six categories analyzed



Source: Prepared by the authors.

Discussion

Monitoring indicators through digital platforms and dashboards provides essential information for improving health service outcomes. Online systems that integrate with electronic medical records can support managers and professionals in population health

management by generating reports and alerts about necessary actions, as well as providing feedback on team performance^{7,26}.

The eSUS Feedback system usability evaluation revealed promising results, stressing the importance of digital technologies in Brazilian PHC management. The system achieved an average score of 77.5 in the SUS, categorized

as acceptable or excellent, reflecting significant acceptance by evaluators. Studies point to the benefits of ICTs for care coordination, information management, and clinical decision support^{1,2}.

Adopting a digital system that integrates AI and data visualization helps monitor performance indicators and track strategic actions. The ability of digital technologies to reduce information overload and paperwork through intuitive interfaces that share data and exchange information across the healthcare network can transform care delivery in PHC^{5,6}.

PHC unit managers assessed the usability of eSUS Feedback. According to ISO 9241-110:2020, usability is defined as the ability to achieve specific objectives effectively, efficiently, and with satisfaction using a given product, thus providing a more objective approach²⁷. However, in the Public Health context, good usability alone does not ensure the adoption and continued use of digital technologies. Successful implementation also depends on factors such as institutional engagement, user training, and integration with existing workflows in healthcare facilities²⁸⁻³⁰.

In this study, other qualities of user-interface interaction were considered when evaluating the user experience, such as perceptions, feelings, and manager responses resulting from the use of the digital system. Thus, the usability data were complemented with a subjective quality rating. The UEQ assessment indicated an overall positive user experience, with scores above 0.8 in almost all categories, except for innovation, which presented a neutral experience. None of the scale's scores fall into the 'good' or 'excellent' category, which corresponds to the top 10% of results, so there is still room for significant improvements in the interface. Therefore, the need for continuous innovation is crucial to ensure that healthcare systems keep up with the growing and complex demands of users³¹.

The predominance of professionals with higher education and the high qualifications of

the participants reflect a qualified user profile, which may have positively influenced the system's evaluation. The high acceptance and usability reported by managers suggest that eSUS Feedback is an efficient and reliable tool for PHC management. However, we should consider that the sample was purposeful and non-probabilistic, which may limit the generalizability of the results. Furthermore, the small sample size, considering the universe of PHC professionals, is another limitation to be considered.

Despite its limitations, the study contributes significantly to the literature on the use of digital systems in PHC management, an area still underexplored. The high usability score and the positive experience reported by users indicate that eSUS Feedback can serve as a model for other digitalization initiatives in healthcare. Future research should focus on longitudinal studies with more diverse samples to assess the impact of eSUS Feedback on the quality of care and long-term digital health outcomes.

Implementing improvements based on user feedback can further increase system acceptance. New features and adaptation to the emerging needs of healthcare managers are crucial to ensuring the system remains relevant and practical. Furthermore, the recommendations of the WHO Global Digital Health Strategy 2020-2025 should be followed to ensure that digital interventions benefit people ethically, safely, and sustainably⁴.

Conclusions

This study contributes significantly to the literature on Brazilian PHC management digitalization, showing that eSUS Feedback is an excellent usability tool. Implementing digital health management systems is vital to improving care coordination and patient information management, aligning with the recommendations of the WHO Global Digital Health Strategy 2020-2025.

System validation not only ensures its effectiveness but also provides valuable insights for continuous improvement of the interface and healthcare practices. Having a concept or adjective to use as a reference for SUS and UEQ results is helpful in allowing healthcare professionals and developers to make relative judgments about usability and user experience, whether in terms of user-interface interaction or in comparisons between different products.

We recommend that future efforts be directed toward continuous user training and incorporating feedback to improve the system. New monitoring and evaluation studies of the tool should be conducted with its increasing use. Fostering a collaborative environment and adapting to the emerging needs of healthcare managers are crucial to ensuring the feasibility, relevance, and continued effectiveness of eSUS Feedback.

Collaborators

Oliveira MS (0009-0005-5802-2573)* contributed to the conception, design, acquisition, analysis, and interpretation of data, drafting, critical review of intellectual content, and approval of the final version of the manuscript. Tajra FS (0000-0001-7236-5541)* contributed to drafting and critical review of intellectual content and approval of the final version of the manuscript. Barrêto ICHC (0000-0001-8447-3654)* contributed to drafting the methodology, results, and conclusion, and critical review of the manuscript. Silva-Júnior FL (0000-0002-0273-6738)* contributed to the conception, data interpretation, elaboration, and review, approval of the final version final and responsibility for the accuracy and integrity of the ethical aspects of the manuscript. ■

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