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ORIGINAL

Website for congenital syphilis prevention in Primary Health Care: a methodological study*

Website para prevenção da sífilis congênita na Atenção Primária: estudo metodológico*

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ABSTRACT

Objective: To develop a website providing information on the diagnosis, treatment, and monitoring of syphilis in pregnant women, while evaluating its usability among health care workers. **Method:** This knowledge translation project included a methodological phase to create a technological product. It was a cross-sectional study applying the System Usability Scale to 21 professionals working with pregnant women in primary care in a city in southern Brazil. The Spearman correlation test was used for analysis. **Results:** The usability score was 90 (interquartile range: 85–97.5), classified as "best imaginable." No statistically significant association was found between the score and participants' characteristics. The professionals reported ease of use, met expectations, and motivation. They also indicated they would recommend the website to colleagues and academics for both continuous education and clinical practice. Key facilitators included internet accessibility and minimal time required for usage. Suggestions for website application included individual consultations, reproductive planning, and the perinatal period. **Conclusion:** The evidence-based website was validated and adapted to the local context, proving suitable for use in primary health care. Its implementation has the potential to enhance the quality of health care services for pregnant women.

Descriptors: Communicable Disease Control; Vertical Transmission of Infectious Diseases; Congenital Syphilis; Primary Healthcare; Translational Biomedical Science.

RESUMO

Objetivo: Desenvolver um website com informações sobre diagnóstico, tratamento e monitoramento da sífilis em gestantes, avaliando sua usabilidade por profissionais de saúde. **Método:** Este é um projeto de tradução do conhecimento com etapa metodológica para criação de um produto tecnológico. Estudo transversal com aplicação da *System Usability Scale* a 21 profissionais que atendem gestantes na atenção primária de um município do sul do Brasil. Foi utilizado o teste de correlação de Spearman. **Resultados:** O escore de usabilidade foi 90 (intervalo interquartil: 85-97,5), classificado como "melhor imaginável". Não houve associação estatisticamente significativa entre o escore e as características dos participantes. Os profissionais relataram facilidade de uso, expectativas atendidas e motivação, além de afirmarem que recomendariam o website a colegas e acadêmicos, tanto para educação permanente quanto para a prática assistencial. Os principais facilitadores foram o acesso via internet e o tempo necessário para utilização. Houve sugestões para aplicação do website em atendimentos individuais, planejamento reprodutivo e no período perinatal. **Conclusão:** O website, baseado em evidências, foi validado e adaptado ao contexto local, demonstrando-se adequado para uso na atenção primária à saúde. Sua implementação tem o potencial de qualificar a assistência à saúde de gestantes.

Descritores: Controle de Doenças Transmissíveis; Transmissão Vertical de Doenças Infecciosas; Sífilis Congênita; Atenção Primária à Saúde; Ciência Translacional Biomédica.

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INTRODUCTION

The World Health Assembly emphasizes the need to expand evidence-based actions and services to achieve the goal of eliminating various transmissible infections by 2030. Of these infections, sexually transmitted infections (STIs) affect millions of people and pose a significant public health challenge due to their impact on individuals' health and lives[1].

Key goals for STI elimination include eradicating congenital syphilis and reducing acquired syphilis. In Brazil, to address this issue, the National Week for Combating Syphilis and Congenital Syphilis was launched in 2021 with support from the Pan American Health Organization (PAHO-Brazil)[2]. This initiative was prompted by an analysis of syphilis indicators and trends in the country, which revealed a significant increase in cases of syphilis in pregnant women diagnosed during the first trimester. In 2018, there was a 25.7% rise in reported cases compared to the previous year, totaling 62,599 cases. Of these, 44.9% occurred in the Southeast, 23.5% in the Northeast, 14.6% in the South, 9.1% in the North, and 7.9% in the Midwest region[3].

Epidemiological surveillance data on vertical transmission (VT) of syphilis in at least six Brazilian states highlight the urgent need to improve early diagnosis, appropriate treatment, and follow-up care in primary health care (PHC), particularly during prenatal care, due to existing gaps in service delivery[4]. Continuous monitoring of pregnant women and their partners in PHC settings enables timely case detection[5].

Public policies developed by Brazil's Unified Health System, such as the Rede Cegonha initiative, have contributed to increased diagnosis and detection rates of gestational syphilis, particularly after the implementation of rapid testing in PHC[6]. However, significant challenges remain in expanding early diagnosis and adequate treatment[7].

Efforts to create technologies for managing syphilis reflect researchers' commitment to developing educational materials in various formats, such as serial booklets[8], guides[9], videos[10], mobile applications[11-12] and technical manuals for case management[13] targeted at health care workers. However, a study evaluating ten mobile applications in virtual environments recommended improvements in their quality[14].

In addition to health education strategies, clinical practice must rely on evidence-based approaches to guide decision-making in syphilis management. The Ministry of Health (MoH) recommends tools such as protocols and decision-making flowcharts, which should be readily accessible to health care workers, facilitating diagnosis and treatment[15-18]. Nonetheless, a gap persists between what is known (recommendations) and what is done (decisions). To address this issue, the research team collaborated with healthcare practitioners and administrators to develop a solution. This involved engaging stakeholders in implementing an evidence-based intervention. The team chose to adapt information previously available only in print—on diagnosis, treatment, and monitoring of syphilis during the pregnancy-puerperal cycle (decision-making flowcharts)[15-18]—into an online format as a website. The website was designed to assist physicians and nurses working in PHC in managing syphilis.

The objective of this study was to develop a website containing information on the diagnosis, treatment, and monitoring of syphilis and to evaluate its usability among health care workers.

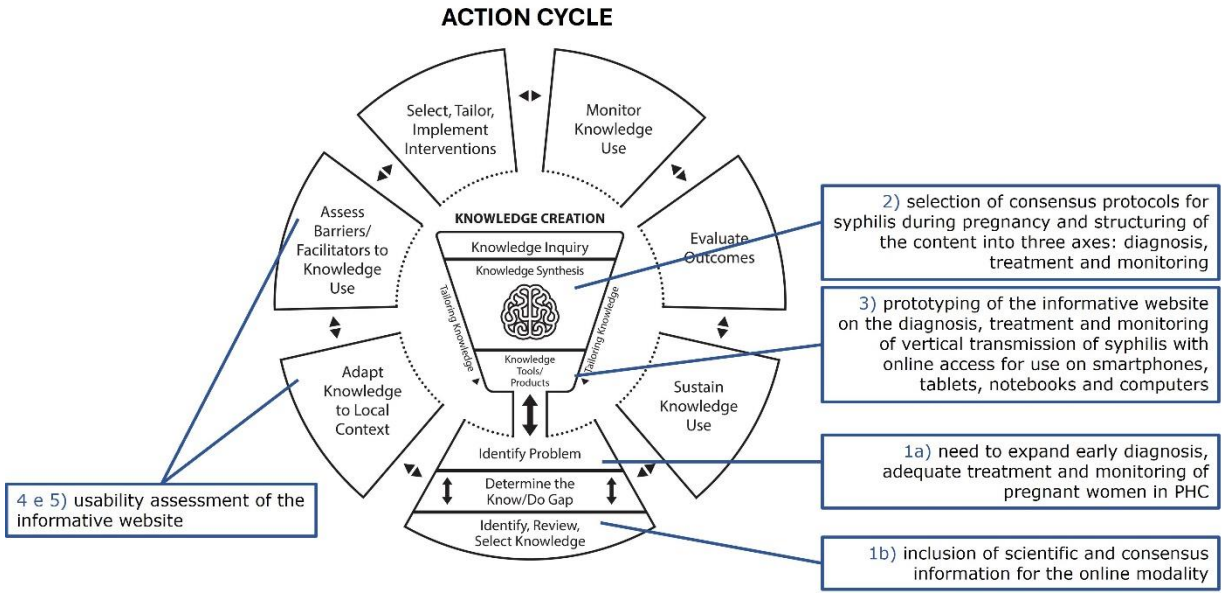
MÉTODO

This study is part of a larger knowledge translation project grounded in the Canadian theoretical model of Knowledge Translation. This model structures a cycle that links knowledge to action, encompassing both the creation and application of knowledge[19]. It includes the synthesis, exchange, and application of knowledge to strengthen health care systems and services[19-20], while also facilitating its dissemination.

In this study, five stages of the proposed cycle were developed: 1) identifying the problem and gaps; 2) synthesizing knowledge; 3) developing the product; 4) adapting it to the local context; and 5) evaluating barriers and facilitators for its use (Figure 1). The first three stages were conducted through a methodological study, while the last two were addressed in a cross-sectional study.

The methodological study was conducted between March 2021 and July 2022. The first stage began with identifying the problem: the need to enhance early diagnosis, appropriate treatment, and follow-up care for pregnant women in PHC. The proposal was based on the idea that providing scientific and consensus-based information in an online format could help bridge the gap between knowledge and practice.

Figure 1 - Application of the stages of the knowledge-to-action cycle in the knowledge translation project. Santa Maria, RS, Brazil, 2023



In the second stage, efforts were made to ensure that the product's content was evidence-based. Four national consensus documents on the diagnosis, treatment, and monitoring of syphilis[15-18], as well as a local work instruction, were selected. The recommendations from these documents were synthesized into three main categories: diagnosis, treatment, and monitoring. Diagnosis includes four clinical cases presented in the Clinical Protocol and Therapeutic Guidelines[18], with guidance on diagnostic tests and result interpretation. Additionally, instructions based on theoretical frameworks of vulnerability were included, focusing on sexual practices and the individual. Treatment contains detailed information about the recommended therapies. Monitoring provides guidelines for case follow-up within PHC.

The third stage involved defining the product. Meetings with an IT team were held to assess institutional feasibility and ensure the continuous maintenance of the content. It was decided to create an informational website accessible via smartphones, tablets, notebooks, and computers. This solution offered the advantage of incurring no additional costs for health services or management, as it was hosted on an institutional platform.

The prototype of the website was developed by the technical team from the Tutorial Education Program of the Computing Course (PET-CC), linked to the institution. In collaboration with researchers and professionals specialized in syphilis-related topics, the type of tool (website), its interfaces, and options for quick access to information were defined, incorporating filters to facilitate navigation.

Once the PET-CC team developed the prototype, a panel of specialists was assembled to conduct the initial review of the website. This panel included professionals working in prenatal care in PHC, such as physicians, nurses, and municipal health policy leaders. It also included members of the Committee for the Prevention of Vertical Transmission of Diseases, the Women's and Children's Health Policy, and a representative from state policy, who was responsible for coordinating the Rede Cegonha Conduction Group of the 4th Regional Health Coordination and the Regional Committees for the Prevention of Vertical Transmission of Syphilis and HIV. Specialists were provided with the website link and submitted their feedback to the research team regarding text or functionality adjustments. Based on this feedback, the technical team revised the graphic interface, including images and icons, while the writing and visual language team performed a final review of the content.

Stages 4 and 5 were carried out through a cross-sectional study conducted between September and December 2022 in a medium-sized city in southern Brazil with a population of 285,159 and a PHC coverage of 49.39%[21]. To recruit health care workers, the Basic Health

Care Coordination Office provided a list of 72 potential participants with their contact information.

Inclusion criteria were defined as: professionals working in women's health and prenatal care within PHC. Exclusion criterion was being on leave from work during the data collection period. After analysis, 23 professionals did not meet the inclusion criteria. Of the remaining 49 eligible professionals, 21 participated in the study (43% of the target sample), while the others did not respond to contact attempts.

The participants included physicians and nurses. Notably, a local normative instruction in the municipality allows nurses to perform clinical management of pregnant women. Although the sample size was small, it was sufficient to estimate any outcome occurring in 50% of cases, with a margin of error of approximately 20 percentage points and a confidence level of 95%.

For data collection, the *System Usability Scale* (SUS)[22] was used. This tool is designed for end-users to evaluate the usability of a product and its interfaces. The scale comprises ten Likert-type questions with five response options: 1 ("strongly disagree"), 2 ("disagree"), 3 ("neutral"), 4 ("agree"), and 5 ("strongly agree").

Additionally, specific questions related to the study's topic were included. Five questions were designed to explore aspects of website use, including: identifying barriers and facilitators based on a previous study on barriers[23]; a multiple-choice question about user experience; three dichotomous questions (yes or no) to assess expectations, motivation, and usability capacity; and a final question to determine if and to whom the professional would recommend the website.

Before data collection, a team composed of three postgraduate nurses and an undergraduate research assistant was trained by the project's lead researcher. This researcher, an expert in emerging, re-emerging, and neglected diseases, was supported by a statistician experienced in methodology and analysis. To initiate data collection, the data-collecting team visited health care units (US) with posters containing a link and QR code, enabling professionals to access the website and explore its functionalities. The participants were also provided with an informed consent form (TCLE) and a self-administered electronic questionnaire (via Google Forms) sent by email or through social media platforms like WhatsApp.

In analyzing the SUS scale, responses to odd-numbered items were adjusted by subtracting 1 from the value marked by the participant, while responses to even-numbered items were subtracted from 5. The adjusted values for each participant were then summed and multiplied by 2.5, yielding a final score on a scale of 0 to 100. A score of 53 or higher was considered indicative of good usability[23].

Categorical variables were described using frequencies and percentages, while normality was assessed with the Kolmogorov-Smirnov test. For variables with asymmetrical distributions, medians and interquartile ranges were reported; for normally distributed variables, means and standard deviations were calculated. Mann-Whitney and Spearman correlation tests were used (with a significance level of 5%). Cronbach's α was 0.85, indicating high internal consistency for the scale. Qualitative variables were categorized based on the similarity of participants' responses.

The project was approved by the Research Ethics Committee under CAEE no. 52479921.9.0000.5346 in November 2021 and adhered to all ethical guidelines outlined in Resolution no. 466/2012 of the Brazil's National Health Council and subsequent regulations.

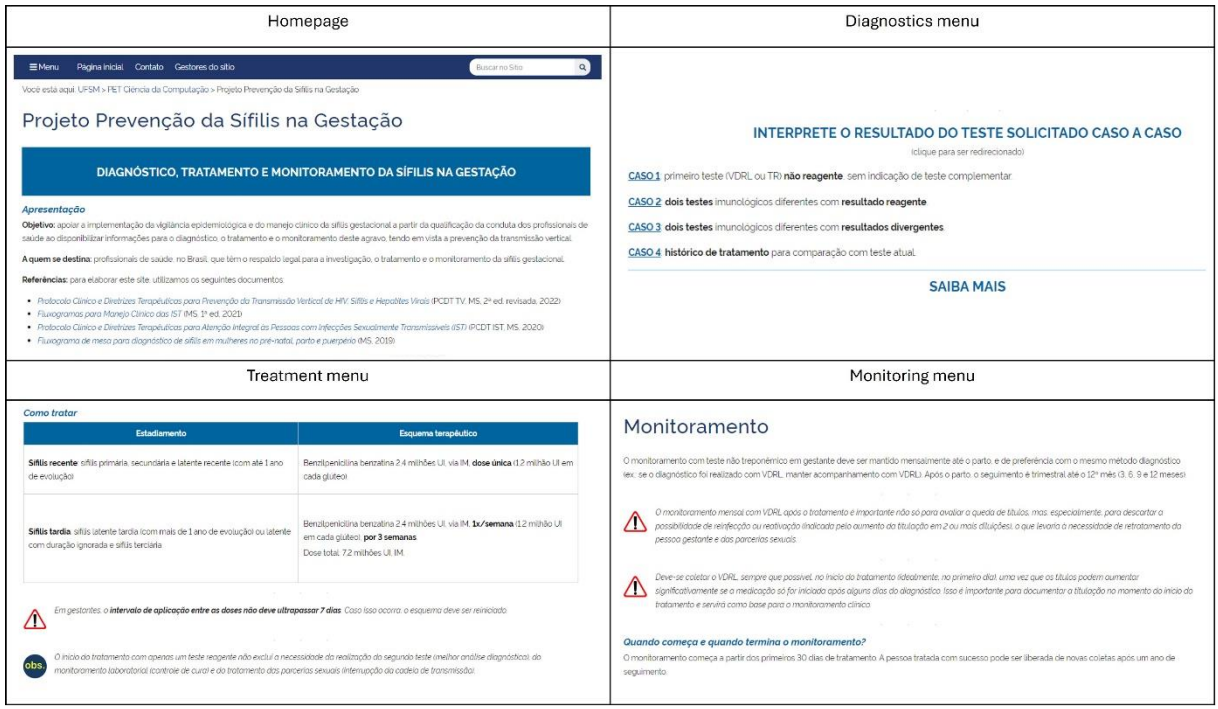
RESULTS

The website was designed to be accessible on various devices, including smartphones, tablets, notebooks, and computers, with free online access: https://www.ufsm.br/pet/ciencia-da-computacao/projeto-prevencao-da-sifilis-na-gestacao

The website is organized into three main sections: diagnosis, treatment, and monitoring of syphilis during pregnancy (Figure 2). Additionally, it includes a homepage introducing the website's functionalities, its integration into a larger project, funding details, and information about the responsible team. The content was structured using a decision tree logic, enabling health care workers to select the scenario that best matches the case they are analyzing, in accordance with current protocols[15-18].

The website was evaluated by 21 healthcare professionals, of whom 52.4% (n = 11) were affiliated with the Family Health Strategy (ESF) and 47.6% (n = 10) with Basic Health Units (UBS). Most participants (95.2%, n = 20) performed care-related activities, while 28.6% (n = 6) also held administrative roles, 19.0% (n = 4) acted as preceptors, and 19.0% (n = 4) served as managers.

Figure 2 - Illustration of the website with information sections on the diagnosis, treatment, and monitoring of syphilis during pregnancy. Santa Maria, RS, Brazil, 2023



Of the total participants, 71.4% (n = 15) were female, with an average age of 36.3 years. Regarding education, 61.9% (n = 13) were nurses, and 38.1% (n = 8) were physicians, with an average of 10.9 years since graduation. Academic qualifications included 33.3% (n = 7) with a Master's degree, 33.3% (n = 7) with a Specialization, and 9.5% (n = 2) with a Residency.

In terms of professional development courses and training, 4.8% (n = 1) had training related to clinical diagnosis, 14.3% (n = 3) to laboratory diagnosis, 38.1% (n = 8) to clinical protocols, 28.6% (n = 6) to other topics, and 14.3% (n = 3) did not respond to the question. The average time working with pregnant women was 6.3 years.

The main activities performed included diagnosis (85.7%, n = 18), treatment (71.4%, n = 15), monitoring (71.4%, n = 15), and consultations (38.1%, n = 8).

Regarding professional improvement initiatives, 61.9% (n = 13) had completed updates on syphilis vertical transmission (TV) prevention, while 38.1% (n = 8) used clinical protocols as a basis for training.

In the usability evaluation of the website, the professionals' responses to the scale items indicated that the product is consistent, integrates functionalities effectively, and is easy to learn and use. Additionally, the evaluators expressed interest and confidence in using the website (Table 1).

The usability classification for the informational website was calculated, resulting in a score of 90, categorized as "best imaginable" (Table 2).

In identifying barriers and facilitators for website use, 61.9% of professionals reported having experience with Telehealth, 42.9% with mobile applications, and 38.1% with digital tools like websites.

Regarding expectations and motivation, 95.2% of participants responded positively, also expressing confidence in their ability to use the website. The professionals stated that they would recommend the tool to colleagues and academics, whether for clinical practice or continuous education.

The main facilitators highlighted were internet accessibility and the potential to improve time management during work. Additionally, it was suggested to expand the website's application for individual consultations, reproductive planning, and the perinatal period.

When analyzing the correlation between professionals' profiles (age, years of education, and

Table 1 - Absolute frequency of usability evaluation items for the website (n=21). Santa Maria, RS, Brazil, 2022

Questions/Responses	1 n(%)	2 n(%)	3 n(%)	4 n(%)	5 n(%)
I think I would like to use this product frequently	1(4.8)	-(-)	-(-)	7(33.3)	13(61.9)
I found the product more complex than necessary*	10(47.6)	7(33.3)	2(9.5)	1(4.8)	1(4.8)
I found the product easy to use	1(4.8)	-(-)	-(-)	5(23.8)	15(71.4)
I think I would need technical support to use this product*	18(85.7)	1(4.8)	2(9.5)	-(-)	-(-)
I found the product's functionalities well-integrated	-(-)	1(4.8)	-(-)	5(23.8)	15(71.4)
I found many inconsistencies in this product*	15(71.4)	5(23.8)	-(-)	-(-)	1(4.8)
I suppose most people would learn to use this product quickly	1(4.8)	-(-)	2(9.5)	7(33.3)	11(52.4)
I found the product very complicated to use*	18(85.7)	1(4.8)	-(-)	1(4.8)	1(4.8)
I felt very confident using this product	1(4.8)	-(-)	-(-)	8(38.1)	12(57.1)
I had to learn a lot before being able to use this product*	19(90.5)	2(9.5)	-(-)	-(-)	-(-)

Note: *Questions require reverse scoring in the analysis.

Table 2 - Usability scale in the sample (n=21). Santa Maria, RS, Brazil, 2022

Variables	Measures n(%)
Scale categories	
Worst possible	-(-)
Poor	1(4.8)
Average	-(-)
Good	-(-)
Excellent	4(19.0)
Best imaginable	16(76.2)
Scale score (median [min–max])	90(85-97.5)

work experience) and the usability classification of the website, no statistically significant associations were found. The same result was observed when correlating usability scores with gender, area of expertise, and participation in training or postgraduate courses (Table 3).

DISCUSSION

The development of the informational website as a technological product represents a strategy to enhance the care provided to pregnant women in PHC[24]. The profile of professionals who evaluated the website revealed a predominance of care-focused roles[25], underscoring the need

Table 3 - Factors associated with the usability scale (n=21). Santa Maria, RS, Brazil, 2022

Variables	r_s	p
Age	-0.12	0.618*
Years of education	-0.23	0.312*
Years of experience with pregnant women	-0.23	0.335*
	Median (minimum-maximum) usability score	
Sex		0.267**
Male	87.5 (82.5-97.5)	
Female	95.0 (32.5-100.0)	
Area of expertise		0.645**
Nursing	90.0 (32.5-100.0)	
Medicine	92.5 (82.5-100.0)	
Participation in training courses		0.750**
No	87.5 (80.0-100.0)	
Yes	92.5 (32.5-100.0)	
Graduate education		0.999**
Yes	90.0 (32.5-100.0)	
No	95.0 (80.0-100.0)	

Note: *Values obtained using Spearman correlation coefficient r_s. **p-values obtained using the Mann-Whitney test.

for investments in the training and qualification of these professionals. Increased involvement of nurses in caring for and welcoming pregnant women, particularly after being authorized to prescribe treatments during initial PHC visits, has contributed to reducing syphilis transmission[26]. This demonstrates that evidence-based interventions have a direct impact on clinical practice and Continuing Education in Health (CEH)[27].

For example, the evaluation of a software tool designed to prevent skin lesions in hospitalized newborns found that the digital tool supported clinical practice and facilitated nurses' decision-making[28].

The website created falls within the realm of technological innovation, offering continuous access to information, optimizing time, and enabling rapid dissemination of content[29]. It also serves as valuable support for clinical decision-making. Participants in this study demonstrated familiarity with digital tools and frequent access to these technologies. This behavior was observed, for instance, when mobile technology was applied during prenatal health recordkeeping, justifying the interest in recommending the website for use in other services[30].

Previous studies corroborate the utility of mobile technologies in supporting clinical decision-making. One example is the use of an app for post-exposure HIV prophylaxis, where the content was widely accessed by professionals via the internet[31]. Another app evaluated usability for facilitating maternity access, showing positive results such as faster service and improved communication[32].

Motivation for using applications is closely tied to an intuitive and functional interface. A study involving nurses and educators experienced in diabetes care demonstrated that the app's interface and features enhanced message comprehension and received positive evaluations, including its design[33]. These findings underscore the importance of investing in improving digital interfaces and functionalities to increase their effectiveness and user acceptance.

In the present study, one satisfactory outcome was participants' perception of their ability to use the website in their daily work activities in PHC. Reviews on the usability of mobile applications suggest that the likelihood of use increases with positive user experiences—in this case, health care workers who evaluated and handled the tool[34].

The website was widely regarded as easy to use, requiring no external assistance, and received positive evaluations regarding expectations and receptiveness. These factors indicate its potential for implementation in daily practice. Additionally, the lack of statistically significant associations between participant profiles and usability scores suggests that the website meets the demands of end-users, regardless of their personal characteristics. This indicates that a diverse range of professionals can efficiently utilize it.

One limitation of the study was the small sample size, which prevented robust correlations between variables. However, no significant differences were observed that might compromise the results.

The potential of the website as a valuable tool in PHC services lies in its ability to enhance clinical decision-making for diagnosing, treating, and monitoring syphilis. This technological product was developed to provide evidence-based infor-

mation, adapted to the language of health care workers, and accessible online for free, compatible with computers and mobile devices.
Thus, the website has the potential to address inadequate conditions related to the diagnosis and treatment of syphilis in pregnant women, while strengthening the role of the health care team in PHC.

CONCLUSION

The developed website is evidence-based, adapted to the local context, validated, and designed for use in PHC. Its classification as "best imaginable" highlights its feasibility as a tool for health care workers, with significant potential to enhance syphilis VT prevention efforts, particularly in the care of pregnant women, thereby directly impacting neonatal health. The interactive features and evidence-based content provide clinical decision-making support, contributing to improved care practices.
Participants reported feeling confident in using the website, likely due to their prior experience with digital platforms. This reflects positive expectations and motivation to integrate the tool into their daily work, emphasizing the importance of CEH not only for this specific topic but also for improving the use of digital technologies.
Finally, the website proves to be a versatile tool, offering unrestricted access regardless of geographic location or time, broadening its applicability in healthcare services.

*Paper extracted from the Master's Dissertation entitled "Avaliação da usabilidade de um website informativo para prevenção da transmissão vertical da sífilis por profissionais da saúde na atenção primária", presented to the Graduate Program in Nursing at the Federal University of Santa Maria, Rio Grande do Sul, Brazil, in 2023.

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CONFLICT OF INTERESTS

The authors have declared that there is no conflict of interests.

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