

# Localization of the SureWash Pocket® mobile health app to Brazilian Portuguese



*Localização do aplicativo de saúde móvel SureWash Pocket® para o português do Brasil*

*Regionalización de la aplicación móvil de salud SureWash Pocket® al portugués de Brasil*

Érica Baggio<sup>a</sup>

Marília Duarte Valim<sup>a</sup>

Sayonara de Fatima Faria Barbosa<sup>b</sup>

Grace Teresinha Marcon Dal Sasso<sup>b</sup>

Gerard Lacey<sup>c</sup>

## How to cite this article:

Baggio E, Valim MD, Barbosa SFF, Dal Sasso GTM, Lacey G. Localization of the SureWash Pocket® mobile health app to Brazilian Portuguese. Rev Gaúcha Enferm. 2020;41:e20190462. doi: <https://doi.org/10.1590/1983-1447.2020.20190462>

## ABSTRACT

**Objectives:** To localize the textual interface of the SureWash Pocket® mobile health app and to present the methodological experience used in the localization process.

**Method:** Software localization study to Brazilian Portuguese. The localization process was carried out between December 2018 and June 2019 in the city of Cuiabá/MT, through six steps: permission to localize the software; two independent translations; synthesis of translations; evaluation of the validity of the textual interface by a Committee of Expert Judges; back translation; and publication.

**Results:** The textual interfaces were organized into 107 items and analyzed by ten expert judges. In the first round, 64% of the items reached a pre-established minimum agreement level of 90%. During the second round, 39 remaining items were adapted according to consensual suggestions and the pre-final version was consolidated.

**Conclusion:** The localization process suggests that the localized SureWash Pocket® is considered valid and can be used for an educational intervention on hand hygiene.

**Keywords:** Patient safety. Hand hygiene. Continuing education. Information technology. Mobile applications.

## RESUMO

**Objetivos:** Realizar a localização da interface textual do aplicativo de saúde móvel SureWash Pocket® e apresentar a experiência metodológica utilizada no processo de localização.

**Método:** Estudo de localização de software para o português do Brasil. O processo de localização foi realizado entre dezembro de 2018 e junho de 2019, em Cuiabá/MT, mediante seis etapas: permissão da localização do software; duas traduções independentes; síntese das traduções; avaliação da validade da interface textual por Comitê de Juizes Especialistas; tradução reversa; e publicação.

**Resultados:** As interfaces textuais foram organizadas em 107 itens e analisadas por dez juizes especialistas. Na primeira rodada, 64% dos itens alcançaram nível mínimo de concordância pré-estabelecido de 90%. Durante segunda rodada, 39 itens remanescentes foram adequados conforme sugestões consensuais e consolidou-se a versão pré-final.

**Conclusão:** O processo de localização sugere que o SureWash Pocket® localizado é considerado válido e poderá ser utilizado para intervenção educacional sobre higiene das mãos.

**Palavras-chave:** Segurança do paciente. Higiene das mãos. Educação continuada. Tecnologia da informação. Aplicativos móveis.

## RESUMEN

**Objetivos:** Localizar la interfaz textual de la aplicación de salud móvil SureWash Pocket® y presentar la experiencia metodológica utilizada en el proceso de localización.

**Método:** estudio de localización de software para portugués brasileño. El proceso de localización se llevó a cabo entre diciembre de 2018 y junio de 2019 en Cuiabá/MT, a través de seis pasos: permiso para localizar el software; dos traducciones independientes; síntesis de traducciones; evaluación de la validez de la interfaz textual a cargo de un Comité de Jueces Expertos; traducción inversa; y publicación.

**Resultados:** Las interfaces textuales se organizaron en 107 elementos y fueron analizadas por diez jueces expertos. En la primera ronda, el 64% de los artículos alcanzó un nivel de acuerdo mínimo preestablecido del 90%. Durante la segunda ronda, 39 elementos restantes se adaptaron de acuerdo con sugerencias consensuadas y se consolidó la versión pre-final.

**Conclusión:** El proceso de localización sugiere que la aplicación SureWash Pocket® localizada se considera válida y puede usarse para intervenciones educativas sobre higiene de las manos.

**Palabras-clave:** Seguridad del paciente. Higiene de las manos. Educación continua. Tecnología de la información. Aplicaciones móviles.

<sup>a</sup> Universidade Federal de Mato Grosso (UFMT), Programa de Pós-Graduação em Enfermagem. Cuiabá, Mato Grosso, Brasil.

<sup>b</sup> Universidade Federal de Santa Catarina (UFSC), Programa de Pós-Graduação em Enfermagem. Florianópolis, Santa Catarina, Brasil.

<sup>c</sup> University of Dublin, Trinity College Dublin, School of Computer Science and Statistics. Dublin, Ireland.

## ■ INTRODUCTION

In recent years, the theme of patient safety has been gaining visibility within the health services, with investments in actions aimed at reducing unsafe acts during health care and efficient results for the patient. Hand Hygiene (HH) is part of one of the goals of the World Health Organization (WHO) for the consolidation of patient safety policy in health care environments and is a priority measure in infection control programs and actions, since the health professionals' hands are considered the most common vehicle for the transmission of microorganisms<sup>(1-2)</sup>.

However, HH adherence among the health professionals has historically been low<sup>(1,2)</sup>. Conformity with this practice requires strict compliance at the five specific times during health care through the correct technique, time, and adequate products. Although this measure is considered simple, the behavior related to HH is complex and is not readily apprehended or changed, constituting a great challenge to patient and professional safety<sup>(3-4)</sup>.

In this context, Digital Information and Communication Technologies (DICTs) have proved to be promising resources in several areas, with emphasis on health and education. Among the possibilities of technological strategies, the *mHealth apps* (mobile health apps) have gained popularity and are being developed for all the agents involved in the health work process. It is worth highlighting that such strategies can offer many advantages, such as greater accessibility, low cost, personalized feedback, information portability, as well as the dissemination of safe practices that need to be cultivated in work environments, such as HH<sup>(5-6)</sup>.

In view of the foregoing, it is important to invest in the use of the DICTs in the area of health and education to ensure inclusive, equitable, and quality education for the sustainable development of the world and the Americas, as well as for increasing the quality of health, efficiency in care management, and decision-making based on scientific evidence<sup>(7)</sup>.

In addition, software internationalization and localization are two concepts that are part of the globalization cycle and the DICTs are incorporated in this universe<sup>(8)</sup>. Specifically, object of this investigation, software localization is defined as the process of adapting a software app to a specific international market, which includes the translation of the user interface, resizing dialog boxes, and customizing resources and test results to ensure the program works in the target language. Internationalization (I18N) means the re-engineering of a product capable of supporting multiple languages and the development is in line with cultural references for an international public<sup>(9)</sup>.

It is important to consider that there is currently an educational-focused mobile health app about HH called SureWash Pocket®, which was developed in the English language of Ireland and can support the improvement of HH adherence and the prevention of Health care-associated infections (HCAIs). This app makes it possible to train and evaluate the HH technique following the WHO recommendations through gamification resources; augmented reality, concerning the video image, which is the technique performed by the user and shown live on the cell phone screen; and mobile learning (*m-Learning*)<sup>(10)</sup>.

From this point of view, considering that, when well designed and used, the integration of mobile technologies in the educational and health context can contribute to supporting continuing education in health to reduce and prevent HCAIs and that DICT resources, such as mobile health apps, can be designed for an international and multicultural market, the following question was asked: What is the validity of the textual interface of the localization of the SureWash Pocket® mobile health app to Brazilian Portuguese?

Thus, this study aimed to localize the textual interface of the SureWash Pocket® mobile health app and to present the methodological experience used in the localization process.

## ■ METHOD

This is a software localization study, as it concerns the process of adapting an international software program to Brazilian Portuguese<sup>(9)</sup>. The SureWash Pocket® mobile health app localization process took place from December 2018 to June 2019 in the city of Cuiabá, state of Mato Grosso, Brazil. It is highlighted that, during the SureWash Pocket® mobile health app localization process, only the textual interface was translated to Brazilian Portuguese.

The SureWash Pocket® app is available in the two largest online mobile app stores: *Apple App Store*® (iOS) and *Google Play Store*® (Android), which together account for over 98.9% of the smartphone app market share<sup>(11)</sup> by Glantata Ltd (Dublin, Ireland).

The gamification technique used by the SureWash Pocket® app is still incipient in the field of mobile health; however, it has already proved to be promising in improving health care practices<sup>(6)</sup>. In this case, gamification involves the use of game elements, the main feature of SureWash Pocket®, to motivate and involve people in changing behaviors and attitudes that favor the quality of health care. Depending on the adequacy of the HH technique, side bars are filled in and the user proceeds to the next steps<sup>(10)</sup>.

The app establishes training goals for 21 consecutive days, has an immediate assessment of the HH technique for compliance and execution time, real-time performance feedback, star rating, and a ranking of the registered users. In addition, it sends daily commands so that the user trains the technique of the six steps of HH and rises to level five, considered the most complex for not providing tips and requiring the user to memorize all the steps, without previous warning<sup>(10)</sup>.

The mobile learning (*m-Learning*) of such app is organized according to David Kolb's Experiential Learning Theory, also known as the "learning through reflection on doing". For this author, learning encompasses experience, reflection, and change of behavior or attitude in a cyclical process<sup>(12)</sup>. Thus, the five levels of learning present in the app provide the opportunity for several short experience sessions with feedback, contributing to the development of psychomotor skills related to HH.

For the process of localizing and evaluating the textual interface of the SureWash Pocket® mobile health app, a path was proposed based on the experience of cultural adaptation and validation of instruments of the authors of this study, following national and international recommendations, and on research studies with a methodological design similar to that presented in this research<sup>(13-16)</sup>.

Localization (L10N) involves adapting a digital product in linguistic and cultural terms to a specific region or language. Translation is the basis of software localization and encompasses all the components of the interfaces, whether graphic or textual. Although the graphical interface has evolved substantially, the textual interface plays a crucial role in the human-computer interaction and requires quality methods and metrics during the localization process<sup>(9,13)</sup>.

Thus, for the development of this study, the following stages were conducted: 1) Permission to localize the software; 2) Two independent translations from the source language to the target language; 3) Synthesis of translations; 4) Evaluation of the validity of the textual interface by a Committee of Expert Judges; 5) Back translation; 6) Publication in online stores, as shown in Figure 1.

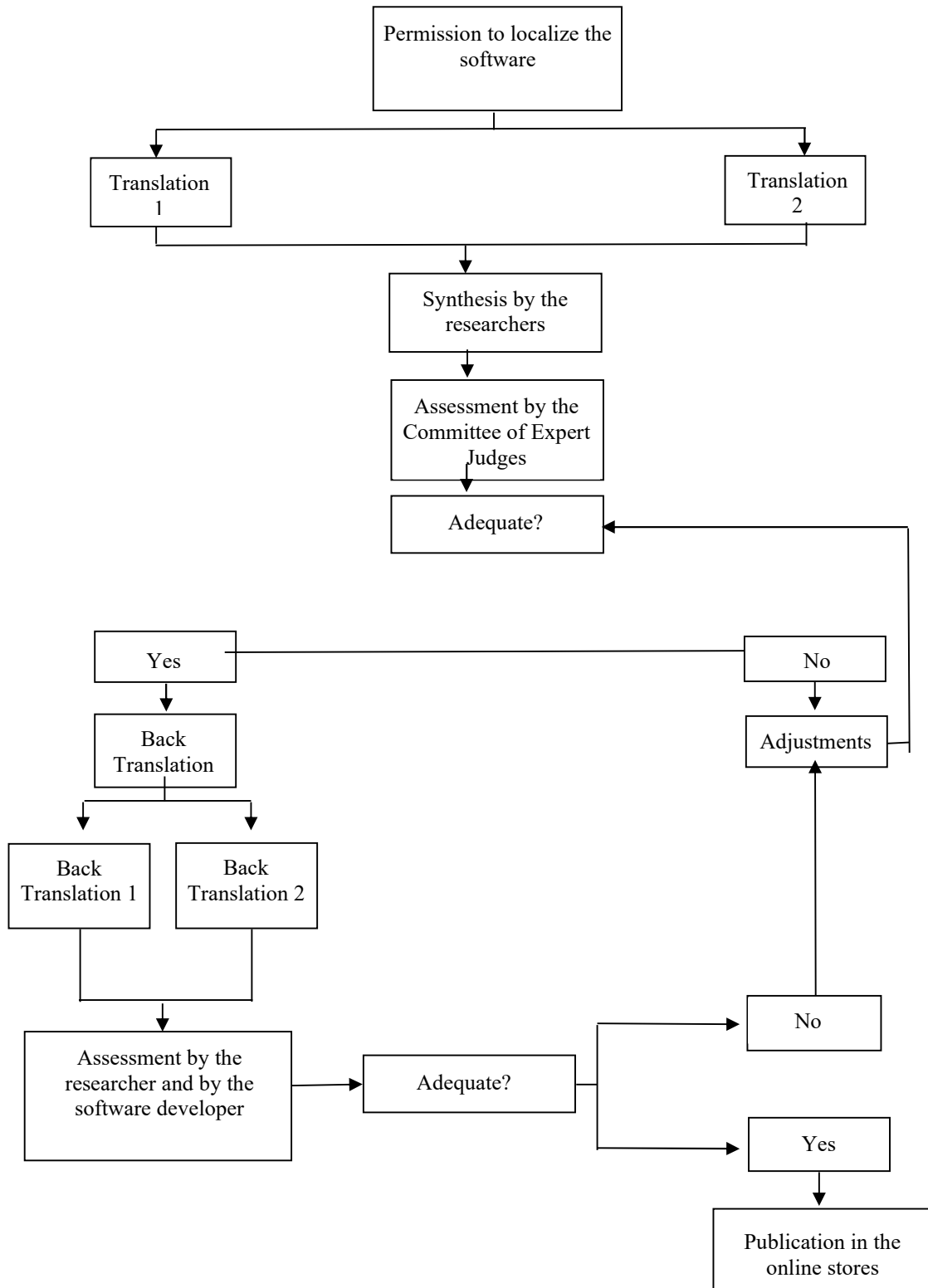
First, contact was made through email with the software developer to learn about the SureWash Pocket® internationalization process. It is important to emphasize that internationalization is fundamental to the localization process and, mainly, to obtain quality metrics<sup>(16)</sup>.

Thus, with the possibility and authorization to localize it to Brazilian Portuguese, the app developer offered a spreadsheet containing the encoded strings (characters) and the words,

phrases or texts in the English (source language) written and spoken in Ireland, present in the app. The textual interfaces, organized into items, were translated into the Brazilian Portuguese language by two bilingual translators, both with Brazilian Portuguese as their native language, but who were fluent in the source language of the app. To ensure greater equivalence between the cultures, the recommendations of the instrument validation experts were followed and, in this way, the first translator was a researcher on patient safety and was fully aware of the objective of the study; and the second translator was unaware of the objectives and concepts related to the research theme. Thus, two independent translations were obtained (T1 and T2), in which each translator was instructed to report the observations they deemed necessary<sup>(14-15)</sup>.

Both translated versions were compared and synthesized by two researchers of this article in order to obtain a single version that represented the consensus. The role of the responsible researchers in this stage is fundamental, since they have sufficient knowledge about the evaluated construct and can minimize errors from inappropriate choices, although there were questions related to the terms that were flagged to be discussed with the Committee of Expert Judges. The aforementioned committee is responsible for evaluating the semantic, idiomatic, conceptual, and experiential equivalences of the items translated from the app and consolidating the consensus, that is, verifying whether the expressions mentioned are culturally appropriate for the target audience to which the software is intended and whether, during the translations and synthesis, the meaning of the original proposal has not been lost, thus guaranteeing content validity, that is, of the textual interface<sup>(14-15)</sup>.

The body of the Committee of Expert Judges was composed of specialists related to the study theme and representatives of the target audience whose eligibility was due to expertise in the theme combined with face-to-face convenience during the study period. The specialists should have a master's or doctor's degree in the area of interest (health or informatics) and be fluent in the English language; and the health professionals representing the target audience should work in health care and have over two years of clinical experience. In this way, ten expert judges were selected and invited by means of an invitation letter sent by email with the date of the face-to-face meeting and prior instructions to download the SureWash Pocket® app from the *Apple App Store*® online store, for iOS operating system, or from the *Google Play Store*, for Android® systems, and to use the app for at least 10 minutes. All the expert judges accepted the invitation.



**Figure 1** – Flowchart of the methodological path adopted in the localization of the SureWash Pocket® mobile health app. Cuiabá, MT, Brazil, 2019.

Source: Adapted from Borsa, Damásio, Bandeira<sup>(15)</sup>.

The body of the Committee of Expert Judges, with a multidisciplinary nature, was composed of two nurses, one PhD in Health Sciences and one MS in Nursing, with experience in the theme of infections related to health care and hand hygiene; one nurse with a PhD in Health Sciences, as well as an education specialist and teaching and research manager at a teaching hospital; one post-doctorate nurse in Health Sciences, specialist in hospital quality management; one nurse with a PhD in Health Sciences and fluent in the English language; one PhD in the field of informatics; and health professionals who work in direct health care: one physician, with two years of professional experience in the health field; two nurses, both specialists in adult health, with professional experience of nine and five years, respectively; and one nurse technician, with five years of professional experience.

For validity of the textual interface, the members of the Committee of Expert Judges received an instrument for analysis prepared in Microsoft Word®, which contained the

first translations (T1 and T2) and their synthesis (S1), according to some examples presented in Table 1. In addition, the content in the English language and the synthesis in the Brazilian Portuguese language, with illustrations from the app, were designed using audiovisual resources to better guide the participants. Everyone had previously downloaded the app in the English language to their smartphones, as recommended by the researchers, and was able to access it whenever necessary. Finally, the expert judges were instructed to complete the instrument that evaluated the equivalences of the translated textual interface.

The textual interfaces, including those of an introductory video with subtitles in the English language, were organized into 107 items, which consisted of short words or phrases that facilitated the analysis. The answer of each judge on the instrument was recorded according to the following options: Exactly the same meaning; Almost the same meaning; and Different meaning. To evaluate the level of agreement of the

Item	Content	T1*	T2*	S1*	Equivalences
01	Brought to you by	Criado para você por	Patrocinado por	Patrocinado por	( ) exactly the same meaning ( ) almost the same meaning ( ) different meaning Obs.:_____
02	The WHO hand hygiene method is the best for killing germs.	O método da OMS para higiene manual é o melhor para eliminar germes.	A técnica de Higiene das Mãos da OMS é a melhor para eliminar microrganismo.	A técnica de higiene das mãos da OMS é a melhor para eliminar microrganismos.	( ) exactly the same meaning ( ) almost the same meaning ( ) different meaning Obs.:_____
03	The same method should be used with sanitizer or soap and water.	Este mesmo método deve ser executado usando-se antisséptico ou água e sabão.	A mesma técnica deve ser utilizada com solução alcoólica ou água e sabão.	A mesma técnica deve ser utilizada com solução alcoólica ou água e sabão.	( ) exactly the same meaning ( ) almost the same meaning ( ) different meaning Obs.:_____
...	...	...	...	...	...

**Chart 1** – Instrument for recording the process of evaluating the localization of the textual interface of the SureWash Pocket® app by a Committee of Expert Judges. Cuiabá, MT, Brazil, 2019.

Source: Research data, 2019

\*T1 – Translation 1

\*\*T2 – Translation 2

\*\*\*S1 – Synthesis of the T1 and T2 translations

translation of the app, the percentage of agreement was adopted (% agreement = number of participants who totally agreed with the item/total number of participants x 100)<sup>(17)</sup>.

Thus, for this study, an acceptable minimum agreement rate of 90%<sup>(17)</sup> was considered, that is, at least nine of the ten expert judges should check the “Exactly the same meaning” option. For the items analyzed in the first round with an agreement below 90%, the reasons for the discrepancies and the possibilities for improvement were discussed. In the second round, adjustments were made according to the suggestions, until the minimum consensus of 90% agreement was reached on each item. This gave rise to the pre-final version of the app’s textual interface, which was subjected to back translation. In the *Back Translation*, two independent translators, different from those who carried out the first translations (T1 and T2), with English as their native language and who were specialists in translating scientific articles without expertise in the app construct, translated the pre-final version back into the source language, which resulted in the BT1 and BT2 versions. It should be noted that the purpose of this stage is not to obtain a literal equivalence between the pre-final version and the source version, but to identify words that were not clear in the target language and/or inconsistencies or conceptual errors in the translation, thus ensuring conceptual equivalence in the new culture, as proposed by the original version<sup>(14–15)</sup>.

In possession of BT1 and BT2, both back-translated versions were compared by the researchers, who found no significant divergences. Therefore, the pre-final version was sent to the software developer, who analyzed and agreed with the Brazilian Portuguese textual interface of the SureWash Pocket® mobile health app. After the developer’s evaluation and once the synchronization regarding the audio, subtitles and layout of the app was satisfactory, the app was updated in the online *Apple App Store*® and *Google Play Store*®, which correspond to the beta version of the app.

The study is part of a first research entitled “Multimodal Strategy for the adherence of health professionals to hand hygiene: A quasi-experimental study”, approved by the Research Ethics Committee of a public hospital in the Midwest region of Brazil, under CAAE opinion: 75169317.0.0000.5541. All the study participants signed the Free and Informed Consent Form.

## ■ RESULTS

Both independent translations (T1 and T2) presented small differences, which were assessed during the synthesis of the translations by the researchers. The analysis of the committee of expert judges resulted in changes mainly related

to semantic equivalence, which concerns the meaning of the items after translation into the target language, clarity, dubious interpretations, and grammatical errors<sup>(15)</sup>.

Regarding the total number of items (n=107), 64% (n=68) of these reached the minimum agreement level in the first round. The 39 items, presented in Chart 2, which had an agreement percentage below 90%, were discussed and adapted during the second round according to suggestions from the experts, the theme, and the representatives of the target audience, until reaching the minimum consensus.

Searching for semantic equivalence, it was decided to substitute the word “microrganismo” (microorganism) in items 19,102, and 107. This adaptation was performed because it is considered that the term “germe”, a literal translation of “Germ”, reproduces exactly the same meaning in the target language and, in addition to having better intonation, requires text space in the software similar to the original. Similar situations, regarding spelling and ambiguities, were adequate in items 16,52,58,61,80,86,92,94,98,101,103, and 106.

One of the specialists suggested that the phrase in item 25, “Realize o seguinte movimento” (Make the following move), be changed to “Faça assim!” (Do it like this!) since, in his perception, it better represented the information conveyed, considering the context, text, and image present on the screen of the app. At the moment that the mentioned text appears, the step of the technique that is being worked on is illustrated in the app and then the user must follow exactly the same step. This suggestion was accepted by the other specialists.

Items 27 and 99 were considered incomplete by the specialists, who suggested that they were changed to “Palmas das mãos” (Palms of the hands) and “Este aplicativo funciona melhor quando o celular está sobre uma superfície plana e na horizontal” (This app works best when the phone is on a flat, horizontal surface).

Item 31 generated misunderstandings by the participants and the app needed to be accessed to better clarify the term “lateralizado” (lateralized) from S1. Thus, it was suggested that the term be changed to “fora do quadrado” (outside the square) because the app, through the cell phone camera, captures the gesture that is being performed within the square that appears on the cell phone screen. This change resulted in changes in items 34,37,40,43,46,47, and 104 in order to clarify and standardize the adopted terminology, thus ensuring the semantic and conceptual equivalences.

In item 41, an error was identified between the paronyms “engajada” (engaged) and “enganchada” (hooked), and the meaning in the sentence refers to the spelling of the last word. Items 45,64, and 82 generated questions regarding the terms during the consensus reached by the researchers,

Item	Version of the original items	Synthesis of the translations (S1)* of the original items	Suggested change
16	Unable to connect to the internet to verify registration code. Proceed as guest.	Não é possível conectar-se à internet para verificar o código de acesso. Proceder como visitante.	Não é possível conectar-se à internet para verificar o código de acesso. Continue como visitante.
19	I'm Jimmy the Germ. Let's learn how to wash your hands in under 20 seconds like an expert!	Eu sou o Jimmy, o microrganismo. Vamos aprender a higienizar as mãos em menos de 20 segundos como um especialista!	Eu sou o Jimmy, o germe. Vamos aprender a higienizar as mãos em menos de 20 segundos como um especialista!
25	Here's what to do!	Realize o seguinte movimento!	Faça assim!
27	Palms	Palmas	Palmas das mãos
31	Too close and sideways	Muito perto do centro da tela e lateralizado	Muito perto da tela e fora do quadrado
34	Too far off centre and sideways	Muito longe do centro da tela e lateralizado	Muito longe da tela e fora do quadrado
37	Sideways and using backs of hands	Lateralizado e usando o dorso das mãos	Fora do quadrado e usando o dorso das mãos
40	Fingers not interlocked and outside of the box	Dedos não entrelaçados e fora do centro da tela	Dedos não entrelaçados e fora do quadrado
41	Fingertips of one hand hooked into the other	Friccione o dorso dos dedos de uma mão engajada na outra	Friccione o dorso dos dedos de uma mão enganchada na outra
43	Thumb is hidden from the camera	O polegar está escondido da câmera	O polegar está fora do quadrado
45	Fingertips	Ponta dos dedos (ou polpas digitais)	Polpas digitais
46	Fingertips hidden from camera	Polpas digitais escondidas da câmera	Polpas digitais fora do quadrado
47	Fingertips and palm in view	Polpas digitais e palma no foco	Polpas digitais e palma da mão no quadrado
52	Hand sanitizers are an effective alternative to washing with soap.	As soluções alcoólicas são uma alternativa eficaz à higiene com água e sabão.	Soluções alcoólicas são uma alternativa eficaz à higiene com água e sabão.
54	80% of communicable diseases are transferred by touch.	80% das doenças transmissíveis são transmitidas pelo toque.	80% das doenças transmissíveis são transmitidas pelo contato.
58	The average person's hands can carry at least 3,000 different bacteria.	Estima-se que as mãos de uma pessoa possam carregar pelo menos 3.000 bactérias diferentes.	Em média, as mãos de uma pessoa podem carregar pelo menos 3.000 bactérias diferentes.
61	Contact SureWash	Entre em contato com a SureWash	Entre em contato com o SureWash
64	Science	Referências (ou ciência)	Referências
66	Level 2: build smooth flow	Nível 2: realize um fluxo suave	Nível 2: realize os passos sem pressa
79	Lightening Fast	Correndo contra o tempo	Rapidíssimo

**Chart 2** – Changes suggested by the Committee of Expert Judges (n=10) for the items of the Brazilian version of the SureWash Pocket® mobile health app. Cuiabá, MT, Brazil, 2019

Item	Version of the original items	Synthesis of the translations (S1)* of the original items	Suggested change
80	Pass in Less Than 15 Seconds	Faça em menos de 15 segundos	Realizou em menos de 15 segundos
81	Top Researcher	Pesquisador líder	Melhor pesquisador
82	Read the Science of Hand Hygiene	Leu as referências (ou ciência) sobre higiene das mãos	Leu as referências sobre higiene das mãos
83	RANKINGS	Placar dos líderes	Rankings
86	Get an organization account	Obter uma conta da instituição	Obter uma conta institucional
88	ON	Ligado	ON
89	OFF	Desligado	OFF
92	Intro video	Vídeo de introdução	Vídeo introdutório
94	EXP	EXP	Experiência
95	TRAINEE	Estagiário	Em treinamento
98	Phone movement detected	Movimento no celular detectado	Movimento do celular detectado
99	This app works best when the phone is lying flat on a table.	Este aplicativo funciona melhor quando o celular está deitado sobre uma superfície plana.	Este aplicativo funciona melhor quando o celular está sobre uma superfície plana e na horizontal.
100	Hi! I'm Jimmy the germ.	Oi! Eu sou o Jimmy, o microrganismo.	Oi! Eu sou o Jimmy, o germe.
101	Together let's learn to clean your hands using the WHO method.	Juntos vamos aprender a higienizar as mãos usando a técnica da OMS.	Juntos vamos aprender a higienizar suas mãos usando a técnica da OMS.
102	This is the best method to kill germs on your hands and reduce your risk of spreading infections.	Esta é a melhor técnica para eliminar os microrganismos das suas mãos e reduzir os riscos de disseminar infecções.	Esta é a melhor técnica para eliminar os germes das suas mãos e reduzir os riscos de disseminar infecções.
103	To use the app, place the phone flat on a table and stand with your hand roughly half a meter above the camera.	Para usar o aplicativo, coloque o telefone deitado sobre uma superfície plana, na horizontal, e eleve as suas mãos aproximadamente 50 cm acima da câmera.	Para usar o aplicativo, coloque o celular sobre uma superfície plana, na horizontal, e eleve as suas mãos aproximadamente 50 cm acima da câmera.
104	Follow the steps keeping your hand inside the box.	Siga os passos mantendo suas mãos no centro da tela.	Siga os passos mantendo suas mãos no quadrado.
106	If your organization has a SureWash account, you can record what you've learnt, complete the goals, and challenge your friends.	Caso sua instituição tenha uma conta SureWash, você pode lembrar o que aprendeu, completar os objetivos e desafiar seus amigos.	Caso sua instituição tenha uma conta SureWash, você pode registrar o que aprendeu, completar os objetivos e desafiar seus amigos.
107	Now, let's go get those germs!	Agora, vamos eliminar esses microrganismos.	Agora, vamos eliminar esses germes.

**Chart 2 – Cont.**

Source: Research data, 2019.

\*SI – Synthesis of the T1 and T2 translations



which were flagged to be discussed with the committee. Unanimously, the specialists preferred “Polpas digitais” (Digital fingerprint) to “Ponta dos dedos” (Fingertips), and “Referências” (References) to “Ciência” (Science).

With regard to item 54, six specialists disagreed with the term “toque” (touch), since it excluded other types of direct contact, such as kisses and sexual relations. Therefore, it was decided to change the word to “contato” (contact) in order to encompass all modes of transmission that refer to the phrase.

In the opinion of three specialists, items 66 and 79 could be improved in order to better respond to conceptual equivalence. In this way, “Nível 2: realize um fluxo suave” (Level 2: perform a smooth flow) was changed to “Nível 2: realize os passos sem pressa” (Level 2: perform the steps without haste), and “Correndo contra o tempo” (Running out of time) to “Rapidíssimo” (Lightning fast).

As for items 83,88, and 89, the specialists considered expressions that have the same denotation and connotation in both languages (English and Portuguese). Therefore, the aforementioned items were not changed from the original language, as they did not present any discrepancies in understanding between the specialists, thus facilitating the software localization process since, in the case of mobile apps, text space is limited, so expansions or restrictions need to be considered with caution<sup>(9)</sup>.

## ■ DISCUSSION

The process of localizing the SureWash Pocket® mobile health app followed the main international and national parameters for adapting instruments<sup>(14–15)</sup>, considering the specific concepts that permeate the software adaptation process<sup>(8,9,13,17)</sup>.

This methodological path allows for the elaboration or improvement of instruments, devices or measurement methods, ensuring their reliable and precise use in other contexts, with other populations. Thus, the adaptation of a tool, instead of building a new tool for the target audience, has some advantages such as reproducibility of scientific research studies, comparison of data obtained from different samples and contexts, equity, and generalization of the evaluation of the same construct across diverse cultures. In addition, it makes the process of developing a tool less expensive, shorter and, depending on the time available for the study, more feasible<sup>(14–15)</sup>.

Software localization is part of a complex process that allows a product to reach any market, regardless of language or culture. The acronym GILT, Globalization, Internationalization, Localization and Translation, is used to refer to the set

of tasks and strategies that allow for the development of a global digital product, that is, adaptable to the language of different countries and cultures<sup>(8)</sup>.

When developing software for an international audience, the cultural references need to be considered, also called international variables, which are related to politics, economics, religion, education, linguistics, and technology, from internationalization to translation. Internationalization enables the software to support multiple languages without major engineering modifications; however, it also depends on a correct localization since, in order to adapt textual and non-text content, the localizer needs to know the location for which the product is intended, to achieve the equivalences of the new culture without major changes that compromise the quality of the product<sup>(18)</sup>.

A number of studies that discuss software localization indicate the importance of professionals with technical and linguistic skills in the translation process; however, there are no guidelines for this stage, which can even be outsourced<sup>(18)</sup>. In addition, some issues are considered before and during localization, as they influence the translation process that will be adopted; for example, the nature of the project, the technologies involved, time, and the human and financial resources available<sup>(8)</sup>.

Therefore, in the perspective of globalization and considering the fact that mobile health apps are showing promising resources today, especially in the field of health and education, interest in internationalization and localization is aroused, making it possible to compare constructs in different cultures and nations<sup>(6,19)</sup>. For this, the translation of the textual interface, which is the basis of localization and was methodologically presented in this study, was carefully followed, considering international recommendations and specific peculiarities.

In this context, it is notable that cyber culture has brought a new field of study and professional intervention that refers to software internationalization and localization products, like mobile health apps, which grow in development and use every day. However, as digital products are developed for several languages, there is a greater need for quality metrics to evaluate whether the localization process was satisfactory and the technological tool can be considered good in the target language<sup>(9,13)</sup>.

It is important to highlight that there is certain concern mainly related to the safety of the diverse information available, as there is currently no regulation regarding the content and there is little involvement of the users in the process of development and evaluation of the quality of mHealth apps; and, when it comes to localized digital products, that involvement is even more scarce<sup>(6,19)</sup>.

There are several initiatives being developed to respond to the professional needs and demands of the contemporary and highly technological society. A literature review identified web content localization tools, also known by the acronym CAT (Computer Assisted Translation), available to facilitate the work of translator-localizers during the localization and translation process<sup>(6)</sup>. However, automated verification mechanisms can distort web app interfaces, and there is also an automated technique for detecting when a web interface was distorted due to internationalization and localization, as manually checking all pages in all languages can be intensive and sometimes unworkable<sup>(20)</sup>.

Most internationalization and localization studies available are related to the experience and development of content localization tools for web or websites apps, which involve millions of lines of source code<sup>(8,9,16,18,20)</sup>. The evaluation of the textual interface of the translated software by the end users or specialists in the subject matter is rarely addressed<sup>(13)</sup>, which corroborates to reassert the originality of this study in the Brazilian scenario.

The experience of working with mobile application has its advantages, since the number of strings (character sequence, usually used to represent words, phrases or texts in a program) is relatively smaller when compared to the websites, which have millions of lines of code<sup>(18)</sup>. In this way, the number of textual items that need to be localized can be discussed and evaluated by a Committee of Expert Judges. The multi-disciplinarity of the expert committee also facilitates the localization process, as it allows for the textual interface to be evaluated under various perspectives.

In this study, the participation of specialists in the theme and representatives of the target audience was essential for adjustments related to the clarity of the content; however, the inclusion of professionals specialized in linguistics and/or languages and literature and/or health literacy in the committee is suggested, since some grammar questions could be optimized with the participation of these professionals.

Another important issue concerns the face-to-face meeting of all the expert participants, which was instrumental in understanding the functionality of the SureWash Pocket® mobile health app. The specialists were able to access the app in the original language and understand the meaning of the word, phrase or text, thus ensuring proper translation.

As a limitation of this study, there is lack of national and international studies on internationalization and localization of mobile health apps, which prevents comparisons between research studies with this type of design, since most of the available studies propose the development of mobile health apps. However, it is believed that the experience reported in this study may contribute to the

progress in the field of Nursing and Health Sciences, since it provides a possibility of a methodological path that can guide and/or provide insights for their improvement in new research studies and also provide useful information on quality metrics during the localization process that may support future research studies.

## ■ CONCLUSION

The mobile health app localization process suggests that the Brazilian Portuguese version of SureWash Pocket® can be considered valid from the point of view of its textual interface. Future studies should focus on testing the software and on conducting a clinical trial intervention with health care professionals to evaluate the efficiency of the localized app version.

The internationalization and localization aspects addressed in this research raise a reflection on the nuances that involve the development of quality software products for a global market and the importance of considering the type of technology, the available resources, the privacy policy, and the time required to choose the localization process.

This study is relevant as it presents and enables an innovative technological tool that can be used for educational interventions to improve adherence to the hand hygiene of the Brazilian health professionals. In addition, as it is a mobile health app designed for an international market, its impact can be compared at a global level, as well as undergo localization processes to other cultures and nations.

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#### Acknowledgments:

To the Coordination of Improvement of Higher Level Personnel (*Coordenação de Aperfeiçoamento de Pessoal de Nível Superior, CAPES*) and to the Foundation for Research Support of the State of Mato Grosso (*Fundação de Amparo à Pesquisa do Estado de Mato Grosso, Fapemat*).

#### ■ Corresponding author:

Érica Baggio

E-mail: [baggio.1994@hotmail.com](mailto:baggio.1994@hotmail.com)

Received: 12.10.2019

Approved: 03.18.2020

#### Associate editor:

Carlise Rigon Dalla Nora

#### Editor-in-chief:

Maria da Graça Oliveira Crossetti