Integrating Telehealth into Chronic Disease Management - Original research article

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Exploring the impact of digital care delivery for patients with diabetes and hypertension: A longitudinal qualitative study

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Abstract

Background: Diabetes and hypertension disproportionately affect socioeconomically disadvantaged populations. Telehealth programs offer opportunities to improve access, engagement, and outcomes, yet little is known about patients' experiences or their impact on patient-reported outcomes. This study focuses on the OnCall Advanced Care (OCAC) program, a high-touch telehealth model that combines remote monitoring, nurse-led support, and 24/7 access to clinical staff. **Aim:** To identify the patient-reported outcomes of the OCAC program and assess whether participation improves patients' perceptions of diabetes and hypertension management over time. **Design:** Longitudinal, qualitative research design using semi-structured interviews. **Methods:** Patients diagnosed with diabetes and/or hypertension and enrolled in the program were recruited via text, letter, and/or phone. Three semi-structured interviews were conducted at around the time of enrollment, 3–4 months, and 6–9 months post-enrollment. Interviews lasted 30–70 minutes and were thematically analyzed. **Results:** Thirty-eight patients completed the first interview, 29 the second, and 18 the third. Five major themes emerged: *behavioral changes, access to care, health-related quality of life, knowledge of condition,* and *changes in symptoms and overall health*. Participants also reported improved self-management, increased medication adherence, and improved eating habits, as well as a reduced reliance on emergency departments and greater access to primary and specialty care. Over time, patients reported improved blood pressure and blood glucose control, weight loss, and increased confidence in managing their disease. **Conclusion:** Telehealth programs can have a positive influence on patient behavior change and health outcomes. This highlights the importance of further investigating telehealth implementation and patient-reported outcomes.

Keywords
telehealth, digital health, diabetes, hypertension, Medicaid, patient-reported outcomes

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1. Introduction

The prevalence of chronic conditions such as diabetes mellitus (DM) and hypertension (HTN) continue to rise in the United States (U.S.),[1] disproportionately affecting socioeconomically disadvantaged populations, particularly those enrolled in Medicaid programs.[2] Compared to individuals with Medicare or private insurance, patients insured with Medicaid often face greater challenges in both accessing healthcare and managing chronic conditions. This is in part because socioeconomic factors such as poverty, low health literacy, unstable housing, and discrimination, coupled with state and federal policies, can limit access to healthcare and make self-management difficult.[3]

In addition, for patients with DM and HTN, fragmented care coordination is a well-documented problem that further complicates disease management. The combination of social inequities and inadequate care coordination within the U.S. healthcare system creates an environment where those most at risk are often the least likely to receive the care and support they need. In response, telehealth has increasingly been utilized as a solution to address these disparities by enhancing access to care and support, particularly for Medicaid populations and individuals residing in rural areas, where geographic and socioeconomic barriers to care are particularly significant.[4,5]

2. Background

Telehealth programs have become more popular for managing chronic conditions like DM and HTN[6] because they can increase access to care, patient engagement, and improve clinical outcomes. According to the American Telemedicine Association (ATA), these programs provide services via telecommunications technologies, which can include synchronous or asynchronous communication and/or remote patient monitoring technology that is used by a healthcare practitioner at a different physical location than the patient.[7] These types of programs have been associated with significant reductions in blood pressure and HbA1c levels among patients with diabetes and hypertension, highlighting their capacity to improve disease control.[8–10] In addition to improving clinical outcomes, telehealth and online patient portals (e.g., MyChart) can also provide support for chronic disease management by extending access to care and by fostering patient-centered care,[11] through strengthening patient-provider relationships,[12] improving communication,[10] supporting self-management and empowerment,[13,14] and personalizing care to meet individual needs.[15] It has also been suggested that telehealth can address some of the longstanding problems that patients face accessing care in both rural and urban areas, such as transportation barriers, provider shortages, and limited mobility.[13,16,17]

However, the potential benefits of telehealth can be offset by limited access to high-speed internet, reliance on prepaid mobile phones, or a lack of digital literacy skills necessary to navigate telehealth platforms.[18,19] There are also concerns about privacy and confidentiality because some patients live in crowded households and may not have private spaces for sensitive medical conversations.[20]

Given the potential benefits and challenges of using telehealth to manage chronic disease within socioeconomically disadvantaged populations, most research to date has emphasized process measures and clinical outcomes rather than patient-reported outcomes (PROs) and patient experience. Nevertheless, PROs, which include a patient's own assessment of health status, symptoms, and their quality of life, can provide critical insights into the effectiveness of care delivery, patient engagement, and program improvement.[21,22] Moreover, PROs are not necessarily static and can change during different points of a patient's treatment trajectory. Despite their value, a recent review of research studies[23] found that only 48% of randomized trials testing digital health interventions for cardiovascular disease included PROs. Moreover, research on telehealth experiences has primarily centered on patients with private insurance, Medicare, or those living outside of the U.S. and limited evidence exists on Medicaid populations,[24] who face distinct socioeconomic challenges and health profiles in the U.S. Thus, while more objective indicators such as visit rates and clinical results remain essential, it is important to also focus on experiential data that captures how patients use, perceive, and benefit (or not) from telehealth strategies.

3. Study

3.1. Study aim

This study aimed to identify patient-reported outcomes associated with participation in the OnCall Advanced Care (OCAC) program and to assess whether participation in the OCAC program improves patients' perceptions of their diabetes mellitus (DM) and/or hypertension (HTN) management by describing time-specific patient-reported outcomes.

4. Methods

4.1. Design

This study employed a qualitative, longitudinal, descriptive design to explore patient-reported outcomes and to determine whether these outcomes changed over time. Investigators did not assign participants to the OnCall Advanced Care (OCAC) program or alter their clinical care, and all participants were already enrolled in the OnCall Advanced Care (OCAC) program as part of routine care. The longitudinal approach was selected because managing HTN and DM often requires behavioral changes and an increase in knowledge before any physiological improvements occur. Consequently, patient-reported outcomes may vary at different time points. We aimed to document these potential changes by interviewing patients shortly after enrollment, at 3-4 months, and then again at 6-9 months after enrollment. This approach can minimize the recall bias common in cross-sectional study designs. The topics for the three semi-structured interviews along with the analytic approach were developed based on a review of the chronic disease management and telehealth literature, the SPROUT Telehealth Evaluation and Measurement Framework (STEM)[25] and the programmatic priorities of the OCAC program. The reporting of this study followed the Consolidated Criteria for Reporting Qualitative Research (COREQ).[26]

4.2. Setting

OnCall Advanced Care (OCAC) is a telehealth program that serves patients with chronic, complex diseases. It is designed to assist these high-risk patients in better managing selected chronic conditions such as hypertension, diabetes, heart failure, asthma, and chronic obstructive pulmonary disease by providing 24/7 access to virtual care, remote patient monitoring, and coupled with regular (sometimes weekly) nurse phone visits. Upon enrollment, patients receive a comprehensive care kit, which includes a tablet and home monitoring devices specific to their disease condition.[27] Patient data are transmitted via Bluetooth peripheral devices into the patient's electronic health record (EHR) using a third-party vendor interface system. The data also trigger warnings (alerts) for the OnCall staff if values for vital signs or other readings are outside of preset ranges. Patient-reported symptoms may also trigger an alert. Staff are available 24/7, and regularly scheduled calls from nurses to patients occur twice weekly or as deemed necessary by program staff and patients. The team consists of a physician, advanced practice nurses (APRNs), registered nurses (RNs), pharmacists, dieticians, clinical counselors, and digital health navigators who assist with a full range of healthcare concerns. Patients' eligibility is determined by insurance type and risk stratification, which involves assessing patient disease severity and utilizing an internal risk algorithm. Patients are also screened by program staff for suitability for the program (e.g., do not have a current substance abuse problem). Nurses coordinate care appointments virtually with advanced practice providers as part of the program. Additionally, care co-ordination with primary care and specialty providers is managed by OCAC staff. For more information about program development, see Klein et al.[27]

4.3. Recruitment

A purposeful sampling strategy was used to identify patients for the research study. In the first year of the study (November 2022-November 2023), eligible patients received a recruitment letter via postal mail, followed by a phone call approximately ten days later. In the second year (December 2023-December 2024), a digital outreach process was implemented to improve patient recruitment, enhance tracking, and better connect study participants with their medical records. This process involved sending patients a recruitment text after program enrollment, which included information about a stipend for their time, followed by an automated reminder two days later. A member of the research team then contacted patients who replied "yes" to the text message asking if they were interested in participating. In total, 144 patients were contacted (94 via a recruitment letter accompanied by a phone call and 50 via text only). Forty of them answered their phone, and 38 agreed to participate. Recruitment ended after data saturation was achieved.

4.4. Inclusion and exclusion criteria

Eligibility was determined based on enrollment in the OCAC program within the past 30 days and whether the patient had been diagnosed with HTN, DM, or both. Eligibility for the interviews was limited to HTN and DM patients because they represent the largest part of the population of patients served by the program and because HTN and DM often co-occur. Patients were excluded if they could not speak English. In addition, since rurality has been shown to impact the management of chronic conditions,[28] patients' Rural–Urban Commuting Area Codes were also used to select patients from metro and nonmetro areas in one U.S. state.

4.5. Data collection

Participants were interviewed up to three times for 30-70 minutes. The interviews were conducted using semi-structured interview guides (Supplemental Table 1). The first interview was conducted within six weeks of enrolling in the program, the second after 3-4 months, and the third between 6 and 9 months after enrollment. The interviews were conducted via phone or Microsoft Teams. The interview guides covered a range of topics, including illness narratives, disease management, experiences with and use of the program, health literacy, social drivers of health, health concerns, and changes in health status (Table 1). The research team met to refine the interview guides after the first five interviews were completed to improve clarity and alignment with study aims. See Supplemental Table 1 for sample interview questions.

4.6. Ethical considerations

This research study was approved by the University of Illinois College of Medicine Institutional Review Board (IRB)-1, Peoria, Illinois (#1876230). A waiver for documentation of informed consent was granted by the IRB as the study protocol met federal regulatory requirements. All participants were informed about the study's goals and confidentiality, verbally consented to participate before enrolling, and received a $20 gift card as appreciation for their time.

4.7. Analytic strategy

The interviews were recorded using Microsoft Teams or via telephone with an audio recorder, and the recordings were transcribed verbatim. After each interview, interview summary sheets and notes were composed and uploaded into NVivo 14, a qualitative data analysis program. Transcripts, notes, and interview summaries were de-identified and inductively coded using a constructivist approach, following the process for reflexive thematic analysis developed by Braun and Clarke.[29] This method includes multiple steps: familiarizing oneself with the data, generating codes, combining codes into themes, reviewing the themes, determining the significance of the themes, and reporting the findings. Members of the research team initially coded their transcripts and interview summary sheets independently. Although the analysis was inductive, the STEM framework, which conceptualizes the relationships among telehealth engagement, self-management behaviors, and patient-reported outcomes, informed the interpretation of patient-reported outcomes. After the first three interviews were coded, the team met to discuss the codes and findings. From the meetings, a detailed codebook was created and continuously updated in tandem with the data analysis and collection (Supplemental Table 2). Throughout this process, analytic memos were utilized to document coding decisions, emerging themes, and interpretive insights.[30] These memos served as an audit trail and an analytical strategy, thereby enhancing the reliability of the findings. Upon finalizing the codebook, all the transcripts were recoded, and the themes and subthemes were organized by interview period.

Themes were also analyzed by interview time point and summarized using descriptive frequencies to support temporal interpretation of patient-reported outcomes.[31] Thus, subthemes, including 'no change' were retained to capture the specific PROs (both positive and negative) within each of the major themes which could be clinically or pragmatically important over

Table 1. Sample interview topics for participants enrolled in the OnCall Advanced Care program by interview.

	Interview 1 Enrollment	Interview 2 3 Months	Interview 3 6-9 Months
Sample Topics[a]	Benefits Care preference Concerns Goals/expectations Health literacy Illness narrative Learnability/accessibility Outcomes Patient experiences SDoH[b]	Barriers to care Care transitions Concerns Disease management Health literacy Illness narrative Outcomes Patient experiences SDoH Social intrusiveness	Disease management Health literacy Illness narrative Outcomes Patient experience Reflections on program SDoH

Note.[a]These are sample topics covered in the interviews and are not inclusive of all the topics covered.
[b]SDoH= social drivers of health.

time. Data collection and analysis were conducted concurrently, and data saturation, the point where no new themes emerged, occurred after the recruitment of 30 participants.

Demographics and sample characteristics were gathered through an internal worklist and data orchestration platform that tracks program enrollment. Demographics were calculated using descriptive statistics. In addition, the Charlson Comorbidity Index (CCI), which predicts 10-year survival for patients with multiple comorbidities,[32] was calculated using data from participants' electronic medical records to describe the health of the study participants. The index ranges from 0 to 10, with a higher score indicating a greater burden of comorbidity and a higher risk of mortality.

4.8. Reflexivity and study rigor

The research team consisted of two advanced practice registered nurses, two Doctor of Nursing Practice (DNP) students, and one medical anthropologist. Thus, the team members have diverse clinical and academic perspectives (e.g., faculty, students, and administrators), which enhances the data collection and analysis. We recognized that our professional identities and previous experiences could influence the research process. To address this, we engaged in continuous reflexive practice to examine how our positionalities affected data collection, analysis, and interpretation, following the guidelines outlined by Braun and Clarke.[29] Two team members with extensive qualitative research experience (MD and CK), provided instruction, guidance and training for the DNP students prior to their interviews with patients. Training encompassed informed consent processes, interview strategies, data collection, transcript cleaning, NVivo software use, and data analysis. To ensure interview quality, team members reviewed each other's interview transcripts and provided feedback on the interview techniques used. In addition, after reviewing the transcripts, participants were asked clarifying questions in subsequent interviews. To improve analytic rigor, team members also independently coded transcripts and then discussed them in group meetings. Regular meetings were held throughout the coding phase to review, revise, and refine the code structure until consensus was reached. Initial findings were shared with program staff, and feedback was used to guide future interviews.

5. Findings

5.1. Participant characteristics

Overall, 38 individuals completed one interview, 29 completed two, and 18 completed three interviews, respectively. Out of 38 participants (23 females and 15 males), 34 had hypertension (HTN), 33 had diabetes mellitus (DM), and 31 had both conditions. Detailed information on participant characteristics can be found in Table 2.

5.2. Themes

Analysis of the transcripts identified five major themes (*Behavioral Changes, Access to Care, Changes in Symptoms and Overall Health, Health-Related Quality of Life,* and *Knowledge)* along with 28 subthemes (Table 3). All themes and subthemes are presented to illustrate the specific patient-reported outcomes reflected within each major theme; however, some subthemes with shared characteristics are described together.

5.2.1. Behavioral changes

The first major theme has nine subthemes and describes the behavioral changes participants reported following their enrollment in the OCAC program, illustrating the specific changes they made. These include adjustments in diet, healthcare utilization, self-management strategies, and adherence to treatment programs. Participants noted improvements related to the program and recognized its effectiveness in encouraging healthier lifestyles. At the same time, there were instances where some individuals felt that they had not made any changes or did not intend to make any.

5.2.1.1. Self-management routines and adherence behaviors. Subthemes in this section include frequent monitoring, development of routine, and improved medication use. Participants frequently described changes in how they monitored their health, took medications, and structured daily routines. Before enrollment, many participants frequently mentioned that they did not consistently measure their blood pressure and/or blood glucose levels for various reasons (e.g., forgot, did not consider it important, or lacked access to necessary equipment). However, after enrollment, participants noted changes in how often they monitored their health metrics, including blood pressure, blood glucose levels, weight, and hemoglobin A1c. Many expressed that this increased frequency of monitoring allowed them to stay more informed about their health status.

Table 2. Participant sociodemographic and clinical characteristics (N=38).

Category	Subcategory	n	%
Gender	Female	24	63.2
	Male	14	36.8
Primary Provider	OSF	28	73.7
	FQHC	9	23.7
	Unknown	1	2.6
Marital Status	Married	13	34.2
	Divorced	11	28.9
	Single	9	23.7
	Not available	3	7.9
	Legally Separated	1	2.6
	Widowed	1	2.6
Patient Race	White or Caucasian	28	73.7
	Black or African American	7	18.4
	Not available	3	7.9
Patient Ethnicity	White/Caucasian non-Hispanic	27	71.1
	Black/African-American non-Hispanic	7	18.4
	Not available	3	7.9
	Hispanic/Latino	1	2.6
Primary Diagnosis	Hypertension (HTN)	34	89.5
	Diabetes Mellitus (DM)	31	81.6
	HTN and DM (both)	28	73.7
CCI Group (score ranges)	1–3	23	60.5
	4–6	6	15.8
	7–9	6	15.8
	Not available	3	7.9
Age Group (years)	35–50	11	28.9
	51–65	20	52.6
	66–80	4	10.5
	80+	0	0.00
RUCA			
	Metropolitan	22	57.9
	Non-metropolitan	11	28.9
	Not available	5	13.6

Note. CCI= Charlson Comorbidity Index. The index ranges from 0 to 10, with a higher score indicating a greater burden of comorbidity and a higher risk of mortality. RUCA= Rural-Urban Commuting Area Codes.

Table 3. Major Themes and subthemes identified in the qualitative analysis of the OCAC program participants.

Major Themes	Subthemes
Behavioral changes	frequent monitoring, improved medication use, nutritional changes, positive exercise changes, use of healthcare, development of routine, hospital or ED admissions, other changes, no behavioral change
Access to care	access to medical information, access to primary care, access to specialists, medication changes or access, limited access to care
Changes in symptoms and overall health	blood pressure control (hypertension), HbA1c blood sugar levels (diabetes), improved weight management, other health improvements, no symptom/health changes
Health-related quality of life	increased feelings of support, more independence, reduced caregiver burden, reduced stress level, sense of accountability and control, no HRQoL improvement
Knowledge	improved knowledge of condition, overall health literacy improvement, no improvement in health knowledge

Note. This table presents themes and subthemes identified through qualitative analysis of participant interviews in the OnCall Advanced Care program. See Supplemental Table 2 for a detailed description of each of the themes.

> I'm [now] taking my blood pressure every day and putting it on the tablet, and I take a look at my finger [blood sugar reading] every day so you can make sure it's down there where it should be, and when it's a bit too high or too low. They call me and make sure everything is OK, so that helps out a lot. (P2, DM/HTN, Interview 2)

The program's daily prompts and regular nurse check-ins supported the improved medication adherence. For instance, some participants mentioned that they historically did not take their medications due to barriers such as forgetfulness or a lack of knowledge about their health. However, the check-ins and the phone calls from program staff helped them remember to take their medication as prescribed.

> [I] stick with it… I mean, it takes time, and you get into a routine [using the program], so to say, you know, I get up, I do my medicines right away now, I give it a few hours, you know." (P1, DM/HTN, Interview 3)

5.2.1.2. Lifestyle and health behavior changes. This section presents subthemes related to nutritional changes and positive exercise changes. Participants described modifying food choices, reducing salt intake, adjusting portion sizes, and trying to exercise more. For example, participants in the program noted that it helped them improve their eating habits (e.g., timing and portion sizes) and encouraged them to make more thoughtful food choices. As one participant reflected,

> "You know… I backed off the salt now. I don't add extra salt… I buy 'low-sodium' when it's available." (P1, HTN, Interview 2)

Another patient mentioned,

> It's easier when I can keep track of a pattern that says, Oh, you're doing good today, or you're a little high today, because I'll be like, OK, that means I just got to change my meals for the rest of the day. You know, get those numbers down again, down from where I [I'm] at. If they were like in the 200, 250 to 300, I'm like, OK, that's it. So, much for eating this, we're going to make a meal, it's going to be this and that, that's exactly how it goes down. (P15, DM/HTN, Interview 2)

Participants also reported increased physical activity, whether through doing more household chores, walking, or other small to significant lifestyle changes that they were encouraged to make. Improvements were linked to both increased motivation and better overall health, which allowed them to be more mobile.

> So in the past, I'd say six months, I just started exercising again. I've been able to figure out what shoes work best, and I always have to have shoes on. It just took me a while to figure out what doesn't hurt my feet. That's the easiest way to put it. So I started exercising again, and I think that's what changed... (P19, DM/HTN, Interview 1)

Additionally, some patients reported that they or their caregivers were also instructed to go to the hospital.

> Yeah, yeah, it was, I think, two or three weeks. I was on....on the program and it was… Saturday or Sunday that they [OCAC]… called my phone and my wife answered my phone in [sic] and she told them that, you know, I had been sleeping all day and wouldn't wake up. So that, that's when they told her to call the ambulance and get me in. And she took my fever…and I had a fever about 103.8. (P25, DM/HTN, Interview 1)

5.2.1.3. Healthcare use and care-seeking behaviors. Participants described experiences related to hospital or emergency department admissions and use of healthcare. As part of the program, patients can also receive appointment reminders, assistance with scheduling, and encouragement to visit their primary care provider as needed. Some patients who had trouble remembering appointments, disliked attending them, or failed to schedule them reported that participation in the program helped them remember and follow through with in-person clinic visits.

> I was at home with diabetes because I used to miss a lot of appointments, because I forget about them, because I live on nothing hardly and better for me, I don't have to go to them. They reached out to me. (P9, DM/HTN, Interview 1)

In addition, some individuals also mentioned that they found it challenging to decide when to visit the emergency department (ED). As a result, patients either sought care unnecessarily or delayed seeking it altogether. However, after enrolling in the program, they received guidance on when to go and when not to go to the hospital.

> When I first started the program, it was like a daily thing. I was talking on the phone. I was constantly being sent to the hospital, but that's not the issue anymore. So now I just send my vitals in and they call me on Friday. We have a little chat [about my health] and I'm done. (P10, HTN, Interview 2)

5.2.1.4. No changes. At different stages of the program, some participants felt they had already made as many adjustments as possible and could not realistically make further changes to their daily routines, highlighting the limits of behavioral change.

> No, I'm not going to change my diet any more than I already have. I mean, I love sugar, but I've cut it almost completely out. I'm not going to give up my fried food, though. (P3, DM/HTN, Interview 1)

5.2.2. Access to care

The second major theme comprises five subthemes, referring to the various ways in which the program affected patients' access to care. Participants reported that the program increased their access to medical information, primary care, specialists, and needed medications. This ease of access was beneficial for patients in both rural and urban areas, as they face slightly different barriers, allowing them to connect directly with a healthcare provider.

5.2.2.1. Access to clinical services. This section encompasses subthemes related to access to primary care and access to specialists. Participants described how the OCAC program improved their ability to connect with healthcare providers, including registered nurses, advanced practice providers, and specialty services. Many reported that virtual visits, facilitated referrals, and scheduling support reduced delays and barriers they had previously encountered. For instance, some participants reported that the OCAC program has improved their access to timely and effective care through providing virtual visits with RNs and APRNs, phone consultations, and prescription services, which have streamlined the process of accessing healthcare. Participants reported that this approach has alleviated some of the historic challenges that they have faced in reaching healthcare providers, particularly when traditional office hours are inconvenient. One participant explained that she rarely went to her primary care provider [PCP] to help her manage her DM/HTN because of her work schedule; however, the flexibility of the program alleviated some of those barriers.

> Having to go to the office [for primary care], wait 15, 20, 30 minutes, when I had to shut down my daycare to go to the doctor, and not get into the doctor I know. I mean, I know my doctor's appointment isn't going to be on time, but that's the first thing I learned when I had to start going to the doctor back in 2005, but it has just gotten worse over the years. So anyway, I would rather do certain things at home [have a virtual visit]. (P19, DM/HTN, Interview 1)

In addition to primary care, patients reported having more timely access providers in various specialties, including dieticians and mental health professionals, which might have been difficult before. As one patient explained,

> When my doctor [PCP] would send a request to somebody like....and the appointment was like two months away. Well, by that time, I had already ended up at the hospital for it… Well, with the [OnCall] I seem to get in faster [to specialists]. (P22, DM/HTN, Interview 2)

5.2.2.2. Access to health information and medications. This subsection describes subthemes related to access to medical information and medication changes or access. Participants in the program reported improved access to health information through digital tools and communication with staff, which reduced the need for repeated phone calls and enhanced understanding of their care. Others described how program staff assisted with medication adjustments, prescription coordination, and insurance-related barriers. Participants also noted that the program reduced the need for phone calls to their doctors and facilitated more efficient communication with healthcare providers.

> I would say more access to medical information is helpful. I don't really have to call in anymore; if I need information, it could all be in one place where I can just say I need information on… (P10, HTN, Interview 2)

Closely related to the increased access to medical information, the OnCall RNs were also willing and able to take the time to help patients make informed decisions.

> I thought maybe, you know, we did it together in discussion [make a medication change]. You know, we discussed it, and it's something I was curious about because I have known people who have had good results from it [medication]. And I just thought

> maybe what my thought, you know, where is my problem trying? Like, you know, I don't know. I'm just trying to [do] stuff. So we did it, and she got it for me…. (P5, DM/HTN, Interview 2)

Furthermore, they also worked with the patient and the insurance company to find a medication that was covered, thus increasing their access.

> I called a couple of times about a prescription that didn't get filled because of my insurance, and I guess one of their [OCAC] pharmacists called and had it changed over to one that my insurance would cover? So, they got it [medication] ... (P20, DM/HTN, Interview 1)

5.2.2.3. No changes in access to care. The only circumstance in which participants reported no improvement in access to care was when they traveled out of state, which occasionally occurred because of the proximity of many participants to another state. In these cases, medical care could not be provided, and some participants expressed frustration at the lack of continuity.

> I got upset with her [the nurse]… I had issues, and I talked to her, but I was out of Illinois and in Wisconsin, and she told me she could not help me. She said I had to go back to Illinois to talk to her, and I said, 'OK, I am in Wisconsin—how am I supposed to get back to Illinois?'" (P2, DM/HTN, Interview 3)

5.2.3. Changes in symptoms and overall health

Throughout the interview phases, changes in the participants' reported symptoms and overall health were assessed. This theme focuses on the health changes attributed to patient involvement in the OCAC program. These collective findings illustrate the positive health transformations reported by participants.

5.2.3.1. Perceived changes in cardiometabolic health. Participants reported perceived changes related to hypertension and diabetes management, including blood pressure, blood glucose levels, and weight. Several reported achieving blood pressure targets of less than 140/90 mmHg during their program. Blood pressure medications were reported to be titrated to a lower dose or discontinued because of the improvements resulting from the OCAC program. At the second interview phase, one participant who struggled to maintain stable blood pressure reported

> She [OCAC nurse] was very impressed with how good my blood pressure was going. (P17, DM/HTN, Interview 2)

In addition, participants mentioned that their blood pressures had improved, with some successfully weaned off hypertension medications.

> I am getting better, so I don't need it [blood pressure medication] as much anymore. They [OCAC] do check up on me and I still send my vitals, but I don't really need that so much now." (P10, HTN, Interview 2)

The program also played a vital role in enhancing glycemic control, as participants reported reductions in blood glucose levels.

> Well, my blood sugars have been doing really good... I don't take insulin anymore. I just take a pill now. (P31, DM/HTN, Interview 2)

Finally, some participants reported weight loss during their second and third interview, as a result of a better diet, increased exercise, and improved diabetes management.

> I went from 304 [pounds] to I think I'm now down to like 285 [pounds]. (P18, HTN/DM Interview 3)

5.2.3.2. Other health improvements. A few participants reported other health improvements, including an overall increase in their feelings of well-being and vitality.

> I felt fatigued all the time, but now my blood oxygen level is in the low 90s. I'm getting more energy now; I have more energy, and I'm not confused as much anymore. (P25, HTN/DM, Interview 1)

Others reported how participation reduced their symptoms, improved their mental health, and just generally made them feel better.

> I feel fabulous and wonderful. I don't feel dreadful anymore. (P5, DM/HTN, Interview 3)

5.2.3.3. No changes. A few participants reported that their health problems had not changed since entering the program. Notably, those who mentioned little to no improvement in weight, HbA1c, or blood pressure did so only during the first or second interviews.

> I couldn't be more heartbroken than a Cubs fan ever would be. And I mean, I was just like—it was the exact same number [weight] that I had before. It hadn't moved up or down a pound. This is ridiculous, you know? (P15, HTN/DM, Interview 2)

By the third interview, however, participants who reported no changes tended to emphasize long-term chronic health conditions outside the program's focus, rather than their hypertension or diabetes. The lack of people who reported *no changes* may also reflect selective attrition, as individuals who felt the program was not beneficial may have already withdrawn.

5.2.4. Health-related quality of life (HRQoL)

This major theme consists of six subthemes that explore the impact of the program on health-related quality of life changes for patients and caregivers. It identifies various outcomes, not typically associated with healthcare interventions, including a reduced burden on family and caregivers, increased feelings of support, an enhanced sense of accomplishment, greater independence, and a stronger sense of control over one's life.

5.2.4.1. Psychosocial and emotional impacts. This section presents subthemes related to increased feelings of support and reduced stress levels. Participants frequently described emotional benefits associated with program participation, including feeling less isolated, more reassured, and more supported in managing their conditions. As one patient explained,

> To start, because I'm really ill and I have the problems… I don't feel like I'm alone... If something happens, I can reach out and talk to somebody... I didn't have that option before. (P6, DM/HTN, Interview 1)

Other participants described the support in terms of what the staff did to help them.

> It's just nice to have someone who's on top of every aspect because I mean, you have all these different doctors while they are on top of just the thing that they're treating. And now I have somebody who has it all in front of them. And so, they can, you know, see the whole big picture and notice when you know a problem is happening. (P8, DM/HTN, Interview 2)

Moreover, patients explained that having that type of support, reduced their stress and improved their day-to-day life.

> My stress level is down because I'm not worried about it... With this program, I know what it is [HbA1c levels]. And if I feel something that I haven't felt before, I call them, and they are right there... I used to sit here and every little twinge [panic]... More than likely, it's just anxiety. (P30, DM/HTN, Interview 3)

5.2.4.2. Independence, control, and changing care roles. This section presents subthemes related to more independence, sense of accountability and control, and reduced caregiver burden. Participants described greater confidence in managing their health, increased independence in daily activities, and a stronger sense of personal responsibility for their care. As one patient explained,

> I'm not like I was before. Well, constantly fighting between my heart and my lungs. And I'm able to get up and move around a bit. Even though it's not far, it's enough. So, I could be happy enough to get around. (P6, DM/HTN, Interview 2)

Caregivers of participants also reported a reduction in their caregiving burden due to the support provided by the OCAC program. One participant shared a critical incident where he had become seriously ill, and his wife contacted OCAC. The program responded by dispatching an ambulance, ultimately saving his life. For both the participant and his spouse, having this level of support was reassuring.

> It gave me peace of mind and gave my wife and family a little more at ease that somebody was monitoring me 24 hours a day. (P25, DM/HTN, Interview 2)

Others noted that the daily check-in reminders and 24/7 monitoring alleviated some of the responsibility of remembering and tracking health information by their spouses and children. By helping participants better manage their chronic conditions, the program has also contributed to lowering stress levels among caregivers.

Additionally, the regular check-ins and support from the OCAC staff supplied ongoing encouragement for participants and their caregivers to remain engaged in their care.

> Definitely learn to be more accountable when it comes to monitoring my health and to pay attention, you know, when I'm not feeling that great and see, you know, usually if I'm not feeling that great, then I'll take my vitals to make sure they're not, you know, crazy out of whack or anything. (P1, HTN, Interview 2)

5.2.4.3. No changes. One participant explicitly stated that the program did not improve her HRQoL. Instead, she felt it was unresponsive to her needs, increased the complexity of managing her health, and ultimately provided no perceived benefit. Explaining why she discontinued participation, she noted,

> I know I didn't personally have a problem with the people I interacted with. It was that the whole program I felt wasn't focused on the health, but I felt the health care that I needed and I felt like it was a double duty. You know, it was like, I call them, they call my doctor, they call me back instead of me just calling the doctor to make an appointment, like I had to go to the doctor to get an appointment with the doctor. And I didn't see any benefit. I didn't. I didn't feel like they helped me because I needed help with my blood sugar. (P21, DM/HTN, Interview 2)

5.2.5. Knowledge of condition

The fifth major theme includes three subthemes that capture the growth in participants' understanding and self-management of their chronic conditions throughout their involvement in the OCAC program. This theme tracks explicitly any changes in the participants' knowledge of DM, HTN, lifestyle, or medication use. As participants gained a deeper understanding of their conditions and how to manage them, they reported increased confidence in their ability to handle their health.

5.2.5.1. Improved knowledge of condition and health literacy. This section presents subthemes related to improved knowledge of condition and overall health literacy improvement. Participants described gaining a clearer understanding of diabetes and hypertension, including how to interpret blood glucose and blood pressure readings, how lifestyle behaviors influenced their conditions, and how medications functioned in disease management. As one explained,

> I'm more aware it makes me more aware because, you know, sometimes you get so busy… (P16, HTN, Interview 3)

Participants reported an improvement in their overall healthcare knowledge, including a greater understanding of specific dietary choices and the impact of physical activity on their conditions, through participation in the program.

> Like, for instance, like some people might say. Well, I never knew how to do carb counting, or I didn't really understand what my A1c, you know, meant…[Now I can say] Wow, that was an really interesting thing that I learned, or that makes a lot of sense. That's very important for me. (P32, DM/HTN, Interview 3)

5.2.5.2. No improvement in health knowledge. In some instances, patients were not able to describe previous conversations about their condition management and if their health-related goals were being met. For example, in this third interview, the patient's response to meeting a goal over the past nine months was affirmative, but without recalling what was learned or met.

> Yeah, pretty sure I am. Nobody says I haven't. They said I'm doing really good. No, I can't remember [the goal]. (P29, DM/HTN, Interview 3)

5.3. Patient reported outcome changes over time

To account for changes over time in PROs, the themes and subthemes reported were organized by the interview in which a participant mentioned them, with negative cases (i.e., no change) removed to facilitate measuring the changes. Figure 1

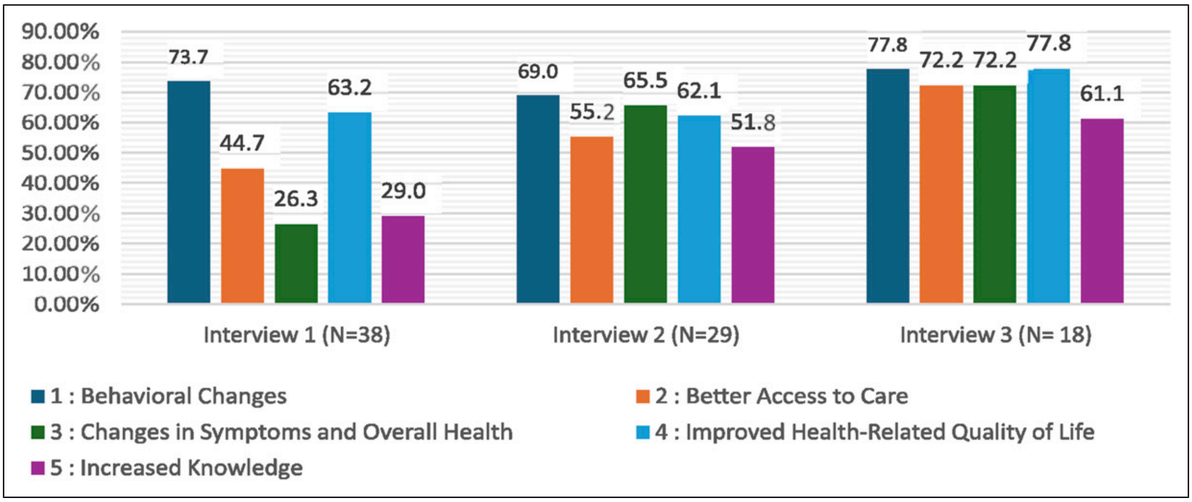

Figure 1. Percentage of respondents reporting positive changes in major themes by interview number.
Note. The number of participants varies between interviews due to study attrition over time.

illustrates the percentage of participants who reported the major themes during each interview. Overall, the frequencies suggest positive reported changes across all five major themes and time periods. Of note, a high percentage of participants reported *behavioral changes* across all interviews, with the highest in Interview 3 (77.8%), suggesting that behavioral changes were a common outcome throughout the program. There was also an increase in the theme *access to care* between Interview 1 (44.7%) and Interview 3 (72.2%), suggesting that the program might also positively influence perceptions of access to care over time. While still showing improvement, the percentages for *knowledge of condition* were relatively lower compared to other categories, ranging from 28.9% in Interview 1 to 61.1% in Interview 3. This might suggest that while knowledge increased, it was not as prominent as the other changes reported to have resulted from program participation.

Table 4 presents the percentage of respondents reporting the various subthemes across three interviews (both positive and negative), organized by the theme frequencies that increased by over 10% between Interview 1 and 3, those that changed by less than 10%, and those that decreased. Notably, the most frequently reported subthemes, *increased feelings of social support* and *monitoring*, did not vary significantly between the interviews, suggesting their continued importance to the participants. The biggest positive change in the theme frequencies between the first and third interviews was observed in the

Table 4. Patient reported subthemes by interview time.

	Percentage of respondents reporting subtheme		
	Interview 1 (N=38)	Interview 2 (N=29)	Interview 3 (N= 18)
Subthemes increase by more than 10%			
Medication changes or access	21.1	41.4	61.1
Health literacy improvement	23.7	37.9	55.6
Blood pressure control (Hypertension)	7.9	34.5	50.0
HbA1c (Diabetes)	10.5	48.3	39.0
Nutritional changes	18.4	51.7	44.4
Access to primary care	21.1	20.7	33.3
Access to specialists	13.1	31.0	27.8
Development of routine	13.1	17.2	27.8
Other changes	0.0	6.9	22.2
Other health improvements	5.3	20.7	16.7
More independence	5.3	13.8	16.7
Subthemes decrease by more than 10%			
Medication use	26.3	31.0	11.1
No behavioral changes	26.3	6.9	11.1

Note. Only subthemes whose frequency changed by more than 10% between the first and third interviews are included. These changes are not statistically significant.

subthemes related to *medication changes or access, health literacy improvement, nutritional changes, blood pressure control (hypertension),* and *HbA1c (Diabetes)*. This suggests that some patients believe the program enhances their access to care, increases their knowledge, and improves the management of their diabetes and hypertension over time. Conversely, the most significant decreases were observed in *medication use* and *no behavioral change*, which could indicate that patients started taking their medications more frequently at the start of the program, and by interview three, the change was not as memorable or that they were not making any additional changes. Additionally, there was a decrease over time in the percentage of people reporting *no behavioral change*, suggesting that as individuals progress through the program, they start or continue to modify their behaviors to better manage their health (Table 4).

6. Discussion

This longitudinal qualitative study explored patient-reported outcomes (PROs) among Medicaid patients with diabetes and hypertension enrolled in the OnCall Advanced Care (OCAC) program. While telehealth is increasingly used for chronic disease management, few studies have examined its impact on Medicaid populations within the U.S., who often face disproportionate socioeconomic and structural barriers to care.[33] These barriers, including limited insurance coverage, access to reliable internet, and health literacy, can affect their use of and outcomes associated with telehealth programs. By focusing on patients' experiences over time, our results illustrate how digital health programs can enhance access to healthcare, promote behavioral change, and improve self-management, as described in detail below.

6.1. Access, behavior, and health changes

As other studies have highlighted, navigating the U.S. healthcare system can be very difficult for low-income adults. For instance, participants frequently contrasted their experiences in the OCAC program with prior encounters with traditional, in-person care, which they described as fragmented, delayed, and difficult to navigate. These findings align with a growing body of evidence suggesting that telehealth healthcare programs can reduce structural barriers, travel costs, and improve access to care, particularly for individuals in rural and underserved areas.[13,16,34] However, these improvements were not uniformly experienced by patients within our study. Limited health insurance coverage, digital literacy gaps, care fragmentation outside of the health system, and out-of-state policy restrictions sometimes hindered their access. In addition, although some obstacles to accessing care were mitigated, patients still reported difficulties finding specialists and obtaining their prescriptions. These findings highlight that while telehealth programs can improve access, they are unable to overcome all of the barriers that people face.

The OCAC program's emphasis on education, routine monitoring, and individualized support also fostered meaningful improvements in patients' knowledge, health behaviors, and self-management skills. Interestingly, some participants described their healthcare in terms of a transition from episodic care, when they were sick, to the development of self-care routines that supported improved nutritional choices, increased physical activity, and better medication adherence. According to participants, it was the OCAC's regular digital check-ins and friendly staff reminders that encouraged participants to change their health behaviors and take more ownership of their own care. These findings are similar to those of Ezeamii et al.,[16] who, in a systematic literature review, found that telehealth programs can enhance patient engagement, improve health literacy, and improve management of chronic disease. Other research, focusing on nurse-led telehealth and motivational interviewing, has demonstrated some positive success in improving medication adherence and activity behaviors as well,[35,36] thus lending support to our findings.

Patients also described perceived improvements in their hypertension and diabetes control, including self-reported reductions in blood pressure, HbA1c levels, weight loss, and, in some cases, decreased medication use. For example, many participants reported achieving blood pressure targets (<140/90 mmHg), with some reducing or discontinuing antihypertensive medications as their control improved. Several participants also reported weight loss and increased energy. While these outcomes were self-reported and not verified by their healthcare provider, they align with prior research demonstrating the clinical effectiveness of telehealth in managing chronic diseases.[8,37] Moreover, self-reported patient metrics such as blood pressure are reliable.[38] Our study explored program effectiveness from the patient's viewpoint, illustrating how patients feel and interpret these changes (or lack thereof) from the disillusionment of not losing weight, to the anxiety of going to the doctor's office, the joy of being able to walk more, and the desire to continue to get healthier (even if it is unlikely). Their accounts also highlight some of the changes that patients are most excited about (e.g., weight loss, reduced stress levels, confidence) and when those changes occurred.

6.2. Program mechanisms driving positive outcomes

Staff in the OCAC program addressed patients' needs by combining a system of relational support with digital tools. Unlike other telehealth programs, which are asynchronous (e.g., remote patient monitoring, or text-based) or those consisting of only virtual visits, the OCAC program combines real-time monitoring, 24/7 text support, and access to virtual care with weekly phone calls with registered nurses. Participants reported that these strategies enhanced accountability and fostered a deeper sense of engagement with their treatment plans. These observations are consistent with the findings of Kerr et al.,[39] which highlight the contribution of structured healthcare team involvement and iterative patient feedback mechanisms to improved chronic disease self-management. Participants also indicated that the OCAC had a positive influence on medication adherence, dietary behaviors, and exercise participation. These findings align with prior research by Arigo et al.[40] and Alyafei and Easton-Carr,[41] which determined that structured follow-up systems and digital health reminders can facilitate the adoption and maintenance of new health behaviors.

The frequent interaction with program staff was also seen as positive and fostered a sense of connectivity and support, which has been documented elsewhere.[12] The frequent communication also enhanced healthcare access by facilitating timely referrals and scheduling for numerous patients. Moreover, use of multi-tiered strategies seemed to address the diversity of needs and supported greater symptom management and chronic disease control, leading to a better quality of life, which echoes the broader literature showing that virtual care can narrow disparities and bolster patients' self-management.[16,42]

6.3. Implications for practice and policy

The OCAC program highlights some of the implications for implementing and operating telehealth programs designed to help at-risk populations. This program demonstrates how gaps in access to care can be addressed for individuals living in urban and rural settings, as well as those enrolled in Medicaid. For nurses and healthcare leaders seeking to expand virtual care in underserved communities, clear and consistent communication combined with empathy from staff are essential components that drive positive patient experiences. Establishing trust and rapport in telehealth programs can enhance patient satisfaction, motivation, and adherence to care plans.[12]

Furthermore, the inclusion of PROs into the design and evaluation of telehealth programs ensures a patient-centered approach that places a higher emphasis on self-management, as they offer insight into patients' perspectives on their health and treatment satisfaction. The integration of PROs into evaluation frameworks also offers actionable insights for clinicians, administrators, and policymakers seeking to design patient-centered telehealth initiatives. Investing in digital infrastructure and incorporating routine PRO assessments could ensure that programs remain adaptable, equitable, and focused on outcomes that matter most to patients. This information may help inform care planning and enhance global health in areas such as hypertension, where it is currently underutilized[43] in countries beyond North America and Europe, and for diabetes management as well, given the epidemic nature of the disease.

Additionally, it is essential to note that the OCAC program offers 24/7 access to care, enabling patients to receive assistance whenever needed. These findings suggest a preference for and potential benefits of "high-touch" telehealth interventions among Medicaid recipients. Nevertheless, the translation of PROs into health outcomes requires further investigation.

6.4. Strengths and limitations

A key advantage of this study was its longitudinal format, which provided insight into patient engagement and the reporting of perceptions in a manner that minimizes recall bias. However, this approach has some limitations to consider. First, the number of participants who participated in the interviews decreased over time. The use of a single healthcare system within the U.S., with a focus on patients with Medicaid, further limits the generalizability of the findings to other countries or among other at-risk groups. The reliance on self-reported data, which may be subject to social desirability bias, is another limitation. Additionally, we were unable to interview people who had exited the program prematurely, which may have revealed a greater awareness of the challenges and barriers associated with telehealth care. Furthermore, while the study included rural participants, future research should explore differences in outcomes by rurality, race/ethnicity, and digital literacy more explicitly.

7. Conclusion

This study highlights the novel use of PROs to evaluate a virtual care program for Medicaid patients with diabetes and hypertension. Unlike traditional metrics that focus solely on clinical indicators or utilization data, our approach captured patients' lived experiences, perceptions of care, and behavioral changes over time. This patient-centered focus revealed meaningful improvements in health literacy, self-management, and quality of life, all of which are insights that may not have been identified through standard clinical outcomes alone. By demonstrating how PROs can illuminate the holistic impact of telehealth interventions, our findings underscore the value of integrating patient voices into program evaluation. It also highlights the experiences of Medicaid enrollees who use telehealth and how it can impact their access to and utilization of care. Future studies should continue to prioritize PROs alongside clinical measures to create a more comprehensive understanding of the long-term effectiveness and sustainability of virtual care models for underserved populations.

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Ethical considerations

Ethical approval to report this research study was obtained from the University of Illinois College of Medicine Institutional Review Board-1 (1876230).

Consent to participate

All participants were informed about the study goals, confidentiality, publication, verbally consented prior to enrolling, and were given a small stipend in appreciation for their time.

Consent for publication

As part of the informed consent process, all participants provided consent for the publication of their anonymized information.

Author contributions

MD, CK, and MC contributed to the conceptualization and design of the study (Conceptualization, Methodology). MD, DL, and CK conducted the interviews and transcribed them (Investigation). All authors contributed to the formal analysis and interpretation of the results (Formal Analysis, Interpretation). MD, CK, and DL prepared the original draft of the manuscript (Writing – Original Draft), while MC provided supervision and contributed to reviewing and editing (Supervision, Writing – Review & Editing). All authors read and approved the final version of the manuscript (Approval of Final Manuscript).

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Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data Availability Statement

The data generated and analyzed during the current study are not publicly available since the participants did not consent to have the full transcripts of the interviews made publicly available. The data that support the findings of this study are available on reasonable request from the corresponding author.

Trial and protocol registration

Clinical Trials.gov: NCT: NCT05555095
https://clinicaltrials.gov/study/NCT05555095

Supplemental material

Supplemental material for this article is available online.

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Evaluating the Efficacy of the Medicaid Innovation Collaboration (MIC) Virtual Health Program Outcomes for High-Acuity Patients

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Introduction

- The impact on healthcare delivery for high-acuity patients needing continuous monitoring and specialized care is significant.
- High-acuity patients with diabetes and hypertension need enhanced education and coordinated care due to the complexities of health.[1]
- In some studies, digital health tools have facilitated enhanced education and care coordination, preventing emergency department (ED) visits and/or hospital readmissions.[2]
- The OSF OnCall Advance Care (OCAC) program is a strategy for the management of chronic conditions, aimed at improving patient care coordination and overall health outcomes.[3]
- **However, there is a need to understand the effectiveness of telehealth services as reported by patients with complex health issues.**

OSF On Call Advance Care: Virtual Health Program

OSF's virtual care team is designed for individuals who are overseeing the health and treatment of chronic health conditions. It provides support by connecting patients access to nurses and practitioners. Through technology, enrolled patients receive digital resources, support and regular assessments to manage the complexities of health.[3]

AIM

To assess whether participation in the OCAC program enhances the management of diabetes mellitus (DM) and hypertension (HTN) by describing time-specific patient-reported outcomes.

References

Study Findings

Results

- A total of 37 individuals completed the first interview, 25 completed the second interview, and 17 completed the third interview.
- Out of 38 participants (23 females and 15 males) aged 43 to 60, 34 had hypertension (HTN), 33 had diabetes mellitus (DM), and 31 had both conditions.

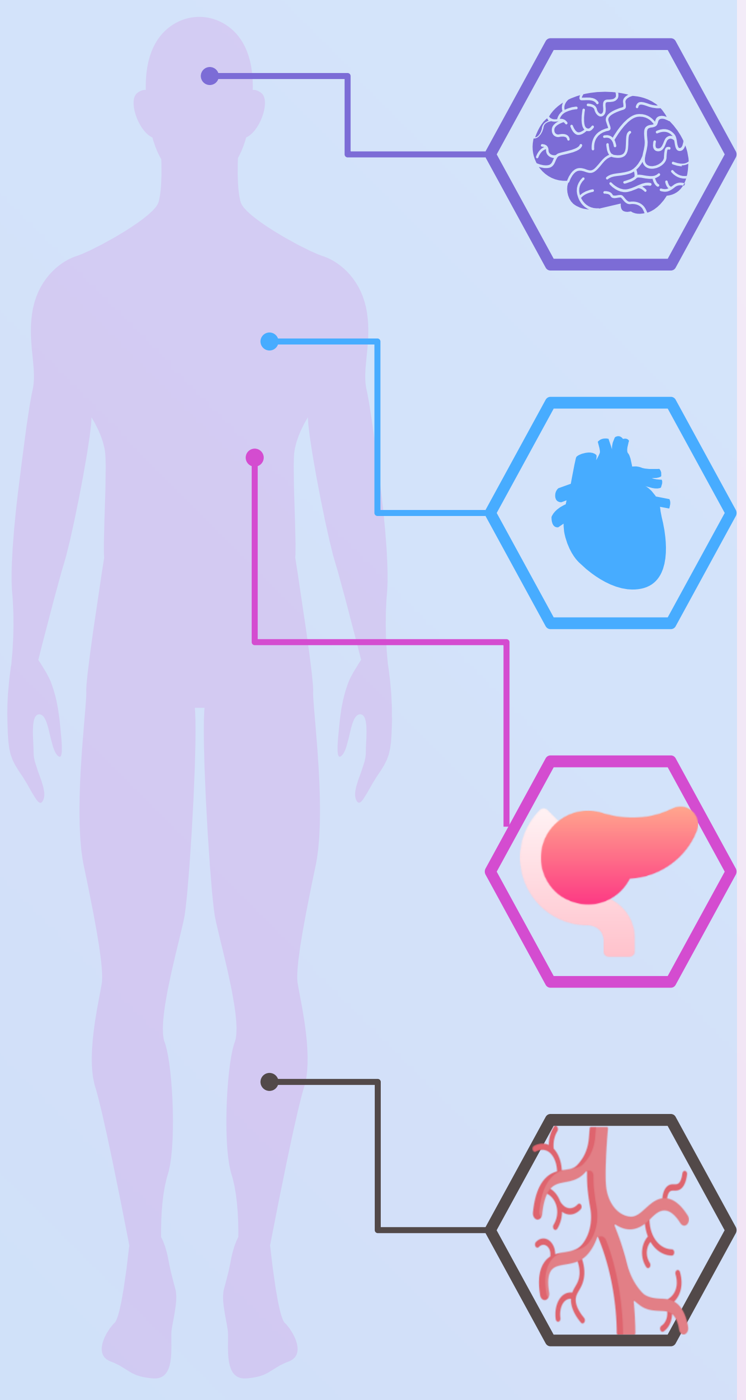
Theme #1: Behavioral Changes	
Increase Monitoring	"I now check my blood sugar and vitals every day."
Changes in Diet	"I don't eat as much sweets as I use to."
Increase Physical Activity	"I am able to move around the house more."

Theme #3: Psychological Benefits	
Increased Feelings of support	"I always feel like someone is there for me."
Diminished Stress Levels	"I'm not as worried as I once was because of this program."
Increased Sense of Accountability	"I definitely feel like there is more accountability because I am now more aware."

Theme #2: Symptoms Health
"I am completely off all my blood pressure medications!"
"I am no longer on insulin and now just taking metformin."

Theme #4: Knowledge
"I am now more aware of what to do and how to take care of myself whereas before I had no idea!"

Theme #5: Changes in Access to Care
"I was always in the emergency room getting admitted. Since this program, I have not gone once or needed to be readmitted to the hospital."



Conclusion

The preliminary findings highlight a range of patient-reported outcomes associated with participation in the OCAC program beyond standard metrics like blood pressure. For example, participants reported improved knowledge, care access, and support. As the interviews progressed, key themes emerged, including enhanced health knowledge and significant improvements in blood pressure and A1C levels. Ongoing research is needed to fully understand the long-term effectiveness of virtual health services, particularly in meeting complex health needs and providing psychological benefits.

Study Design

A qualitative, longitudinal research design was utilized, employing semi-structured interviews to gather in-depth insights from patients regarding their experiences with virtual health programs.

Methods

Participants were recruited through interviews, with each subject being interviewed up to three times. The interviews were transcribed and subsequently analyzed using NVIVO, a qualitative research software that supports a reflective thematic analysis approach.

Nursing Implications

Education: Empower patients through OCAC technology for active health management and promptly report any damaged equipment.

Research: Members of the research team are conducting an analyze of health-related outcome data related of the OCAC program participants. The data along with these findings will inform future research.

Practice: Virtual health technologies can be incorporated into nursing care. Clear communication and empathy can be used to enhance the patient experience in a virtual care model. Ongoing feedback strengthens patient participating and will help to improve the healthcare delivery of patients.

Policy: Nursing policies should focus on establishing guidelines for digital health nursing roles and use of digital technologies to support patients in self-management through programs like the OCAC Program.