Title: Digital Literacy and Technology Access Among Patients at a Student-Run Free Clinic
Running Title: Digital Literacy and Access in SRFC Patients

Kristina Khaw BS[1*], Angelica Piccini BS[1], Arnold Rojas BS[1], Bryan Chen BS[1], Iris Hagans MD[2]

1. Cooper Medical School of Rowan University, Camden, NJ, USA.
2. Cooper University Health Care, Camden, NJ, USA.

***Corresponding Author:**
Kristina Khaw
Cooper Medical School of Rowan University
401 Broadway, Camden, NJ 08103
Phone: 1-(609)-937-0314
Email address: kkhaw9@gmail.com (primary), khawkr94@rowan.edu

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Abstract

Background: Although telemedicine expanded during the COVID-19 pandemic, a digital divide remains that may limit the implementation in clinics serving underserved patient populations. To assess barriers to digital health services, this study investigates technological capabilities and access among low-income, uninsured patients at a student-run free clinic (SRFC).

Methods: A cross-sectional survey was conducted over five weeks among patients at a SRFC. Patients over 18 years old (yo) who provided consent and demonstrated capacity completed a survey assessing demographics, device ownership, Wi-Fi access, technology proficiency, and knowledge of electronic medical records. Patient age groups were compared to matched United States population data.

Results: Among 109 patients (mean age 49.7 ± 11.6 years), 93.5% identified as Hispanic/Latino and 82.3% preferred Spanish. Smartphone ownership was high (87.2% vs 90% U.S., $p = 0.323$), comparable to the US population. However, fewer patients had reliable Wi-Fi access (70.6% vs 95% U.S., $p < 0.001$) and fewer owned other devices such as computers or tablets (32.1% vs 66% U.S., $p < 0.001$). While 75.2% reported at least basic proficiency with their devices, only 41.2% knew how to access their records, and just 23.9% had ever been taught how. By age group, smartphone ownership mirrored national rates ($p > 0.05$). However, only the youngest (18–29 years) and oldest (65+ years) groups had Wi-Fi access comparable to their US counterparts, with middle-aged groups showing lower levels.

Conclusion: Despite high smartphone ownership, significant gaps in digital literacy remain in underserved populations. These findings suggest smartphone-based digital health solutions could improve healthcare access, but tailored educational programs are needed to enhance digital literacy and empower patients to use electronic medical records. Future research should explore innovative strategies to reduce digital disparities and improve health outcomes in these communities.

Keywords: family medicine, telemedicine, digital literacy, healthcare literacy, digital divide, electronic medical record, health services accessibility

Introduction

Digital services in health care in the United States have evolved alongside other technological advancements to improve patient outcomes and increase efficiency of resource use.[1] The global pandemic of coronavirus disease 2019 (COVID-19) acted as a catalyst, accelerating the adoption of digital services such as telemedicine to continue to provide patient care while mitigating the risk of disease exposure for healthcare workers and patients.[2] Telemedicine has become increasingly prevalent in primary care clinics, utilized for services including hypertension management, mental health care, accessing medication lists, and reviewing prior labs and notes.[3,4]

SRFCs play an essential role in providing primary care health services to underserved communities. Clinics vary in composition, but typically include a combination of medical students, pharmacy students, and other healthcare students supervised by doctors, pharmacists, and other specialized professionals. These clinics often serve as primary care providers for those who lack access to traditional healthcare due to socioeconomic barriers and insurance status.[5,6] These

patients are more likely to live below the federal poverty line,[7] be unemployed, and speak English as a second language.[8]

The "digital divide" describes the lack of access to technology by groups of low socioeconomic status, older age, and racial minorities and may limit the adoption of the digital services in student clinics.[9,10] Although technology such as smartphones have become increasingly accessible, there are varied outcomes in studies evaluating the technological access and capabilities of low socioeconomic status patients. One study suggested that more than half of student clinics utilize telehealth successfully, while student clinics that did not utilize it due to internet or technology access challenges were more likely to serve the homeless or non-English speaking populations.[11] Another study suggests that smartphone ownership is still a continued disparity, with 24% of low-income households having no smartphone ownership.[12] Past research has indicated that patients with lower health literacy, defined as an individual's ability to obtain, process and comprehend health information needed to make informed decisions regarding their health,[10] were also less likely to own smartphones or utilize the internet. These findings underline the need for future digital interventions to address disparities and prevent the exacerbation of existing ones.[10,13] With the shift towards more digital healthcare in medicine, understanding the digital literacy and technological access of patients at student clinics is becoming increasingly essential.

In this cross-sectional study, we aim to evaluate the digital literacy and technological access of patients at a SRFC to evaluate barriers to digital health services. There are limited studies investigating technology use and capability among the uninsured patient population of SRFCs. Studies evaluating telemedicine in student clinics and lower socioeconomic patient populations

are varied and have been conducted prior to or during COVID-19. Our team hypothesizes that the percentage of patients at the SRFC who own a smartphone will not be significantly different from the United States population, with most patients reporting at least basic technological proficiency.

Material and Methods

A cross-sectional survey study was conducted at the SRFC from April 22, 2024, to May 31, 2024. All patients at the SRFC are uninsured and are urban area residents. Clinic patients >18 years old (yo) with the ability to consent to participate in the study were recruited to complete a survey collecting their age, smartphone ownership, other device ownership, access to Wi-Fi, capability of using their devices, knowledge of accessing their online medical records, and previous education about their online medical records. Basic proficiency was defined as the capability of using basic functions of a phone including phone calls, texting, internet searches, and use of pre-installed apps. Patients <18 yo or with significantly reduced cognitive capacity were excluded. No patients were excluded. To avoid bias such as belief that their answers would directly change their healthcare, patients were told that this was a population study and that no immediate changes will be made to their healthcare without having their direct input.

For data analysis, the power used to calculate the sample size was 0.80 with a minimum sample size of 70 patients. Over 5 weeks, the expectation was to recruit about 100 patients. Percentages of smartphone ownership, access to reliable internet, and at least basic proficiency in use of technology were calculated. A student t-test was used to compare the average age of a SRFC patient to that of the United States. A chi-square test was used to compare SRFC smartphone ownership and access to reliable internet to those of the average United States population. To take

age trends into account, patients were stratified by age groups (18-29, 30-49, 50-64, and 65+), and age-group comparisons for all categorical outcomes were conducted using chi-square tests. These age-stratified groups were compared to the United States matched population trends for smartphone ownership, access to reliable internet, and other devices owned.[14,15]

This study was approved and deemed exempted by the Institutional Review Board due to being categorized under anonymous survey collection. Written informed consent was obtained from all participants prior to data collection. Patients were first involved when creating the survey. A sample of 8 patients in the SRFC waiting room were asked how many questions they would be willing to answer to assess the burden of the time required to participate in research. More information was not given to avoid development of bias towards the study. Patients were not involved in developing other aspects of the design of the study nor in the recruitment or conduction of the study.

Results

During the collection period, 109 SRFC patients were surveyed with 93.5% of patients with Hispanic or Latino ethnic origins (Table 1). 82.3% of patients preferred Spanish for their medical appointments. The average age was 49.7 ± 11.6 yo, which is significantly older than the 38.8-year-old average age within the United States ($p < 0.001$).[14] The smartphone ownership percentage at the SRFC was 87.2, which was not significantly different than the 90% of the United States population ($p = 0.322$).[15] Only 70.6% of patients had access to reliable Wi-Fi, which was significantly less than the 95% of people in the United States population ($p < 0.001$).[15] Most patients did not own another device such as a computer, laptop, or tablet, with only 32.1% of

patients reporting access, which was significantly less than the 66% of the United States population ($p < 0.001$). However, 75.2% of patients, including those without a smartphone, report at least basic proficiency with the devices they own. Despite patients' technological proficiency and smartphone access, only 41.2% of patients knew how to access their medical records online with only 23.9% of patients ever taught how to access these records.

Table 1. Technology survey results and demographics of patients at the SRFC, compared to the United States population.

		n = 109	U.S. Population Value	**p-value**
Age (years old)		49.7 ± 11.6	38.8	< 0.001
Race	**Black (%)**	5.5	--	-
	Hispanic / Latino (%)	93.5	--	-
	Other (%)	1.0	--	-
English-speaking (%)		17.7	--	-
Smartphone ownership (%)		87.2	90.0	0.322
Other device ownership (%)		32.1	66.0	< 0.001
Access to Wi-Fi (%)		70.6	95.0	< 0.001
Basic Technological Proficiency (%)		75.2	--	-
Able to access online medical records (%)		41.2	--	-
Educated on accessing online medical records (%)		23.9	--	-

As seen in Table 2, patients were separated into 18-29 yo (n = 6), 30-49 yo (37), 50-64 yo (n = 51), and 65+ yo (n = 15) to stratify the results by age. English speakers ($p = 0.397$), other device ownership ($p = 0.952$), access to Wi-Fi ($p = 0.320$), technological proficiency ($p = 0.211$), ability to access medical records ($p = 0.296$), and prior education on their medical records ($p = 0.462$) were not significantly different across age groups. All age groups' (18-29 yo: 100.0%, 30-49 yo: 91.9%, 50-64 yo: 88.2%, 65+ yo: 60.0%) smartphone ownership was not significantly different than their matched groups in the United States (18-29 yo: 97.0%, 30-49 yo: 97.0%, 50-64 yo: 89.0%, 65+ yo: 76.0%).[15] However, smartphone ownership between patient age-groups was significantly different ($p = 0.012$). While access to Wi-Fi was not significantly different in the 18-

29 yo (100.0% vs 97.0%) and 65+ yo (73.3% vs 88.0%) groups, the 30-49 yo (73.0% vs 96.0%) and 50-64 yo (64.7% vs 88.0%) had significantly less access to Wi-Fi than the US population ($p < 0.001$).[16] Additionally, the 65+ yo group was not significantly different to their average-United States matched group (33.3% vs 40.2%) for other device ownership, but all other age groups (18-29 yo: 33.3% vs 89.6%, 30-49 yo: 35.1% vs 61.1%, 50-64 yo: 29.4% vs 60.3%) were significantly different ($p < 0.001$).[17]

Table 2. Age-stratified technological access and capabilities of patients at the SRFC with comparison to U.S. age-matched population values.

Age Group	English-speaking (%)	Smartphone ownership (%)	Other device ownership (%)	Access to Wi-Fi (%)	Basic Technological Proficiency (%)	Able to access online medical records (%)	Educated on accessing online medical records (%)
18-29 yo (n= 6)	33.3	100.0 p = 0.667	33.3 p < 0.001*	100.0 p = 0.667	83.3	50.0	33.3
30-49 yo (n = 37)	10.8	91.9% p = 0.069	35.1 p < 0.001*	73.0 p < 0.001*	86.5	40.5	18.9
50-64 yo (n = 51)	21.6	88.2% p = 0.861	29.4 p < 0.001*	64.7 p < 0.001*	68.6	47.1	29.4
65+ yo (n = 15)	13.3	60.0 p = 0.146	33.3 p = 0.588	73.3 p = 0.080	66.7	20.0	13.3
p-value (across age groups)	0.397	0.012*	0.952	0.320	0.211	0.296	0.462

*The p-values listed next to each age-group percentage represent comparisons between the SRFC age group and the corresponding U.S. population age group.

Discussion

In this cross-sectional study of 109 patients, 87.2% of patients owned a smartphone, matching the United States population. Although significantly fewer SRFC patients had access to reliable Wi-Fi, 94.6% of internet users access the internet using their mobile phones in the US.[18] All smartphones can access the internet, but data plans and extensive calls or videos can increase the financial burden on patients with lower socioeconomic status. One study reported that 44% of

smartphone owners with an annual household income of less than $30,000 have had to let their service lapse at least once due to financial reasons, compared to 23% of all smartphone users.[19] Thus, internet access may be a significant barrier to telemedicine appointments within student clinics. However, other digital services that do not require as much data such as accessing health records or lab results, health advice, hospital messaging and image sending to physicians, requests for refills, and services addressing social determinants of health may be more realistic to implement. With most patients reporting basic technological proficiency, there is potential to educate them on using devices to navigate health records, empowering their health decisions and incorporating digital services into their healthcare.

Additionally, only 41.2% of patients knew how to access their medical records online with even fewer people having previous education on accessing them. The lack of digital healthcare service outreach even after the digital shift during COVID-19 may be indicative of preconceived notions that lower socioeconomic status and uninsured patients do not have access to smartphones or the internet.[20–22] As a result, telehealth care and online medical record apps that utilize smartphones may not have been recommended, further exacerbating the healthcare disparities and digital divide. One related study suggested that providers were significantly less likely to offer patient portals and provide information on electronic health information to Hispanic as compared to white patients.[23] This SRFC study demonstrated that more patients were able to access their online medical records than those who received previous education, indicating that an educational initiative may be a helpful intervention to improve patients' access to their health records. A study on patient perspective documented that 73% of Hispanic patients believe that being able to access patient portals, particularly mobile versions, would improve their relationships with their

providers.[24] Building on these findings, it may be beneficial for SRFCs serving underserved populations to carry out language-specific workshops that build digital literacy skills. In addition, other interventions such as printing instructional guide booklets or one-on-one sessions with volunteers could tailor digital literacy education to specific populations. Reinforcing newly learned digital health skills with check-ins during clinic appointments can improve skill retention and build confidence. Finally, educating SRFC leadership and faculty on the importance of integrating digital health tools into patient care could help reduce bias and improve patient engagement with these tools.

This SRFC has an older population than the average United States population, likely due to multiple health conditions, more commonly in older populations, requiring increased treatment.[25] Although patients stratified by age continued to have similar smartphone ownership rates in the United States, there were significant decreases in ownership with increased age. This matches previous studies that found older patients were slower to adopt new technologies such as smartphones.[26] Additionally, access to Wi-Fi amongst the 18-29 yo and 65+ yo age groups of this study did not significantly differ from age matched groups in the United States. Knowledge of inexpensive Wi-Fi plans and access to spaces with free Wi-Fi may contribute to the youngest cohort's increased access. Although patients 65+ are the least likely to own a smartphone, their access to Wi-Fi and other device ownership is not statistically significant from the 65+ U.S. population. These findings are supported by one study that showed that although smartphone ownership is more common than other device ownership in the general population, tablets are as popular as smartphones in senior populations.[27] Additionally, one study found that grandchildren are a primary reason for older adults' initial tablet use, suggesting the adults 65+ may have familial

support that improves their access to the internet as compared to other older populations in our study.[28] A difference in preferred type of device ownership amongst senior citizens may potentially be contributing to the bimodal distribution. With significantly fewer non-smartphone devices compared to the general U.S. population in all age groups except 65+ year olds, digital interventions accessible through smartphones and tablets will be important while incorporating more telemedicine services in student clinics.

As a cross-sectional single-center study, the population is limited to patients within an urban area who had visited the SRFC during the collection period with mostly Hispanic/Latino and Spanish-speaking patients. Although this population is a representation of uninsured, low-socioeconomic immigrants in America, it may not represent other lower socioeconomic populations with different backgrounds. With conflicting studies on racial disparities in smartphone ownership, conducting this study in another location may be useful.[25,29]

The predominance of a specific language at the SRFC in this study brings to light the importance of designing digital tools that are both culturally and linguistically sensitive. Language can have a significant impact on the confidence of those using digital health tools. For instance, a non-English speaker may be less confident in navigating an English-only healthcare portal or not trust the information stated there if not in their preferred language. Designing digital health tools with cultural and language sensitivity in mind may increase digital health engagement and reduce disparities.

In addition, only technological barriers were assessed in the survey, which does not necessarily indicate patient adoption. Pivotal issues such as patient attitudes and trust in digital health tools remain scarcely studied. Exploring the trust of underserved clinic patients in using digital health tools, their willingness to use them, and their subjective views on how these tools can impact their care management will be important in guiding implementation. A future larger multi-center study would better assess the technological capabilities and barriers of lower socioeconomic patients at SRFCs and address potential concerns among underserved populations regarding data privacy, provider trust and navigating the healthcare system. Obtaining a greater grasp of these viewpoints can drive future interventions to be more culturally sensitive and personalized to patient needs.

This study shows that this underserved, uninsured, majority Spanish-speaking population has similar smartphone ownership prevalence compared to the US population, indicating the potential of expanding smartphone-based digital solutions to empower patients and enhance access to healthcare services in underserved communities. While smartphone ownership and internet access are high among the SRFC patients, additional barriers such as language inequity, infrastructure, and digital literacy remain important components to the complex issue. There is a need for education to be improved for healthcare tasks, such as accessing one's medical records online. Strengthening the digital literacy of SRFC patients can empower patients to take control of their healthcare, improving delivery and outcomes in these communities. Future research should continue to assess attitudes and perceived barriers in underserved SRFC communities, guiding the design of new interventions that foster engagement and trust in digital health systems. Investigation into this psychosocial dimension can drive innovative solutions that could reduce

252 healthcare disparities and improve outcomes by enhancing online healthcare access through digital
253 education outreach.

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