QR-Specialized Information Guidance Nexus (QR-SIGN): Enhancing OTC Medication knowledge and Adherence of the Deaf Community

Adolf D. Amoloria, Jewel Lyre V. Ebon, Donna D. French, Katrina Mae C. Jereme, Apple Jane Siroy, RPh, MSPharm©

Pharmacy Department, St. Alexius College, Koronadal City, South Cotabato, Mindanao, Philippines

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ABSTRACT

Hearing impairment poses significant challenges in understanding over-the-counter (OTC) medication instructions, often leading to misuse, low adherence, and poor health outcomes. This study aimed to develop and evaluate the QR-Specialized Information Guidance Nexus (QR-SIGN), a QR code-based tool that provides medication instructions through Filipino Sign Language videos to improve knowledge and promote adherence among Deaf individuals. A quasi-experimental, non-randomized pretest-posttest control group design was conducted with 30 Deaf participants from Koronadal City, equally divided into intervention and control groups. The intervention group accessed QR-SIGN, while the control group received no additional support. Results showed significant improvements in knowledge scores— paracetamol (20.00 to 76.67), ibuprofen (26.67 to 71.67), and

phenylephrine (33.33 to 63.33)—and adherence (2.95 to 3.72). The intervention group also reported an overall mean satisfaction rating of 4.39, interpreted as Excellent and Very Satisfied. These findings demonstrate that QR-SIGN effectively enhances medication literacy, adherence, and user satisfaction among Deaf individuals.

Keywords-Hearing impairment, Deaf community, Medication literacy, Over-the-counter (OTC) drugs, Health communication, Sign language (Filipino Sign Language), Digital health tools, QR code technology, Medication adherence, Patient education, Accessibility

INTRODUCTION

Access to healthcare and medication information is a fundamental right, yet the deaf community often struggles with understanding medication instructions due to limited accessible resources and trained personnel in sign language. Communication barriers often result in a lack of understanding of medication instructions, health warnings, and treatment guidelines, leading to potential health risks and misunderstandings (Naseribooriadi et al, 2017). A study by Ferguson et al (2015) revealed that among 73 pharmacists surveyed in United States of America, 68.5% interact with 1 to 5 deaf patients monthly. Most pharmacists rely on written materials as their primary communication method, citing limited access to interpreters as a significant barrier. Alarmingly, none of the pharmacists surveyed recognized a legal obligation to provide or fund interpreter services, underscoring the critical need for enhanced communication strategies and greater awareness of legal responsibilities in addressing the healthcare needs of the deaf community.

Similarly, McKee et al. (2019) found that Deaf ASL users face significantly lower health literacy due to limited access to language-concordant healthcare information and tools. The study emphasizes the need for tailored interventions and accessible resources in ASL to bridge this gap. Additionally, Piao et al. (2023) identified communication challenges as a major barrier for hearing-impaired individuals, suggesting policy changes, sign language-enabled tools, and visual aids to enhance medication literacy.

The deaf community faces significant challenges in accessing healthcare services, particularly in purchasing and understanding medication, due to communication barriers and limited accommodations. According to Quiro, B.

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(2024) many deaf individuals in Koronadal City struggle to communicate with written communication and often rely on family members or other deaf relatives for medication guidance, which can lead to errors due to a lack of proper knowledge or sign language skills. Additionally, deaf customers frequently resort to showing medication wrappers or prescriptions to pharmacists, but inadequate explanations and unclear instructions often hinder their understanding of medication usage. Despite these difficulties, Quiro highlighted that the increasing use of smartphones and social media among the deaf community offers opportunities to implement innovative solutions to improve medication literacy and empower deaf individuals to manage their health effectively. These findings underscore the need for inclusive healthcare practices and accessible communication tools to bridge these gaps and ensure equitable access to healthcare services.

In recent years, technological advancements have shown promise in improving access to information (Brodowicz, 2024). One such innovation is the use of Quick Response (QR) codes. These codes can store comprehensive information and can be accessed via smartphones, allowing users to instantly retrieve visual or written data. According to Funke (2024), QR codes present a potential solution to bridge the communication gap for people with disabilities. The use of QR codes could be instrumental in ensuring that medication instructions, dosage information, potential side effects, and other health-related content are accessible in a format that empowers the deaf community to make informed decisions about their health.

In the study of Madzarac (2024) entitled QR codes improve medication adherence, Waterloo's clinical associate professor, Dr. Tejal Patel, collaborated with QRxDigital to incorporate QR codes on medication bottles. These QR codes direct patients to instructional videos they can view at home, which has been shown to significantly enhance medication knowledge and adherence. Digital tools such as "Si-Apik" utilize QR codes paired with multimedia content to educate the deaf community on financial literacy and business skills, aiding their social and economic inclusion (Adiningrat et al., 2022). QR codes have proven versatile in supporting broader societal efforts, particularly in fostering economic independence and empowering marginalized groups.

The study aimed to develop and evaluate the potential of QR-SIGN: QR-Specialized Information Guidance Nexus as a QR code-based solution designed to improve medication knowledge among the deaf community in Koronadal City. By integrating essential medication information into a format that is both accessible and user-friendly, the study seek to empower the deaf community to make informed decisions about their health. This initiative not only addresses the critical communication barriers between healthcare providers and the deaf community but also highlights the potential of innovative technologies in fostering inclusivity and equitable access to healthcare.

MATERIALS AND METHODS

Research Design

The researchers used a quasi-experimental design, particularly the pretest-posttest control group design, to evaluate the effectiveness of the QR-SIGN system in increasing the knowledge of the deaf community in Koronadal City. With this design, the researchers conducted a pre-test to assess the participants' initial knowledge about the medicine, followed by a post-test to measure any changes in their level of knowledge after using the QR-SIGN system.

Research Locale

The study was conducted in the southern part of the Philippines, specifically in Mindanao, in the City of Koronadal. Koronadal City, also known as Marbel, is the provincial capital of South Cotabato and served as the regional center of Region 12, commonly referred to as SOCCSKSARGEN. The city spans an area of 273.8 square kilometers, which accounted for 7.30% of the total land area of South Cotabato. As of 2020, Koronadal City had a total population of 195,398 individuals. Among these, 99.08% were part of the household population, while 0.92% belonged to the institutional population.

Koronadal City is strategically positioned and played a significant role as an economic and administrative hub in the region. It is known for its vibrant trade and commerce, particularly in agriculture, which serve as a primary

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livelihood for its residents. The city also functions as a center for various industries, including manufacturing, retail, and services, catering to the needs of surrounding municipalities and provinces.

Based on data from the City Social Welfare and Development Office (CSWDO) of Koronadal, there are 115 deaf patients recorded in the city. This information highlighted the relevance and importance of conducting the study in Koronadal. The location was chosen not only because of the presence of the target participants but also for the convenience and accessibility it offered during the research process.

Population and Sampling

The participants of this study consist of thirty deaf individuals residing in Koronadal City. The study included individuals of age 18 and above to participate and has access to a smartphone capable of scanning QR codes. This criterion ensures that participants could independently interact with the QR-SIGN System to receive health and medication-related information.

The study employed snowball sampling, a technique where initial participants helped recruit others who met the study's criteria. This method was particularly effective for reaching specific populations, such as the deaf community, by utilizing existing social networks. Participants were selected based on the following criteria: they had to be deaf, aged 18 years old and above, and possess a cellular phone capable of QR code scanning.

The recruitment process began at the City Social Welfare and Development Office (CSWDO) in Koronadal City, where the researchers were referred to two key communities. The first community, led by Ma'am Carla Labadia, helped connect the researchers with potential participants, and she also introduced them to professional FSL teachers in General Santos City, where the instructional video for the QR-SIGN intervention was filmed. The second community, located at DSWD XII AVRC (Area Vocational Rehabilitation Center), served as a training center where members of the deaf community learned computer skills, and participants from this institution were also recruited. Through snowball sampling, participants were recruited organically, ensuring a more inclusive and representative sample. According to Cohen et al. (2017), at least fifteen (15) participants are recommended for experimental studies to ensure sufficient data for analysis. Additionally, to uphold methodological rigor, standard guidelines and protocols for the intervention were reviewed and validated by the research adviser, professors, and additional validators before implementation.

Research Instrument

The researchers collected data using a pre-test and post-test questionnaire to evaluate the impact of the QR-SIGN system on medication knowledge among the deaf community in Koronadal City. The pre-test assessed participants' initial knowledge and ability to access medication information, while the post-test measured their understanding, confidence, and any improvements after using the QR-SIGN system.

A pretest-posttest control group design was used in this study to effectively measure changes in medication knowledge and adherence among deaf individuals before and after the QR-SIGN intervention. This design is particularly appropriate for evaluating the immediate impact of an intervention when the goal is to assess learning outcomes or behavioral change within the same population over a short period. It enables researchers to determine causality by observing the difference in participant responses before and after exposure to the intervention (Leung, 2015). This paired pre-test and post- test intervention comparison allowed the researchers to assess the effectiveness of the QR-SIGN system in improving participants' ability to understand and manage their medications.

To ensure the validity and reliability of the research instruments, experts in relevant fields reviewed and validated the materials. A licensed doctor verified the content of the recorded video to ensure medical accuracy. The questionnaires were reviewed and validated by three (3) Masters in Pharmacy to confirm their effectiveness in assessing medication knowledge. Additionally, a professional ASL/FSL teacher validated the ASL/FSL (American/Filipino Sign Language) video to ensure its clarity, accuracy, and accessibility for the deaf community. With expert validation and a combination of quantitative and qualitative data collection, the study comprehensively assessed the effectiveness of the QR-SIGN system in improving medication knowledge and

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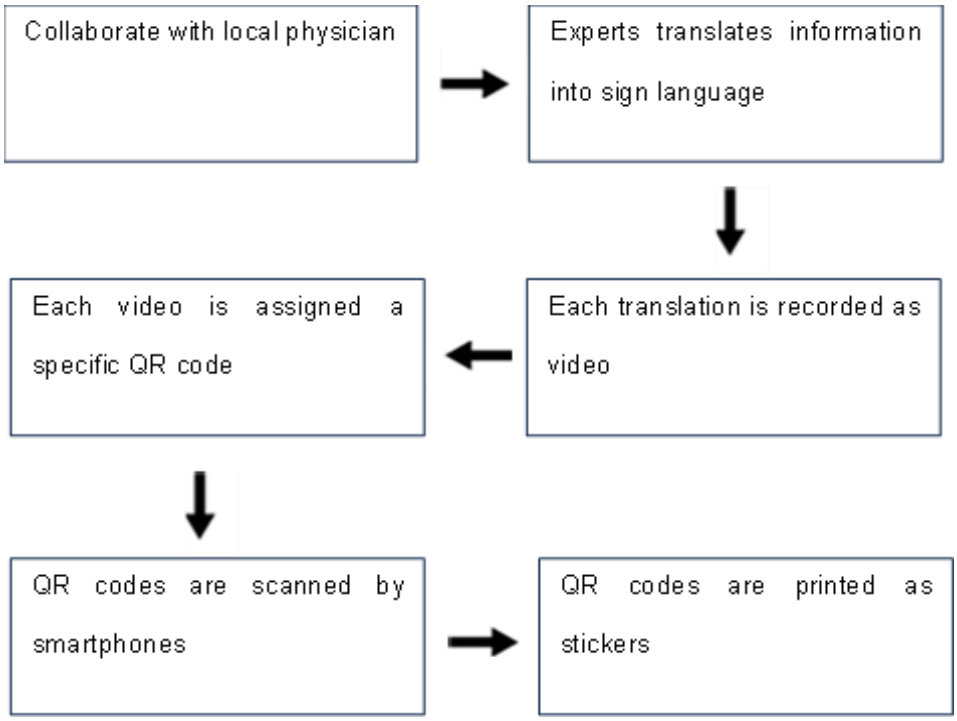
adherence among the deaf population.

Development of the QR-SIGN.



Standard Operating Procedures

QR-SIGN Implementation Procedure

Preparation of the QR-SIGN Tool:

Prepare accurate and medically validated Filipino Sign Language (FSL) video instructions for selected OTC drugs (paracetamol, ibuprofen, phenylephrine).

Ensure the video content is reviewed by licensed physicians and validated by certified FSL/ASL interpreters.

Upload validated videos to YouTube.

Generate QR codes linking directly to each medication video using a QR code generator.

Print QR codes on sticker paper and attach them to drug packages.

Participant Preparation:

Identify eligible Deaf individuals aged 18–60 years in Koronadal City.

Ensure participants own a smartphone with camera and internet access.

Provide informed consent forms and explain participation details via FSL interpreter or visual aids.

Include only those who are FSL/ASL- literate and can use smartphones independently.

Pre-Implementation Testing:

Administer pretest questionnaires to both control and intervention groups to assess baseline knowledge and adherence.

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Use a standardized and validated questionnaire.

Record data in secure, anonymized format for each participant.

QR-SIGN Field Implementation:

Guide intervention group participants to scan the QR codes using their smartphones.

Monitor their ability to access and understand the FSL video content.

Provide assistance only when necessary, ensuring independent interaction with the system.

Post-Implementation Testing:

After two weeks of usage, administer posttest questionnaires to measure knowledge retention and adherence.

Collect feedback on system usability and satisfaction using a 10-item Likert scale.

Ensure PDAO personnel or an interpreter is present during post-testing.

Data Collection and Analysis:

Compile pretest and posttest scores for both control and intervention groups.

Analyze knowledge and adherence scores using descriptive and inferential statistics (e.g., paired t-test, $p < 0.05$significance).

Interpret satisfaction scores using mean range descriptors (e.g., 4.20–5.00 = Excellent).

Digital Tool Quality Assurance

Physical Integrity and Usability Criteria:

Functionality: QR code should open the correct video within 5–10 seconds under different lighting conditions.

Accessibility: Video should have clear visual quality, slow-paced sign language, and minimal distractions.

Ease of Use: Participants should scan and view videos independently with 90% success rate.

Compliance and Safety:

Complies with Data Privacy Act (RA 10173) for handling personal information.

Follows ethical standards under CIOMS 2016 and institutional ethics protocols.

Maintains participant anonymity, secured data storage, and voluntary participation rights.

Data Gathering Procedure

The study was conducted in four structured phases to effectively gather data. In Phase 1**,** the researchers obtained informed consent from Deaf participants in Koronadal City. The study's objectives were explained using accessible methods, such as sign language interpreters and visual aids, ensuring participants fully understood their involvement. Consent forms were signed in the presence of a representative from the Persons with Disability Affairs Office (PDAO) or a government official familiar with the Deaf community. In Phase 2**,** the development of the QR-SIGN tool was carried out. Instructional videos in Filipino Sign Language (FSL) and American Sign Language (ASL), covering proper use, dosage, and side effects of common over-the-counter (OTC) medications such as paracetamol, ibuprofen, and phenylephrine, were produced and medically validated.

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These videos were uploaded to YouTube, and corresponding QR codes were generated using ME-QR. The codes were printed on sticker paper and attached to medication packaging or information cards for easy access via smartphones. Participants were required to have internet access to view the videos. Phase 3 involved the administration of a demographic survey and a pre-test to assess baseline knowledge of medication use. Participants then proceeded to the field test of the QR-SIGN system, conducted in a local pharmacy setting. They scanned the QR codes using their smartphones to access the FSL video content, while researchers observed their interaction with the system. A PDAO representative was present throughout the process to provide support. In Phase 4**,** a post-test was administered to evaluate changes in knowledge and medication adherence. Participants also completed an evaluation form to provide feedback on the usability, accessibility, and clarity of the QR-SIGN system. All data collected from pre- and post-tests served as the basis for analyzing the effectiveness of the intervention.

Figure 3. Flowchart of the four phases of Data Gathering Procedure

Statistical Analysis

The study utilized both descriptive and inferential statistical tools to analyze the effectiveness of the QR- SIGN intervention. Descriptive statistics—such as percentage, mean, and standard deviation—were used to summarize participants' demographics, knowledge levels, medication adherence, and satisfaction. To assess knowledge of OTC medications (paracetamol, ibuprofen, and phenylephrine), pretest and posttest scores were compared using mean values. Medication adherence was evaluated through a 21-item Likert-scale questionnaire, with mean scores interpreted using a standardized rubric ranging from "Very Low" to "Very High" adherence. A paired samples t-test was applied to determine statistically significant differences in knowledge and adherence before and after the intervention, using a 0.05 significance level. Participant satisfaction was also measured using mean and percentage ratings. Overall, these statistical methods provided a comprehensive assessment of the QR-SIGN system's impact on improving health knowledge and adherence within the Deaf community.

RESULTS AND DISCUSSION

This section presents the findings of the study titled "QR- Specialized Information Guidance Nexus (QR-SIGN): Enhancing OTC Medication Knowledge of the Deaf Community". The study aimed to determine the effectiveness of a QR code-based intervention in improving the knowledge and adherence related to over-the-counter (OTC) drug use among members of the deaf community.

Table 1 Mean Level of Knowledge on Otc Drugs Among the Deaf Community Before and After the Implementation of the Qr-Sign

Group	Test variables	Mean	SD	Description
Intervention Group	Before Intervention	26.67	11.30	**Low Level of Knowledge**
	After Intervention	69.67	14.75	**High Level of Knowledge**
Control Group	Before intervention	21.33	8.00	**Low Level of Knowledge**
	After intervention	23.33	6.01	**Low Level of Knowledge**

Table 1 presents the overall mean knowledge scores of participants from both the intervention and control groups, measured before and after the implementation of the QR-SIGN system. The scores reflect participants' general understanding and knowledge of over-the-counter (OTC) medications. In the intervention group, the pretest mean score was 26.67%, which falls under the "Low" knowledge category. After the QR-SIGN intervention, this score significantly increased to 69.67%, elevating the group's knowledge level to "High." This considerable improvement highlights the effectiveness of the QR-SIGN system in enhancing the Deaf community's understanding of OTC medication use, safety, and application.

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By contrast, the control group exhibited minimal change. Their mean pretest score of 21.33% remained within the "Low" category and slightly increased to 23.33% posttest— an insignificant difference that suggests no substantial knowledge gain without the intervention. It is worth mentioning that a few participants in the control group, e.g., Participants 3, 9, 10 and 11, remained at the "Very Low" level even at posttest, indicating that conventional exposure without accessible educational support was insufficient to improve medication knowledge.

The dramatic increase in the intervention group's scores demonstrates the positive impact of a visually accessible, QR code-based learning tool. Many participants shifted from "Very Low" or "Low" to "High" or even "Very High" knowledge classifications. This aligns with the study's primary goal of determining whether the QR-SIGN intervention could improve medication knowledge among Deaf individuals. The system's use of sign language videos and visual aids effectively addressed communication barriers that often impede health education in the Deaf community. The QR-SIGN system not only proved to be an effective educational platform but also exemplifies how linguistically and culturally appropriate resources can empower marginalized groups. By narrowing knowledge gaps and enhancing informed decision-making, such tools contribute to more equitable healthcare outcomes and advocate for the integration of accessible digital health education in wider health systems. The findings align with prior studies, such as those by Kim and Xie (2017), who underscored the importance of eHealth tools designed for accessibility in improving health literacy in marginalized groups. Moreover, research by McKee et al. (2015) confirmed that health education among deaf individuals is most effective when it incorporates sign language and visual tools, as was done in QR- SIGN.

The results from Table 1 not only validate the QR- SIGN system as an effective educational tool but also underline the broader need for inclusive health communication platforms. By delivering information in sign language with supportive visuals, QR-SIGN bridged the common communication gaps that hinder the deaf community's access to drug-related knowledge. Such interventions can ultimately foster safer medication practices and empower individuals to make informed health decisions. As mobile health technology becomes more embedded in healthcare delivery, this study supports the call for user-centered, linguistically tailored solutions that ensure equity and comprehension in health education (Zhou et al., 2021).

Table 2 Extent of Adherence of Otc Drugs Among the Deaf Community Before and After the Implementation of the Qr-Sign Intervention.

Group	Test variables	Mean	SD	Description
Intervention Group	Before Intervention	2.95	1.22	**Moderate Adherence**
	After Intervention	3.72	0.97	**Moderate Adherence**
Control Group	Before intervention	2.30	0.98	**Low Adherence**
	After intervention	2.60	1.85	**Moderate Adherence**

Table 2 presents the results of a questionnaire that assessed medication adherence among deaf participants before and after the implementation of the QR-SIGN intervention. The table reports average scores across 21 adherence-related statements using a 5-point Likert scale, where higher scores indicate more frequent adherence behaviors. The analysis includes both an intervention group that received the QR-SIGN intervention and a control group that did not. Interpretation of scores is based on a predefined matrix, where a mean score of 2.60–3.39 is considered "moderate adherence," 3.40–4.19 is "high adherence," and lower values reflect reduced or poor adherence. In the intervention group, the pretest overall mean adherence score was 2.95 (SD = 1.22)—classified as "moderate." After the intervention, this score increased to 3.72 (SD = 0.97), still classified as "moderate" but showing a clear and meaningful improvement. This upward shift indicates that the intervention significantly influenced participants' adherence to proper and consistent use of OTC medications, even though the post-intervention rating did not yet reach the "high" adherence level.

In contrast, the control group's adherence only slightly improved, from 2.30 (SD = 0.98) to 2.60 (SD = 1.85), marking a marginal shift from low to borderline moderate adherence, with greater variability. This modest change emphasizes the greater impact of structured, accessible interventions like QR- SIGN compared to passive or unstructured access to drug information.

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These findings are consistent with previous research that highlights the importance of health knowledge in supporting behavior change. Bailey et al. (2015) note that while increased knowledge is essential for improving medication adherence, it must be supported by ongoing reinforcement and accessible guidance to result in lasting behavioral shifts. Similarly, Kim and Xie (2017) argue that eHealth tools can enhance understanding, but their impact on behavior is stronger when combined with personalized, engaging content.

As shown in Table 2, the QR-SIGN intervention led to a substantial improvement in adherence behaviors, even if the classification remained moderate. This progress, contrasted with the limited gains in the control group, underscores the value of developing accessible, sign language-integrated tools to support better medication practices among deaf individuals.

Table 3 Testing the Significant Difference in the Levels of Knowledge Among the Deaf Community Before and After the Qr-Sign Intervention.

Group	Test Variables	Mean	SD	T value	P value	Remarks
Intervention Group	Before Intervention	26.67	11.30	15.736	<0.05	**There is a Significant Difference**
	After Intervention	69.67	14.75			
Control Group	Before Intervention	21.33	8.00	0.803	0.435	**There is no Significant Difference**
	After Intervention	23.33	6.01			

*** Calculation was performed at .05 level of significance**

In The results presented in Table 3 demonstrate a statistically significant difference in knowledge levels among Deaf community participants who were exposed to the QR- SIGN intervention, compared to those in the control group who did not receive the intervention. This significance was measured using a paired sample t-test, which assessed the Testing The Significant Difference in The Level of Medication Adherence Among the Deaf Community Before and After the Qr- Sign Intervention. change in knowledge scores before and after the intervention within each group.

Group Test Variables Mean SD T value Pvalue Remarks

the intervention group, the mean knowledge score increased from 26.67 (SD = 11.30) before the intervention to 69.67 (SD = 14.75) afterward. The calculated t-value of 15.736 and a p-value of < 0.05 suggest a highly significant difference, indicating that the improvement was not due to chance but was associated with the effect of the intervention. Such a significant change highlights the effectiveness of the QR Code-based learning materials in enhancing knowledge acquisition. By contrast, the control group showed only a small, statistically insignificant change in knowledge scores ($t = 0.803$, $p = 0.435$),

This marked difference between groups highlights the value of integrating accessible and visual technologies in education, especially for learners with hearing impairments. The use of QR Codes to deliver educational content allows for multimodal instruction — typically combining text, images, and videos — which has been shown to significantly improve learning outcomes among students with special needs (Kumar et al., 2016). Specifically, Deaf learners tend to benefit from visual and interactive materials, as these align with their preferred learning styles and eliminate auditory barriers (Tang, Wu, & Lee, 2019).

Additionally, QR Codes serve as a flexible tool in mobile learning environments, enabling learners to access information independently and repeatedly, which reinforces comprehension and retention (Al-Sharafi et al., 2018). This is particularly advantageous for Deaf individuals who may require more time and visual reinforcement to fully understand abstract concepts, especially those usually taught through spoken language. Studies have found that mobile-assisted learning approaches improve student motivation, accessibility, and autonomy (Looi et al., 2020).

Furthermore, the application of inclusive technologies such as QR codes reflects the principles of Universal Design for Learning (UDL), which advocates for the use of multiple means of representation to accommodate

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diverse learners (CAST, 2018). UDL-based tools reduce systemic barriers to learning by providing equal access to content, and are especially effective for learners with sensory disabilities. According to Mtebe and Raisamo (2019), when instructional content is tailored to the needs of learners with disabilities using assistive and digital tools, their engagement and academic performance improve significantly.

TABLE 4 *Calculation was performed at .05 level of significance

Group	Test Variables	Mean	SD	T value	P value	Remarks
Intervention Group	Before Intervention	2.95	0.33	9.07	<0.05	There is a Significant Difference
	After Intervention	3.72	0.38			
Control Group	Before Intervention	2.3	0.69	0.97	0.34	There is no Significant Difference
	After Intervention	2.51	1.03			

Table 4 evaluates whether there was a statistically significant difference in the level of medication adherence among members of the deaf community before and after the implementation of a QR code-based educational intervention. The table distinguishes between the intervention group and the control group, with adherence measured through a pre- and post-test using a standardized questionnaire. The statistical test used was the t-test, with results considered significant at a 0.05 level.

In the intervention group, the average medication adherence score showed a notable increase from 2.95 (SD = 0.33) before the intervention to 3.72 (SD = 0.38) afterward. Although both scores fall within the “moderate” range based on the study’s interpretation matrix, the rise is statistically significant, as evidenced by a t-value of 9.07 and a p-value less than 0.05. This substantial improvement suggests that the QR- SIGN intervention effectively enhanced participants’ consistency and accuracy in following medication instructions. While the adherence level did not yet reach a “high” classification, the significant upward shift reflects meaningful progress in addressing the research sub-question regarding medication adherence. These findings contribute to the growing body of evidence that visual, accessible educational tools can positively influence health behaviors in deaf and sensory- impaired communities (Mutswanga, 2017; Emerson et al., 2020).

On the other hand, the control group showed minimal change in adherence levels, with the mean increasing from 2.30 (SD = 0.69) to 2.51 (SD = 1.03). The t-value of 0.97 and p-value of 0.34 indicate that this change is not statistically significant. Both scores fall within the "moderate" adherence range, with no meaningful progression observed. This stagnation implies that without intervention, knowledge or habits related to medication adherence among the deaf community are unlikely to improve over time, reinforcing the importance of intervention-based public health strategies tailored to this demographic (Kuenburg et al., 2016).QR-SIGN without needing assistance.

The substantial gain in the intervention group is consistent with literature that affirms the effectiveness of digital and interactive tools in health education, particularly for populations that encounter communication barriers. For example, a study by Rao et al. (2019) concluded that mobile and QR code-based interventions significantly improve adherence in patients with chronic conditions. Furthermore, visual tools help mitigate the literacy and language gap often experienced by the deaf, as demonstrated by Zazove et al. (2017), who emphasized the need for inclusive health resources for the deaf community.

Table 4 substantiates the effectiveness of the QR- SIGN intervention in enhancing medication adherence among the deaf community. The significant improvement in the intervention group, contrasted with the control group’s unchanged behavior, confirms that accessible, visually guided tools can meaningfully support health literacy and adherence. These results highlight the need for scalable, inclusive technologies to address systemic healthcare disparities, especially in marginalized groups. The QR-SIGN loads the informational video quickly and without issues.

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Table 5 Overall Mean on Level of Satisfaction with the Utilization of Qr-Sign.

Statement	**Mean**	**Description**	**Verbal Interpretation**
1. The QR-SIGN is easy to use even without assistance.	4.67	Excellent	Very Satisfied
2. The QR-SIGN interface for first-time users is very good.	4.47	Excellent	Very Satisfied
3. The size of the QR-SIGN is appropriate and easy to scan.	4.6	Excellent	Very Satisfied
4. The QR-SIGN functions under different lighting conditions.	4	Very Good	Satisfied
5. The QR-SIGN loads the video quickly without issues.	4.27	Excellent	Very Satisfied
6. I can easily use the QR-SIGN without needing assistance.	4.4	Excellent	Very Satisfied
7. The QR-SIGN loads the video quickly without issues.	4.4	Excellent	Very Satisfied
8. I find it easy and confident using the QR-SIGN to access information.	4.47	Excellent	Very Satisfied
9. The QR-SIGN loads the information reasonably and smoothly.	4.53	Excellent	Very Satisfied
10. The QR-SIGN directs me to the correct video without confusion.	4.07	Very Good	Satisfied
Overall Mean:	4.39	Excellent	Very Satisfied

Excellent Very Satisfied

Table 5 presents the evaluation of the usability and user satisfaction regarding QR-SIGN — a QR code-based system used to disseminate medication-related information to members of the deaf community. The intervention was assessed through a structured questionnaire rated on a five-point Likert scale, with interpretation based on the rating guide provided.

The overall mean score of 4.39 falls within the "Excellent" system capability and corresponds to a "Very Satisfied" level of user satisfaction. This indicates that the QR- SIGN system met or exceeded user expectations across a wide range of usability factors. Among the highest-rated items were “The QR-SIGN is easy to scan using my device” (M = 4.67), “The size of the QR-SIGN is appropriate for easy scanning” (M = 4.60), and “The QR-SIGN loads the video within a reasonable amount of time” (M = 4.53). These results suggest that the physical and functional design of the QR-SIGN significantly supported accessibility and speed, both of which are critical for deaf users who rely on visual content delivery.

Statements with relatively lower, yet still positive, mean scores included “The QR-SIGN functions properly under different lighting conditions” (M = 4.00) and “The QR-SIGN directs me to the correct video without confusion” (M = 4.07). These were rated as "Very Good" with a "Satisfied" interpretation, indicating areas where the system could be further refined to improve performance in varied real-world environments and ensure greater accuracy in video content linkage. All other statements received mean scores ranging from 4.27 to 4.47, reflecting consistent excellence in ease of use, user confidence, and minimal technical difficulties during scanning and video access. These findings align with previous literature asserting that while mobile and QR-based tools are generally beneficial, they must be designed with universal usability in mind, especially for marginalized populations (Brown et al., 2020). Furthermore, a study by Chen et al. (2021) emphasized that deaf individuals benefit most when digital health tools are tailored to their linguistic and cultural context, including the use of sign language, visual aids, and simple navigation.

The results from Table 5 suggests that QR-SIGN is not only technically reliable but also highly usable for individuals facing communication barriers. These findings demonstrate that the QR-SIGN intervention was both

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accessible and user- friendly for the deaf community. The consistently high satisfaction levels reinforce the system's potential as an effective and inclusive tool for delivering visual health education content.

CONCLUSION

The study concludes that the QR-SIGN intervention is an effective and accessible tool for improving the knowledge and medication adherence of Deaf individuals. By delivering essential drug information in Filipino Sign Language through QR codes, the tool successfully addressed communication barriers and promoted better understanding of OTC medications. Significant improvements in the intervention group, compared to minimal change in the control group, highlight the value of culturally appropriate, tech-based solutions. QR-SIGN was well-received by users and shows strong potential for wider use in public health and pharmacy settings, contributing to a more inclusive and equitable healthcare system.

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