Quality of an Assistive Technology Web App for Primary Care Physicians Serving Older Adults: A Concurrent Mixed Methods Study

Elsa M Orellano-Colon, Wency Bonilla-Díaz, Radamés Revilla-Orellano, Jesús Mejías-Castro, Abiel Roche-Lima

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Abstract

Background: Older Latinos living in Puerto Rico (PR) experience significantly higher rates of functional disabilities (FDs) (27.8%) compared to older adults in the continental US (13.3%). While assistive technologies (AT) can improve daily function and support aging in place, primary care physicians (PCPs), who are essential in addressing FDs resulting from chronic diseases, often lack knowledge about AT devices and services. The Mi Guía de Asistencia Tecnológica (MGAT; My Assistive Technology Guide) web application was empirically developed to address this gap by providing comprehensive information and videos about AT devices for older adults with functional difficulties in daily living activities.

Objective: Assess the quality of MGAT among PCPs and describe their experiences using this tool to increase older Latino access to AT.

Methods: Ten PCPs participated in this usability project, receiving MGAT training prior to a 30-day implementation period. Using a concurrent mixed-method design, data were collected using the user Mobile User Application Rating Scale (uMARS) and individual interviews. The analysis included descriptive statistics and a directed content analysis.

Results: The MGAT received high overall uMARS objective quality ratings (mean 4.06 ± 1.05), with information scoring highest (mean 4.60 ± 0.51) and engagement lowest (mean 3.34 ± 1.51). The subjective quality was also high (mean 3.9 3.34 ± 1.19), with perceived impact receiving the highest score (mean 4.82; SD 0.39). PCPs reported positive experiences using MGAT for the education of AT devices and services and provided recommendations for improving the tool and integrating it into medical practice.

Conclusions: The high-quality and usefulness ratings suggest MGAT could be an effective tool for PCPs in managing older adults' FDs. Future research should evaluate the effectiveness of MGAT in preventing and managing functional disabilities among older adults. Clinical Trial: Does not apply.

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Original Paper

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Conclusions: The high-quality and usefulness ratings suggest MGAT could be an effective tool for PCPs in managing older adults' FDs. Future research should evaluate the effectiveness of MGAT in preventing and managing functional disabilities among older adults.

Keywords: Aged, assistive technology; physically disabled; Latino; mobile applications; primary care physicians; usability testing

Introduction

Assistive technology (AT) devices, such as jar openers, sock aids, and canes, play a significant role in enhancing the daily functioning, safety performance in daily activities, and social participation of older adults (OAs), ultimately contributing to their well-being and ability to live independently in their homes and community [1-6]. Despite the benefits of AT, research indicates that Latino populations, particularly older adults in Puerto Rico, have limited access to these devices due to a lack of awareness and information about the available AT options [7]. This access gap can lead to functional deterioration and adverse health outcomes, including increased hospitalizations, reduced quality of life, and higher healthcare costs [9-10]. Furthermore, primary care physicians (PCPs) may also lack awareness of the AT resources available to their patients, which is critical since information on acquiring AT is a key factor influencing its usage among older adults [11].

PCPs serve as the first point of contact in the healthcare system and play a crucial role in addressing the functional limitations faced by older adults with chronic diseases. Given that functional ability is an essential prerequisite for healthy aging [12], PCPs must have access to comprehensive information about AT devices and services. This knowledge enables them to make informed decisions about their patient's needs and facilitate access to appropriate resources [11].

The Web application (WebApp) Mi Gua de Asistencia Tecnológica (MGAT; My Assistive Technology Guide) has been developed specifically to bridge this information gap for older Hispanics in Puerto Rico [13]. MGAT offers user-friendly access to detailed information about 97 AT devices in eight categories of daily activities: mobility, self-care, bathing, dressing, food preparation, home management, medication management, and home safety. It incorporates visual aids and simple navigation to enhance usability for older adults, showing promise as a valuable resource for PCPs in managing functional disabilities (FDs) among older adults. By providing culturally relevant information on AT options, MGAT can help PCPs assess patients' needs more effectively and educate them about available solutions. However, evaluating the quality and usability of such health applications before widespread implementation is crucial to guide healthcare professionals in making informed recommendations [14-15].

A mixed-method research design that combines quantitative assessments using tools such as the user Mobile Application Rating Scale (uMARS) [16] with qualitative insights from user interviews provides a comprehensive understanding of user experiences and perceptions. This integrated approach not only identifies strengths but also highlights areas for improvement, ensuring that health applications like MGAT effectively support both healthcare providers and their patients in accessing assistive technology resources. Therefore, this study aimed to assess the quality of the MGAT among PCPs and describe their experiences using it.

Methods

Design

To assess the quality and user experiences with the MGAT, ten PCPs were encouraged to use the WebApp for 30 days. At the end of this usage period, the researchers employed a concurrent mixed method design, which consisted of simultaneously collecting quantitative and qualitative data within a single study phase (Figure 1). We selected this design to achieve the study’s aims, allowing the qualitative phase to enrich the quantitative results and thereby providing a comprehensive understanding of the quality and user experiences with the MGAT WebAPP from the PCPs’ perspectives. In this study, quantitative data were obtained measuring the quality of the MGAT WebAPP using the uMARS tool. Qualitative data were collected through semi-structured interviews conducted concurrently after participants responded to each item of the uMARS.

[Insert Figure 1 here]

Integration of mixed methods occurred at three points, as described by Fetters, Curry, and Cresswell (Figure 1). First, integration through the design occurred during the data collection phase by collecting quantitative and qualitative data simultaneously in the same interview. The qualitative in-depth interview questions were informed by data provided in the quantitative section. Second, we used the merging approach for the integration during implementation. During the merging approach, we brought together quantitative and qualitative data to expand on the uMARS items rated with a 3 or less (disagree or strongly disagree). Finally, quantitative and qualitative data were merged for analysis by using a narrative integration apporach.

Conceptual Framework

Karagianni's Optimized Honeycomb model [17], originally developed by Morville [18] was the theoretical perspective that guided data collection, analyses, interpretation, and discussion of the study results. The model was chosen due to its applicability to analyzing the user experience perspective during the application's design. It consists of seven facets used to analyze the WebApp user experience perspective: findable, accessible, usable, desirable, credible, useful, and valuable. These facets are grouped into three parts, reasoning about how the user "Feel, Think and Use" the product by connecting the seven facets.

Intervention

Mi Guía de Asistencia Tecnológica (My Assistive Technology Guide; MGAT) WebAPP had been developed in a previous study to increase community-living older Latinos' access to information about AT devices and services that could increase this population's functional performance in everyday activities [13]. The content included in the MGAT had been determined based on the following: 1) evidence of AT device needs of older Latinos living in P.R. found in previous studies[7,19-20] 2) the Matching Person and Technology Model [21], which considered the person, technology, and environmental factors found in previous studies that influenced the use of AT among older Latinos from poor communities (e.g., AT with aesthetic appearance [umbrella cane] for overcoming the stigma associated with the use of mobility devices), and 3) evidence-based guidelines and recommendations for designing health applications for older adults reported recently in the literature [22-26]. The MGAT had been designed with two fundamental characteristics (Figure 2). First, it was simple to use irrespective of the user's familiarity with mobile apps because the target app users were older adults. Second, it allowed the user to effectively navigate the MGAT through eight different areas of activities of daily living to finally learn about the available AT devices used to compensate for the FDs that older adults might have in each daily living activity. The user could explore AT devices within eight broad areas of activities of daily living in which older adults might exhibit functional difficulties using buttons with photos and text to represent each area (mobility, self-care, bathing, dressing, meal preparation, home management, and medication management). Each of these areas contained sub-categories of activities pertaining to each activity. For example, in the area of mobility, the user could navigate through the activities of bed mobility, getting in and off the chair or sofa, walking, getting in and off the car, and getting in and out of a toilet. In addition, the MGAT features instructional videos demonstrating older adults using the AT devices. As an informational web application, the MGAT lacks interactive functionalities. It is designed to be compatible with any mobile device to enhance free access for users. While the MGAT offers valuable insights into AT devices, it does not guide selecting the most appropriate device based on individual requirements. Consequently, all videos include a disclaimer: "The equipment shown in this video is only demonstrative. This video is solely for educational purposes. We recommend that you consult with your occupational therapist to evaluate your need for assistive technology devices."

[Insert Figure 2 here]

Participants, Sampling, and Recruitment

We recruited a targeted sample of ten PCPs providing services to older adults with physical FDs following the guidelines proposed by Hwang and Salvendy, which recommend using a rule of thumb of 10 ± 2 when estimating the number of participants necessary for user testing [27]. Study sampling was carried out using purpose sampling, which involved an interactive process of selecting research subjects (based on their ability to elucidate a specific theme, concept, or phenomenon, in this case the usability and acceptability of the AT WebApp).). Individuals were recruited until the researchers

perceived that no new themes or subthemes were emerging (ie, data saturation), a standard approach in qualitative research [28].

The inclusion criteria were: 1) adults 21 years and older and 2) being a PCP who provided health care to older Latinos with physical FD. Primary care PCPs could include general practitioners, family practice physicians, internal medicine physicians, or geriatricians. The exclusion criteria were PCPs that were 20 years or younger and those who did not provide healthcare services to older Latinos with physical function disabilities.

Two recruitment methods were used: (1) direct contact through PCPs' telephone numbers in Puerto Rico, obtained from publicly available online contact information, and (2) snowball sampling procedures. During direct contact, researchers with experience in occupational therapy and general medicine called potential participants and provided the PCPs with a complete explanation of the purpose of the study, the study procedures and that their participation in the study was completely voluntary. If the PCP expressed interest in participating in this study, the researchers assessed if the PCP met the two inclusion criteria and proceeded, with eligible participants, to schedule their convenient day, time, and place to conduct the consent form procedures. On the day of the consent form procedures, the researchers first met individually with each PCP in a private place at their preferred location (such as the clinic) to provide them with a complete explanation of the consent form, including the purpose, procedures, risks, and benefits of the study. The researchers gave PCPs the opportunity to ask any questions related to this study. After addressing all PCP concerns related to this study, the researchers asked them to sign the consent form and begin their participation in this study.

Participants, Sampling, and Recruitment

The researchers scheduled a baseline meeting with each PCP to fill out a sociodemographic questionnaire and provide them with training in using the MGAT. The download of the app took approximately two minutes and the MGAT training took approximately 15 minutes. Afterward, PCPs were encouraged to use the MGAT app for 30 days while providing healthcare services to older adults with physical function difficulties performing activities of daily living. At the end of the WebApp usage period, the researchers scheduled an individual face-to-face or virtual meeting with each clinician in their preferred location and convenient time to collect quantitative data using the uMARS and qualitative data through in-depth semi-structured interviews on the experience, usage, and acceptability of the MGAT. During the interview, the researchers also conducted follow-up questions concerning the uMARS items the PCPs rated with a score of three or less (some disagreement). The principal investigator (PI), an expert in mixed methods design, provided eight hours of training to all members of the research team in conducting PCP recruitment and administration of the study measures. The data recollection process was completed in one face-to-face or virtual meeting. With the consent of the PCPs, the interviews were recorded audio with the consent of the PCPs, and field notes were taken to capture further details. The researchers produced verbatim transcripts of the audio-recorded interviews for subsequent analysis.

Study Measures

All measures were conducted in Spanish and administered by the researchers of this study using an interview format on the convenient day of the PCP and the preferred location under the supervision of the PI after data collection training. Compensation for PCPs was $50 for their time invested in data collection at the beginning of the study (during the first visit) and $50 at the end of the 30-day trial period of MGAT WebAPP, for a total of $100.

Sociodemographic Data Questionnaire

The team developed this questionnaire to collect the self-reported sociodemographic data of the following PCPs: (i) age, (ii) sex, (iii) medical specialty, (v) years of experience working with older adults with FDs; (vi) average of older adults with FD attended monthly; (vii) work setting; (viii) frequency of app usage for the provision of healthcare services; (ix) medical practice identifying and addressing functional disabilities of older adults' functional disabilities; and (x) types of assistive devices recommended to older adults with FD. This measure took approximately 10 minutes to complete and was administered before the MGAT usage trial period.

User Mobile Application Rating Scale (uMARS) Spanish Version

The uMARS-S is a 29-item scale that provides comprehensive ratings of user experience and impressions of the mHealth application by assessing the quality of the application (objective and subjective) and perceived impact [16]. Each item has a custom wording that is appropriate for the aspect being assessed. Items employ a common 5-point rating scale from 1 (inadequate) to 5 (excellent), such that higher scores represent a stronger impact of the app on that aspect of user cognition and/or potential behavior. The subjective quality and perceived impact of particular app features will be rated under each subscale of objective app quality, assessed on an individual basis per item. The English version of uMARS was cross-culturally adapted for the Spanish language using a three-process design: cross-cultural adaptation, translation, and evaluation of statistical reliability and validity [29]. No significant differences were observed in the two Spanish translations, which were carried out independently. The blind back-translation, reviewed by the original author of uMARS, suggested minor edits. Discrimination indices (item-scale correlation) obtained appropriate results for both raters. The reliability of the scores was found to be appropriate in terms of internal consistency ($\alpha > 0.77$), temporal stability ($r > 0.72$), and inter-rater reliability ($IC > 0.76$). Correlations between the subscales have shown high values with a range between 0.47 and 0.83. The uMARS takes approximately 10 minutes to complete and was administered at the end of the MGAT usage trial period.

Interview Guide

The researchers in this study developed this guide to facilitate the discussion and collection of qualitative data from PCPs necessary to further assess the utility, acceptability, and modifications of the MGAT WebAPP. The guide used open questions to obtain participants' feedback on their experience using the MGAT and their recommendations to improve its usefulness for PCPs. Interview questions included the following: How adept do you think you are at using the app; did you experience any difficulty when using the app and how did you cope with these issues; what are the strengths and weaknesses of the app; how can you improve the app; how useful is this app in your health service delivery system to older adults with FDs?; and will you use this app as part of your healthcare delivery services? Why? Furthermore, follow-up questions were asked to explain those items of the uMARS with a score of 3 or less. The interviews took an average of 20 minutes and were administered at the end of the MGAT usage trial period.

Data Analysis

Quantitative Data

Quantitative data from the sociodemographic questionnaire and uMARS were analyzed using descriptive statistics of the central tendency, presenting means and standard deviations for continuous variables and frequencies with percentages for categorical variables. Microsoft Excel 2019 facilitated these statistical analyzes.

Qualitative Data

To analyze the qualitative data obtained from semi-structured interviews, a directed thematic content analysis was utilized [20]. This directed qualitative content analysis was informed by the Optimized Honeycomb Model to systematically analyze textual data through the predefined scales of uMARS. The analysis began with clear operational definitions for the objective quality, subjective quality, and perceived impact scales. The researchers deeply engaged with the data, identifying and highlighting text segments relevant to each scale and coding them accordingly. The research team held regular meetings to collaboratively interpret the findings. Data management was supported by QDA Miner Lite V3.0.2, a qualitative data analysis software package.

To ensure rigor in the analysis, peer debriefing sessions were conducted with two researchers for each participant. In addition, an external audit was performed by a qualitative data analysis expert (the principal investigator). This audit involved a comprehensive review of all interviews to confirm the interpretations and analyses carried out by the researchers.

Integration through analysis and interpretation

After completing qualitative and quantitative analyzes, the qualitative insights of individual interviews were merged with the quantitative findings of uMARS for a comprehensive evaluation and comparison. A narrative integration approach was used, interweaving qualitative and quantitative results on a theme-by-theme or concept-by-concept basis to present a more comprehensive understanding of the experiences of the participants. Both quantitative and qualitative analyzes were conducted in Spanish, with specific quotes chosen to illustrate each theme translated into English by a bilingual researcher for inclusion in the manuscript. This method ensures that the original meaning and context of the quotes are maintained during translation while making the findings accessible to an English-speaking audience. This version maintains the original meaning while using different phrasing and structure.

Ethical Considerations

The study was approved by the Institutional Review Board of the University of Puerto Rico, Medical Sciences Campus (Protocol number: 2211060727). The study procedures complied with the Declaration of Helsinki. All participants gave their informed consent in writing to participate in this study.

Results

Sample Characteristics

Thirteen eligible participants were approached. Three participants refused to participate due to time constraints. Ten participants completed the semi-structured interviews and surveys after the trial period of using the MGAT web app. The trial period ranged from 34 to 63 days among participants. Table 1 describes the characteristics of the participants, illustrating a diverse group of primary healthcare providers with a mean age of 45.7 years (SD = 14.2), ranging from 29 to 62 years. Most of the participants were women (60%). Regarding medical specialties, most of the participants were geriatricians or fellows (60%), followed by those in internal medicine (30%). The participants had an average of 17.3 years (SD = 13.7) of service to older adults, ranging from 2 to 33 years. On average, PCPs saw 42.5 older adult with FDs per month (SD = 40.2). The distribution in the workplace showed that most PCPs worked in private clinics (70%), university hospitals (30%), and assisted living facilities (30%) These are only examples of possible headings.

PCPs scored the highest on perceived impact of MGAT (mean 4.82; SD 0.39). The scores were

similar in all aspects, indicating a consistent degree of high perceived impact of MGAT on PCP knowledge, attitudes and intentions to use MGAT to provide AT services to their patients.

Table 1. Sociodemographic characteristics of study participants

Participants Characteristics	Total (n=10)
Age (years) Mean, (*SD*)	45.7 (*14.2*)
Age range (years)	29 - 62
Sex n (%)	
Women	6 (60%)
Men	4 (40%)
Medical specialty n (%)	3.93 (1.19)
Geriatrics or geriatric fellows	6 (60%)
Internal medicine	3 (30%)
Family medicine	1(10%)
Years of services to older adults Mean, (*SD*)	17.3 (13.7)
Years of services range	2-33
Older adult patients with FDs[a] seen by PCPs per month Mean, (*SD*)	42.5 (40.2)
Workplace n (%)	
Private clinic	7 (70%)
University hospital	5 (50%)
Assisted living facility	3 (30%)
University outpatient clinic	3 (30%)
Primary health care clinic	1 (10%)
Veteran hospital	1 (10%)

[a]FDs: Functional disabilities

Quantitative Findings from the uMARS

PCPs positively rated the objective quality of the MGAT WebApp, with a mean objective quality score of uMARS of 4.06 (SD 1.05) (Table 2). The quality, credibility and quantity of information were rated the highest (mean 4.60; SD 0.51), while the engagement received the lowest rating (mean 3.34; SD 1.51). The subjective quality rating of MGAT was also moderately high (mean 3.93; SD 1.19), with the item 'Recommend MGAT to other' rated highest (mean 4.70; SD 0.48) and the item 'Willing to pay for the application' rated the lowest (mean 3.11; SD 1.90).

PCPs scored the highest on perceived impact of MGAT (mean 4.82; SD 0.39). The scores were similar in all aspects, indicating a consistent degree of high perceived impact of MGAT on PCP knowledge, attitudes and intentions to use MGAT to provide AT services to their patients.

Table 2. Scores on the uMARS[a] scales and subscales for the MGAT[b] WebApp

uMARS[a] Scales and Subscales	Score *M* (*SD*)
MGAT objective quality	4.06 (1.05)
Engagement	3.34 (1.51)
Functionality	4.25 (0.71)
Aesthetic	4.27 (0.64)

Information	4.60 (0.51)
MGAT subjective quality	3.93 (1.19)
Recommend the app to others	4.70 (0.48)
Predicted frequency of use of app in next year	4.20 (0.92)
Willing to pay for the app	3.11 (1.90)
Overall MGAT rating	3.60 (0.70)
Perceived impact of MGAT	4.82 (0.39)
Awareness	4.60 (0.52)
Knowledge	4.80 (0.42)
Attitudes	4.90 (0.32)
Intention to change	4.90 (0.32)
Help-seeking	4.70 (0.48)
Behavior change	5.00 (0.00)

[a]uMARS: User Mobile Application Scale
[b]MGAT: Mi Guía de Asistencia Tecnológica (‘My Assistive Technology Guide’)

Qualitative Insights from Participant Feedback

In this section, a summary of the results of the interview data is reported, along with representative quotes that provided deeper insight into the reasons behind their scores on each uMARS scale of engagement, functionality, aesthetic, information, subjective quality, and perceived impact.

Engagement

Although not found to be customizable and interactive, most of the participants found the MGAT entertaining and all of the participants found the MGAT to be interesting and targeted to older Hispanics. One geriatrician stated: ‘I loved the part about where you can buy the equipment. I found the videos really cool, they made me smile. And the actors (older Hispanics) were professional.’ This PCP also found the MGAT videos appropriate to support older adults learning about AT use: 'The application is very valuable because older adults learn with the demonstration.’

Functionality

PCPs found the application easy to use, learn, and navigate, as stated by one geriatrician: “The reality is that the application is quite easy to use. I think it is intuitive in that sense.” However, some PCPs noted that scanning the QR code of the MGAT address was challenging for certain patients: 'Many of the elderly, unfortunately, get frustrated when using the camera (on the phone) and cannot find the link. And pressing it is difficult for them.” (geriatrician). To address this challenge, one internal medicine physician applied various strategies, such as downloading the MGAT to patients’ cell phone home screens, teaching caregivers how to access and use the MGAT, or using the MGAT from the PCP computer screen.

Although performance received a slightly lower score, PCPs identified issues primarily related to the MGAT’s dependency on a reliable internet connection. This dependency resulted in slow logins or delays in loading MGAT screens and videos. As one internal medicine physician mentioned: “If there is no Internet, it doesn’t work. It has happened to me on the phone that it took me a long time to get help (from the MGAT) for the patient on the phone.” This PCP addressed the internet connection issue by stating: “I downloaded the application on the computer and taught them how to navigate the page without having the problem of a bad signal.”

Aesthetics

Regarding aesthetics, the MGAT's design was praised for its visual appeal. One geriatrician remarked, "I was surprised by the quality of the videos and the information." Another geriatrician appreciated the MGAT's layout for diverse users by stating:

> For me, it was a good way to divide it, doing it by needs, an easier way to access the options available not just to a doctor but also for the patient to use it… The app has more options and a wider range of items, so if you were searching for a specific walker, you would be limiting yourself to that. In contrast, if you select that the limitation is mobility, you will see other options you might not have seen.

However, participants provided several suggestions to enhance the MGAT's aesthetics. Regarding visual appeal, one geriatrician suggested: "Maybe make it more attractive in terms of the application's visibility… Maybe something more eye-catching in terms of aesthetics… more inviting to use. It looks a little bit analog." Another internal medicine physician recommended improving the MGAT color scheme: "I think sometimes you need to add more clarity... the contrast can be improved." Two other PCPs recommended increasing the size of some of the MGAT's elements, with one participant stating "What could be done is to put the icons larger on the first page... because they need to see the image that is very good." (geriatrician) In this regard, one geriatrician proposed the following strategy to improve visual access to the MGAT: "When you open it from the computer, it can be viewed more completely."

Information Quality

The PCPs agreed that the quality of the information provided by the MGAT was high, as exemplified by this geriatrician's comment: "I was surprised by the quality of the information." They also highlighted the relevance of the information to older adults. A family doctor stated, "It has much relevant information regarding what can be offered to patients to help them carry out their independent activities, as well as their safety and fall prevention." The positive reception of the MGAT by older adults further supports the relevance and appropriateness of the MGAT's information for this demographic, as illustrated by this internal medicine physician's comment: "It helped patients clarify what equipment they need."

Regarding the quantity of information, the PCPs appreciated the conciseness of the MGAT, as it avoids overwhelming users with excessive text and facilitates ease of use and teaching. This was expressed by an internal medicine physician who said: "The good thing is that it's short, meaning it's not overwhelming to the point I would run out of time to show it or review it." PCPs also rated the comprehensiveness of the MGAT information highly. However, several PCPs suggested that the MGAT could benefit from more specialized information for medical professionals. Some recommended including specific ICD-10 (International Classification of Diseases, 10th Revision) diagnostic codes from the Centers for Medicare & Medicaid Services (CMS), as mentioned by this geriatrician:

> Many problems we face are that when we place these orders for medical equipment so patients can benefit from their health plans, they ask us for specific codes. In other words, we have to dance to the tune of the health plan. In this regard, the application could also help us. For example, for a cane, what diagnosis code could be effective for getting it approved?

Several PCPs also recommended adding the HCPCS codes (Healthcare Common Procedure Coding System codes) for the devices covered by Medicare to the MGAT. One geriatrician expressed this idea by stating: "You should include, if possible, a more private section for the area of physicians that requires a subscription to access the part of the application that includes the codes (for AT

devices).” Several PCPs also emphasized the importance of including links to CMS information to justify medical devices to insurance plans. A geriatrician stated:

> It would be ideal if it took you to the CMS page because you know what? It tells you how to justify the equipment. As a geriatrician, I know how to justify it, but a general practitioner or an internist has no idea how to justify an electric wheelchair for someone who has the use of their hands but whose body does not function.

Additionally, two PCPs suggested that integrating a questionnaire within the MGAT could streamline the process for PCPs, making it more efficient and likely to increase the MGAT’s usage. This was expressed by an internal medicine physician:

> If the application provides a functional problem questionnaire linked to device recommendations, it will help increase the application’s usage compared to a primary doctor simply asking random questions. This way, the doctor won't have to return to the application or search for another educational tool to make recommendations. Having both functions in one place is much better because it reduces the time needed for the task.

Some PCPs also expressed the need for the MGAT to facilitate the transfer of information to patients by sending or printing the information directly from the web app: “Another thing is if it were possible to send a link or print information from the application for the patient to take with them.” (internal medicine physician)

Regarding visual information, participants agreed that the overall clarity of the MGAT photos and videos is satisfactory, as noted by one geriatrician: “I think the photos look clear.” However, to improve the clarity of the visuals for older adults, this participant highlighted the strategy of accessing the MGAT on a computer rather than a mobile device.

A recurring theme was the need for audio instructions to accompany visual content. An internal medicine physician expressed that “The MGAT videos need audio to show them (older adults) how to do it (use the AT device),” suggesting that auditory cues could enhance older adults’ understanding and retention of information. To further improve the visual explanation in the videos, one PCP also recommended adding subtitles, in addition to audio, stating, “not only narrative but also include the subtitles.”

Subjective Quality

PCPs indicated a strong endorsement of the utility of MGAT, evidenced by a high likelihood of recommending it to other physicians. For example, one geriatrician considers the MGAT a valuable tool that can significantly benefit patients, implying a high probability of suggesting it to fellow doctors: “This app has great value because many times we are the first line of contact with the patient who truly needs it… so the more doctors who can have it, the more accessible assistive technologies will become to the community.” Another internal medicine physician suggested that the MGAT benefits other medical specialists as well: “I believe that this is not only directed at primary care doctors but also at physiatrists and rheumatologists.”

Similarly, the willingness of PCPs to use MGAT in the next 12 months, despite time constraints, suggests that the participants view the WebApp as a useful tool. One internal medicine physician stated, “I put the number 3 to 10 (times that I would use MGAT in the next 12 months) because I depend a lot on time. Sometimes, if I’m busy, I forget to use it.”

The data showed mixed views on paying for the MGAT. Although some PCPs are willing to consider paying for it, others expressed concerns about the cost, particularly from the perspective of older Hispanics who might find it difficult to afford. One geriatrician pointed out: “The ideal situation would be for the application to be free so patients could access it.” This feedback correlates with a lower mean rating of 3.2.

Perceived Impact

PCPs reported that the MGAT has significantly heightened their awareness of the functional needs of their patients' daily activities. An internal medicine physician mentioned:

> Using the app and being able to show them to the patients has helped me become a little more aware and attentive to ask them more specific questions about their daily lives rather than if they have fallen or are wetting themselves. One asks about things that affect their daily activities, but not necessarily about whether they have problems brushing their teeth, bathing, dressing, putting on a shirt, and with this (the MGAT), I would come and say, ‘Look, to button your shirt, this device helps you,’ and I would show them the buttoner.

All PCPs also expressed that, while they were previously familiar with common AT devices like walkers and canes, the MGAT has expanded their knowledge of other useful devices. A geriatrician commented:

> Even though we doctors know these items exist, we are not ‘up to date’ with many of them. So, I learned about many items that I didn’t know existed, and that could help my patients in their daily tasks. Thus, the MGAT helps us to give our patients more options.

PCPs also expressed that the MGAT has significantly increased their attitudes and intentions to facilitate access to AT for their patients. A geriatrician emphasized that the application is highly valuable because it makes them a crucial point of contact for patients needing AT. He stated, “Many times, we are the first line of contact with the patient who really needs it... the more doctors have it, the more accessible AT will be to the community.”

The use of the MGAT also prompted changes in all PCPs’ behaviors regarding informing, demonstrating, and prescribing AT devices to their patients or informing their family members. PCPs found it beneficial to use the MGAT during consultations to visually demonstrate the AT devices, which helped make informed decisions about what might be useful for the patients.

> I showed them how to access it from their cell phone, but to speed up the interaction during the visit, I would say, ‘When you tap here on the cell phone, this will appear.’ I would select any device and usually explain that there would be a description of the different devices they could use. Then, I would show them the video. For some, I would download the app to their cell phones and show them where they could find the devices. I would tell them that if they needed it, I could order it for them and always mentioned that for the next time (follow-up visit), if they found something they needed, I could order it for them. (geriatrician)

One geriatrician talked about the value of the MGAT in increasing her patients’ quality of life.

> My job is not only about health but also about quality of life. For them to be able to do gardening with something they wouldn’t consider… such as a gardening chair, and for me to be able to say, ‘Look, you can do it with this device,’ it continues to give them a reason to be alive. … not just to be independent, but to enjoy life. Now with the device, they can dress themselves and go to the opera. … So, having things that give them independence is like an antidepressant.

However, the limited time available during consultations was a significant barrier to using the

MGAT. The high volume of patients and the need to prioritize immediate medical concerns often left little time for detailed discussions about assistive technology. A geriatritian mentioned:

> In medical appointments, we sometimes have many patients scheduled, and although I would like to show them the video and all the assistive devices' instructions, I didn't have much time with them then. But I had already had the opportunity to see them beforehand, so I knew to whom it applied and to whom it didn't, so I gave them a brief summary of how to use it.

PCPs provided several strategies to manage the time barrier associated with using the MGAT. One strategy was to provide patients access to the MGAT before the medical appointment, allowing them to familiarize themselves with the AT devices and identify their needs during the appointment. Another approach was introducing the MGAT to patients during the medical visit and asking them to identify their specific AT needs for the next follow-up appointment. Finally, several PCPs recommended including a screening of functional abilities in daily activities within the MGAT that could be completed by the patient, their family member, the receptionist, the clinic nurse, or the physician themselves as a strategy for more efficient use of the MGAT. For example, an internal medicine physician explained:

> If the application provides you with a questionnaire on functional problems, where one marks the different issues the patient has, which is then linked to a recommendation for a type of assistive device, it will help increase the use of the application instead of a primary care doctor simply asking random questions... If both things are in one place, that's much better because you reduce the working time.

Integration of Quantitative and Qualitative Data

Integrating uMARS ratings with qualitative feedback illustrates a comprehensive understanding of user experiences. For example, the high engagement score correlates with participant comments emphasizing the app's motivational features. Conversely, the lower functionality score aligns with user frustrations about technical issues, highlighting areas for improvement.

Moreover, integrating the uMARS Perceived Impact scores with qualitative feedback provides a comprehensive understanding of the app's potential to influence knowledge, awareness, and behavior. The high mean score of 4.1 aligns with participants' comments about increased knowledge and motivation for change.
However, the qualitative data also highlights the need for additional features and support to overcome barriers to sustained behavior change. This insight suggests areas for improvement in the app's design and functionality to enhance its long-term impact on users' health behaviors.

Discussion

Principal Results

The primary objective of this study was to assess the quality of the MGAT WebAPP among PCPs and to describe their experiences using it to facilitate the access of older adults to AT services. This research is significant as it addresses a critical gap in the provision of AT services for older adults, particularly within Latino populations in Puerto Rico, who often face barriers to accessing necessary devices due to a lack of information and resources [7, 19-20]. By equipping PCPs with this knowledge, the study aims to improve the provision of AT services, ultimately benefiting the daily functioning, well-being and quality of life of older adults.

The results indicated that PCPs rated MGAT positively, with a high or moderately high mean score on all dimensions of uMARS, reflecting high perceived quality, usability, and impact on their

practice. However, some challenges were noted, such as the dependency on a good internet connection, the lack of audio descriptions of the instructional videos on AT use, and the lack of CPT codes for AT devices and their medical justification. These challenges affect PCPs' ability to effectively use the application, as they may need to employ additional strategies to assist their patients, such as using the MGAT from a computer screen with a wired connection to the Internet or spending additional time describing the use of the AT devices to the patients.

Comparison with Prior Work

The findings of this study are consistent with existing literature, which shows that healthcare providers are more likely to adopt technology that is intuitive, easy to navigate, perceived as useful, and encourages them to use it [31]. Similar to previous studies, this research highlights the need for user-friendly designs to ensure effective use of health technology [32]. However, our study contributes new insights by highlighting specific areas for improvement, such as improving engagement and addressing technical issues, which are less frequently discussed in the literature.

Although there is a web-based AT tool, other than the MGAT, to improve access to AT information among people with disabilities, the Atvisor [33], both tools represent two distinct approaches, each catering to the needs of different users. MGAT is specifically designed for older Latinos in Puerto Rico, providing user-friendly access to information on AT devices in various daily activities. Its simplicity and visual aids make it particularly accessible to older adults, enhancing awareness among PCPs about functional needs and available solutions. In contrast, Atvisor.ai is a clinical decision support system aimed at AT professionals and users in Israel, allowing personalized assessments based on individual needs and goals. This platform incorporates advanced features such as a matching algorithm to connect users with suitable products, facilitating online purchases and long-term follow-up. However, the strengths of MGAT lie in its ease of use and culturally relevant content, which is particularly beneficial for older adults who may be less familiar with technology. On the contrary, Atvisor.ai offers a more complex system suitable for environments where detailed evaluations and ongoing support are necessary. Although both platforms aim to improve access to assistive technology, MGAT's simplicity may appeal more to PCPs who require immediate access to AT information without the complexities of personalized assessments.

This study holds significant value for PCPs who work with older adults. By providing a comprehensive resource for AT options, the MGAT can enhance patient care by allowing physicians to make informed recommendations tailored to their patients' functional needs, thus boosting the independence and quality of life of older adults. PCP recommendations for app improvements, such as integrating diagnostic codes and adding audio instructions, highlight areas where further development could increase the adoption and utility rates among healthcare providers.

Limitations and Future Research

This study acknowledges several limitations that may affect the interpretation of the results. The sample size was relatively small and consisted primarily of geriatricians, which may not fully represent the broader spectrum of PCPs. Furthermore, the study was conducted in a specific cultural context, which may limit the generalizability of the findings. Future research should focus on addressing the technical challenges identified in this study and include a larger and more diverse sample of healthcare providers to explore the usability of the app in different settings. Further studies could also explore the long-term impact of MGAT on functional outcomes of patients and investigate the effectiveness of the app in other cultural contexts. Furthermore, research could examine the integration of MGAT with other disability services in primary care to provide a more comprehensive solution for the management of functional disabilities among older adults.

Conclusions

PCPs positively rated the MGAT WebApp, with a high perceived impact on their practice. MGAT shows promise as a valuable tool for PCPs in Puerto Rico, offering comprehensive and culturally relevant information on AT devices. Although technical challenges must be addressed, the positive reception of MGAT highlights its potential to improve the provision of assistive technology services for older adults. By improving PCP knowledge and awareness of AT options, MGAT can contribute to better patient care and improved outcomes for function, health, and quality of life for older adults.

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Conflicts of Interest

None declared.

Abbreviations

AT: assistive technologies
FDs: functional disabilities
MGAT: Mi Guía de Asistencia Tecnológica
PCPs: primary care physicians
PI: principal investigator
uMARS: user Mobile Application Rating Scale
WebAPP: web application

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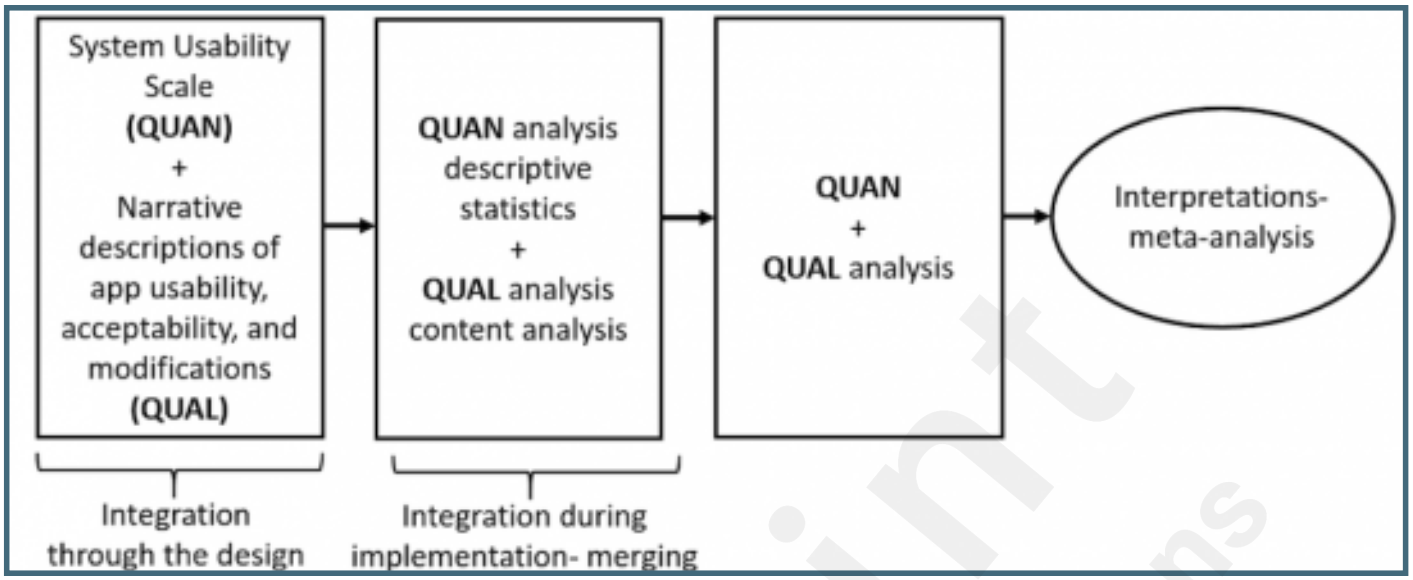
Supplementary Files

Figures

Study design and points of integration at the concurrent mixed method design.



Screens of the Web App: This figure includes screenshots illustrating the navigation within the MGAT, starting from the introductory screen and progressing to the home page, the Categories of Activities screen, the Subcategories of Activities screen, the AT Device Options screen, and finally, the AT Device Selection screen.