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Patient Experiences of Remote Patient Monitoring: Implications for Health Literacy and Therapeutic Relationships

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Abstract

This study explores patients' experiences participating in a home-based remote patient monitoring program for chronic disease management. Using a mixed-methods approach, data was collected through semi-structured interviews and surveys from participants with Chronic Obstructive Pulmonary Disease (COPD) and diabetes. Two key themes emerged: "knowing" and "relationship." The "knowing" theme encompassed data-driven awareness and contextualized education that empowered patients in their health management. The "relationship" theme highlighted the importance of interpersonal connections with healthcare providers and the sense of security from clinical oversight. Technology served as a communication platform supporting patient-clinician interactions rather than replacing them. The findings demonstrate that remote monitoring programs enhance chronic disease self-management through two interconnected mechanisms: the development of 'situated health literacy' through real-time, personalized data interpretation, and strengthened therapeutic relationships enabled by technology-mediated clinical oversight. Rather than replacing human interaction, technology serves as a platform for meaningful patient-provider communication that supports both immediate health management and long-term self-management capability development. These exploratory findings suggest potential design considerations for patient-centered telehealth services that integrate health literacy enhancement with relationship-centered care.

Keywords: remote patient monitoring; hospital in the home (HITH); chronic disease self-management; telehealth; patient experience; health literacy; patient-centered care

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1. Introduction

Chronic disease is identified by the World Health Organisation (WHO) as the leading cause of death and disability worldwide [1]. The impact goes beyond the health and wellbeing of individuals and impacts broadly on society and world economies [1]. Better management of chronic disease is in the interest of governments and industry as much as it is in the interests of the patient's health and wellbeing. The two key areas of focus are Chronic Obstructive Airways Disease (COPD) and Diabetes.

Chronic Obstructive Pulmonary Disease (COPD) and diabetes represent two major chronic conditions that significantly benefit from continuous monitoring and self-management support. The Chronic Care Model offers four key opportunities for improved patient outcomes in chronic disease management: community and health system coordination; self-management support; healthcare delivery system design; and decision support with clinical information systems [2–5].

Telehealth is a term that is broadly used in healthcare today and encompasses different approaches to care delivery. Tele-home technology is described by Kirschner and Cram [6] as that which allows patient and physician (or nurse) interaction but from the comfort of the patient's own home. In this study, the intervention used was Remote Patient Monitoring (RPM). RPM services include data submitted by the patient on a daily basis that is then reviewed by clinical staff. These types of programs are typically supported by a nurse-led model that provides support for patients in the management of their underlying health indicators. Both IT solutions and clinical team support help patients recognize their individual health indicators and determine appropriate actions to correct or improve their health condition [7].

This study aimed to explore patients' experiences of participating in a home telemonitoring program designed to support the self-management of chronic disease. Understanding the patient experience is critical for healthcare practitioners as it reveals the mechanisms through which remote monitoring affects self-management behaviors and highlights factors that influence patient engagement with telehealth technologies. The findings from this research provide important insights for clinicians and program designers seeking to develop and implement effective telehealth interventions. As noted by Willemse et al. [8] and Shigekawa et al. [9], telehealth relies on commitment from both patients and clinical staff, requiring patients to be open to new care modalities and staff to adapt their clinical skills to technology-mediated interactions. By identifying what patients value in remote monitoring programs, this research addresses a crucial gap in knowledge that can inform more patient-centered telehealth service delivery.

While patient experiences with remote monitoring and health literacy have been extensively studied as separate domains, there remains a critical gap in understanding how these concepts intersect and mutually reinforce each other in practice. Remote monitoring technologies generate continuous health data streams that patients must interpret and act upon, creating unique opportunities for health literacy development through real-time, contextualized learning experiences [7,10]. Conversely, patients' existing health literacy levels influence their ability to engage effectively with monitoring technologies and derive meaningful insights from the data they generate [11,12]. This study addresses this intersection by examining how remote monitoring programs can simultaneously serve as vehicles for health literacy enhancement while being influenced by patients' baseline literacy capabilities. By exploring this bidirectional relationship, we provide a framework for understanding how technology-mediated care can be designed to both accommodate varying health literacy levels and actively contribute to literacy development through meaningful patient-provider interactions [13–15].

This study examines how patients with COPD and diabetes experience participation in remote monitoring programs, specifically focusing on how these experiences facilitate health literacy development and therapeutic relationship enhancement. Building on our convergent framework where health literacy and remote monitoring function as mutually reinforcing processes, our research addresses: (1) How does daily engagement with personalized health data influence patients' health understanding and self-management capabilities? (2) How do technology-mediated clinical interactions affect patient-provider relationships? (3) What specific program features do patients identify as most valuable for their chronic disease management?

Following this introduction section, a literature review is presented. Next, the methodology employed in this study is outlined. Then, the research findings are presented. Finally, a detailed discussion of the implications of these research findings for practitioners is provided.

2. Literature Review

The literature review was conducted through systematic searches of PubMed, CINAHL, and PsycINFO databases using keywords including: 'remote patient monitoring,' 'telehealth,' 'patient experience,' 'health literacy,' 'chronic disease management,' 'COPD,' 'diabetes,' and 'self-management.' Additional references were identified through citation tracking and expert recommendations. The review focused on establishing a foundational understanding of patient experiences with remote monitoring and health literacy development.

2.1. The Burden of Chronic Disease

A focus on Non-Communicable Disease (NCD) by the WHO illustrates a health epidemic that is the leading cause of death and disability worldwide [1,16,17]. Most recent figures from the WHO indicate that 16 million people are dying prematurely each year before the age of 70 from NCDs [18]. NCDs are also known as chronic diseases that are not contagious; they generally impact the health and wellbeing of people over a long period of time and eventually lead to death [1]. The four main types of NCDs are cardiovascular disease, cancers, chronic respiratory diseases and diabetes [1,16,17].

These global health challenges create an urgent need for innovative care delivery models that can support patient self-management while reducing healthcare system burden. Remote patient monitoring represents one such innovation, but its success depends critically on patient acceptance, engagement, and the ability to meaningfully participate in technology-mediated care. Understanding patient perspectives on remote monitoring becomes essential for developing scalable solutions to address the growing chronic disease burden.

The United Nations in 2002 outlined the challenges of the ageing population. By 2050, the number of older persons (over 60) for the first time in history will exceed the number of young people. In 1950, the percentage of people in the world over 60 was 8%. By 2050, the expected percentage will be 21% [19]. The effects and outcomes of the aging population have wide-reaching ramifications, inclusive of the health and wellbeing of individuals who are more at risk of NCD as they age. The WHO estimates the cumulative economic losses, between 2011 and 2025, due to NCDs, under a 'business-as-usual' scenario, in low and middle-income countries, to be US $7 trillion [1,20,21]. When people are unwell, not only are they not productive, but they also consume resources to manage their care, be that medical resources or those of caregivers who support them during their failing health.

This global context of aging populations and increasing chronic disease prevalence directly impacts the feasibility and necessity of remote patient monitoring programs. As healthcare systems face growing demands from older adults with complex chronic conditions like COPD and diabetes, understanding how patients experience and engage with remote monitoring technologies becomes crucial for determining whether these interventions can effectively scale to meet population-level needs [1,19].

2.2. Self-Management Support as a Key Strategy

Within the context of expanding chronic disease management needs, health literacy emerges as a critical factor determining patient success with remote monitoring technologies [22]. The notion of Health Literacy has gained ground since its introduction in

1974 [18,22,23]. Health Literacy refers to the degree to which individuals have the capacity to obtain, process and understand basic health information. This includes options about service delivery, navigation and the ability to make appropriate health decisions [22,24,25]. The four dimensions of health literacy, as defined by Sorensen et al. [12], are access/obtain information relevant to health, understand information relevant to health, process and appraise information relevant to health, and apply information relevant to health.

Smith and colleagues [26], in their secondary analysis of data available for older Americans, found that the concepts of Health Literacy and patient activation were separate. In particular, one or the other was not necessarily a predictor of health outcomes [13–15]. They also found that there is an assumption that because an individual possesses the skills and knowledge, in other words, holds a certain level of health literacy, then they will adhere to instruction [26].

The intersection of health literacy and remote patient monitoring represents an underexplored yet critical area of investigation. Traditional health literacy frameworks focus on static information processing [12,22], but remote monitoring creates dynamic, real-time learning environments where patients continuously receive and must interpret personalized health data [7,27]. This technological mediation transforms health literacy from a fixed patient characteristic into an evolving capability that can be enhanced through interactive, contextualized feedback [10,28]. Understanding how patients with varying literacy levels experience and benefit from remote monitoring technologies is essential for designing inclusive telehealth interventions that both accommodate existing capabilities and foster literacy development [15,23].

2.3. Telehealth and Remote Patient Monitoring as Important Tools

Given the population health challenges outlined above, remote patient monitoring has gained attention as a potentially scalable intervention for chronic disease management [27]. Remote Patient Monitoring (RPM), also referred to as telemonitoring, telecare, telehomecare, is an aspect of telehealth that is used to collect a patient's vital signs, biometric data and subjective data via a monitoring device located in the patient's home or place of residence [27–30]. The data collected is transferred electronically to a clinician who can screen and analyse the data for anomalies and respond to the patient according to their needs. A number of benefits have been identified by trials of RPM for patients with chronic diseases, including decreases in mortality, emergency admission rates, re-admission rates and length of stay for patients, as well as reduced travel time and costs [31–35]. More benefits are increased in patient condition, satisfaction, understanding of patients' own health conditions, increased capacity of facilities and resources for health services and increased collaboration between healthcare professionals [27,36–39].

2.4. The Critical Gap: Understanding Patient Experience Mechanisms in Remote Monitoring

While remote monitoring's clinical effectiveness has been established through numerous trials demonstrating reduced mortality and hospital admissions [31–35], a critical gap exists in understanding the patient experience mechanisms that determine program success or failure. Studies by Jaana [27] and Shigekawa et al. [9] reveal that patients value personalized monitoring and clinical responsiveness, with satisfaction depending heavily on perceived clinical oversight and communication quality. However, these findings raise fundamental questions about what creates these positive patient experiences and how they translate into sustained engagement with self-management.

The patient experience literature reveals two consistent themes that remain poorly understood. First, research by Gellis et al. [38] and Miller & Thompson [40] demonstrates that working alliance and communication quality are critical for patient outcomes in technology-mediated care, yet we lack understanding of how these therapeutic relationships develop and function differently in remote versus traditional care settings. Second, studies by Fitzner [36] and Stone [37] show that patients report increased satisfaction and confidence when telehealth includes educational components and active care management, but we do not understand the mechanisms through which remote monitoring facilitates learning or how this relates to patients' existing health literacy capabilities.

This gap becomes critical when viewed through the lens of health literacy research. While health literacy studies demonstrate that lower literacy levels significantly affect patient engagement with health information and self-management [10,24], and that interactive health literacy can be developed through meaningful engagement with personalized information [10,23], these insights have not been systematically applied to understanding remote monitoring experiences. Traditional health literacy frameworks focus on static information processing [12,22], failing to account for the dynamic, real-time learning environments that remote monitoring creates.

The intersection of these research streams reveals an underexplored phenomenon: remote monitoring may function as an intervention that simultaneously requires and develops health literacy while building therapeutic relationships through technology-mediated interactions. Patient-centered care research emphasizes that effective interventions must accommodate varying patient capabilities while fostering development [13–15,41], yet we lack frameworks for understanding how remote monitoring achieves this dual function.

This research gap has significant implications for program design and healthcare policy. As healthcare systems face growing chronic disease burden and aging populations [1,19], remote monitoring represents a potentially scalable solution. However, without understanding the patient experience mechanisms that determine success, programs risk replicating the positive outcomes achieved with highly engaged, technologically comfortable volunteers while failing with the broader, more diverse patient populations that most need these services.

2.5. The Urgency of Understanding Patient Experience Mechanisms

The urgency of this research gap becomes apparent when examining the disconnect between remote monitoring's proven clinical benefits and its implementation challenges. While trials demonstrate effectiveness [31–35], real-world implementation often struggles with patient engagement and program sustainability [8,29,42]. This suggests that the mechanisms driving positive patient experiences in research settings are not well understood or systematically replicated in practice.

Evidence from patient experience studies provides crucial clues about these mechanisms. Research consistently shows that patients prioritize relationship quality and educational value over technological sophistication [9,36,40], yet current remote monitoring research has not systematically examined how these priorities interact with patients' health literacy development needs. Studies of rural patient experiences [42] and technology acceptance patterns [39] suggest that successful programs address both practical and emotional needs, but the specific mechanisms through which technology facilitates these dual outcomes remain unexplored.

The convergence of health literacy and remote monitoring research suggests a theoretical framework that has not been empirically tested: that remote monitoring programs succeed by creating 'situated health literacy'—personalized learning environments where patients develop health understanding through their own data while building therapeutic relationships through responsive clinical oversight. This framework could explain why some patients thrive in remote monitoring programs while others struggle, and why program success depends on more than technological functionality alone.

2.6. Study Rationale: Examining the Intersection

This study addresses the critical gap between established clinical effectiveness of remote monitoring and limited understanding of patient experience mechanisms by examining how patients with chronic diseases experience participation in remote monitoring programs. Specifically, we investigate whether remote monitoring functions as hypothesized—creating situated health literacy development opportunities while building therapeutic relationships through technology-mediated clinical interactions.

Our research questions emerge directly from the gaps identified in existing literature: How do patients experience the intersection of personalized data interpretation and clinical relationship building in remote monitoring? What mechanisms enable some patients to develop enhanced health understanding and stronger clinical relationships through technology-mediated care? Understanding these mechanisms is essential for designing remote monitoring programs that can achieve positive outcomes across diverse patient populations rather than only with highly engaged volunteers.

2.7. Research Gaps and Study Rationale

The literature reveals two parallel but under-connected research streams: studies documenting patient experiences with remote monitoring technologies [8,9,27,38] and research on health literacy development in chronic disease management [10,24,25,43]. While both areas demonstrate the importance of patient engagement and understanding, few studies examine how remote monitoring programs can serve as vehicles for health literacy enhancement, or how patients' existing health literacy levels influence their experience with monitoring technologies. This gap is particularly important given evidence that patient satisfaction with telehealth depends heavily on perceived educational value and communication quality [9,36], while health literacy development requires personalized, contextually relevant learning opportunities [10,14]. Our study addresses this intersection by examining patient experiences specifically through the lens of both technological engagement and health understanding development.

3. Methodology

3.1. Theoretical Framework

This study adopts a convergent framework that positions health literacy and remote monitoring as interconnected rather than parallel phenomena [10,44]. We conceptualize health literacy as both an input factor (influencing how patients engage with monitoring technologies) and an outcome (enhanced through meaningful interaction with personalized health data) [11,28]. This dual conceptualization guided our mixed-methods approach [44], with interview questions designed to explore both how patients' existing health understanding influenced their monitoring experience and how participation in monitoring affected their health knowledge and self-management capabilities [10,14]."

These additions will demonstrate to the reviewer that you have thoughtfully integrated these themes rather than simply placing them side by side, showing the theoretical and practical connections between health literacy and remote patient monitoring in your research.

Our mixed-methods approach was specifically designed to capture both the health literacy development process (through detailed interviews about learning experiences) and relationship quality changes (through questions about clinical interactions and support perceptions). The survey validation confirmed these dual outcomes across the broader program population.

While our study is not a clinical trial, we adapted the CONSORT flow diagram approach to ensure transparent reporting of participant selection processes, consistent with best practices in mixed-methods research reporting [44].

Our literature review was focused on establishing a foundational understanding of patient experiences with remote monitoring and health literacy development. We acknowledge that this rapidly evolving field continues to produce relevant research, including recent systematic reviews and patient satisfaction studies that would further inform our theoretical framework. Future research should incorporate these emerging findings to build upon our exploratory contributions. A critical research priority is conducting non-response analysis comparing demographics and characteristics of study participants versus non-participants to assess the magnitude and direction of selection bias. Future studies must employ strategies to include experiences of patients who decline or discontinue remote monitoring programs to provide evidence suitable for broader healthcare policy development.

3.2. Study Design and Analytical Approach

This study employs an exploratory qualitative design with quantitative validation rather than a statistical generalization approach [44]. The interview component (n = 13) was designed to achieve thematic saturation within our specific program context rather than statistical representativeness [44,45]. Our analytical strategy prioritizes depth of understanding over breadth of generalization, consistent with phenomenological inquiry principles [44]. The survey component (n = 41) served to validate themes identified in interviews within the broader program population rather than to establish statistical significance [44]. This approach aligns with mixed-methods research that uses quantitative data to confirm qualitative insights within bounded contexts rather than to make population-level inferences [44]. Participants were recruited from the Personalised Health Care (PHC) remote patient monitoring program, which provided daily data submission, clinical oversight, and educational support for patients with COPD and diabetes in their home environments.

Following Creswell and Plano Clark's framework [44], this study employs a convergent parallel mixed-methods design where qualitative interviews and quantitative surveys were conducted to address the same research questions from complementary perspectives. Rather than one method confirming the other, both data types provide different but equally important insights into patient experiences with remote monitoring. The interviews explored the depth and complexity of patient experiences, while the survey assessed the prevalence and patterns of these experiences across the broader program population. This design was selected because our research questions required both understanding the nuanced mechanisms of patient experience (qualitative) and validating the broader applicability of identified themes (quantitative) [44]. A total of thirteen participants consented to an in-depth interview exploring their experience, with interviews conducted using video conferencing technology familiar to participants from the intervention. Due to some technical issues, parts of some interviews and some complete interviews were conducted by phone. The interviews were analyzed using a constant comparative approach as outlined by Hansen [46], which allows for structure and a clear process in analyzing complex data. This approach supports the validity of outcomes and theory development through rigorous analysis.

Survey Instrument Limitations: We acknowledge that our purpose-developed survey instrument lacks comprehensive psychometric validation, which limits the generalizability of quantitative findings. However, in exploratory mixed-methods research, purpose-developed instruments can provide valuable descriptive information and triangulation support when their limitations are explicitly acknowledged [44]. The survey demonstrated acceptable internal consistency (Cronbach's α = 0.67) and content validity through expert clinical review, but lacks the full psychometric validation required for standalone quantitative conclusions. Therefore, survey results are interpreted as supportive descriptive evidence rather than definitive quantitative findings.

The interview data were analyzed to understand both what health services are like and what they do [47]. Following each interview, data were transcribed verbatim and analyzed through an immersive process [44]. The interview participants ranged in age from 57 to 92 years, with an average age of 73 at the time of the interview. There were four men with COPD and four men with diabetes. There were five women participating in the interviews, two with COPD and three with diabetes. One of the men had a carer (his wife) accompany him during the interview.

Information was gathered and sorted, with only data directly related to the research questions included in the analysis. Theme development occurred through systematic analysis, where related codes were grouped into coherent categories. We examined code frequencies, relationships between codes, and the underlying meanings participants attributed to their experiences to construct overarching themes that captured essential aspects of the remote monitoring experience. As Creswell [44] indicates, 5–7 themes are reasonable when using this method. The development of themes began with open coding, where similarities in information were identified.

We employed an iterative coding process where interview transcripts were systematically analyzed line-by-line to identify recurring patterns and concepts. Initial codes were developed inductively from participant statements, with each meaningful unit of text assigned descriptive labels that captured the essence of participants' experiences [47]. The next stage involved axial coding, where connections between categories were made to find thematic structure informing outcomes [46]. Nicholls [45] identified the importance of acknowledging instances that do not fall neatly into coding parameters, as these outliers can provide interesting insights. Peer debriefing occurred through planned and ad hoc conversations about the data [48].

Through an inductive process, the data were grouped into themes. Our analytical approach followed established qualitative methods: Open coding involved identifying and labeling discrete concepts within interview transcripts without predetermined categories. Axial coding involved examining relationships between initial codes to develop broader thematic categories. Constant comparative analysis involved continuously comparing new data with previously coded material to refine and validate emerging themes [46].

3.3. Mixed-Methods Integration Process

Data integration followed a convergent parallel approach with three distinct phases [44]:

Phase 1—Separate Analysis: Qualitative interview data were analyzed independently using thematic analysis to identify patient experience themes, while quantitative survey data were analyzed separately using descriptive statistics and reliability testing.

Phase 2—Comparison and Contrast: We systematically compared qualitative themes with quantitative response patterns to identify areas of convergence, divergence, and complementarity. For example, we examined whether high-scoring survey items aligned with frequently mentioned interview themes.

Phase 3—Integration and Interpretation: We used a narrative approach to weave together both data types, creating an integrated understanding that was more comprehensive than either method alone. This integration occurred through: (a) examining how survey responses validated or challenged interview themes, (b) using qualitative data to explain quantitative patterns, and (c) identifying areas where both methods provided complementary insights into the same phenomena.

4. Results

4.1. Participant Characteristics

A total of thirteen participants consented to an interview exploring their experience of receiving healthcare using technology in the home. Additionally, forty-one participants completed and returned the survey. Figure 1 presents the participant selection process using an adapted CONSORT flow diagram format, which provides transparent reporting of participant recruitment and selection in mixed-methods research [44]. All participants were enrolled in the Personalised Health Care (PHC) program, referred to as 'PHC' throughout the results.

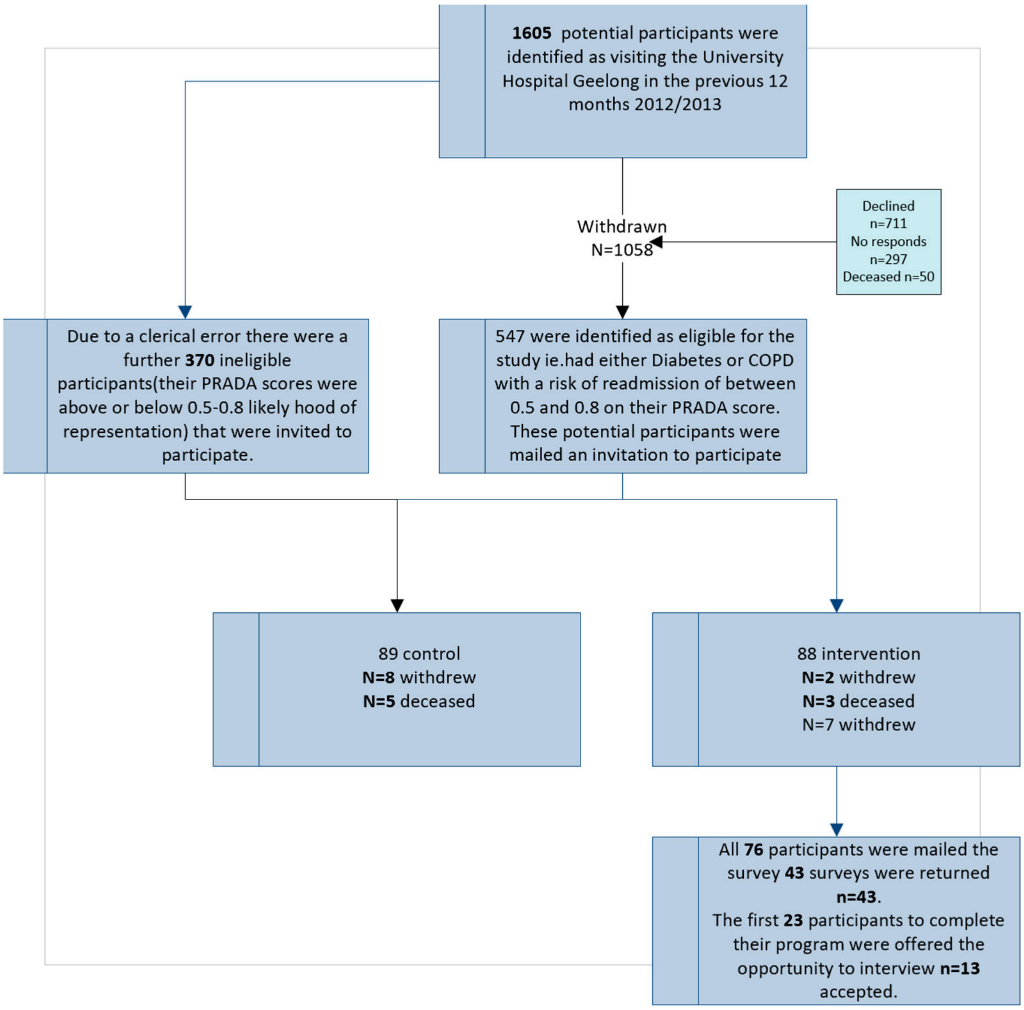

Figure 1. Participant selection process for mixed-methods study.

The participants ranged in age from 57 to 92 years of age with the average age being 73 at the time of interview. While this represents a wide age range, it reflects the demographic reality of chronic disease management, where both conditions (COPD and diabetes) affect diverse age groups. There were four men with COPD and four men with diabetes. There were five women participating in the interviews, two with COPD and three with diabetes. One of the men had a carer (his wife) accompany him during the interview. This sample size was determined by thematic saturation principles rather than statistical power calculations, consistent with qualitative research methodology.

Both interview and survey participants shared similar demographic characteristics, enabling meaningful integration of findings across methods. Table 1 presents the characteristics of the interview sample population.

Table 1. Characteristics of the sample population—Interviews.

Variable	
Sex, males %	61%
Sex, females %	39%
Age, mean	73 years
Diagnosis, %	
• COPD	38%
• Diabetes	54%
• Both COPD and Diabetes	8%
Time in PHC program, mean	12 months
Lived alone, %	39%
Lived with spouse, %	61%

4.2. Qualitative Findings from Interviews

Two overarching themes were identified in the data provided by participants during the interview process: 'knowing' and 'relationship'. Two distinct sub-themes were identified in each of the themes. In the area of knowing, both data and education were central to contributing to the patients' understanding of their health condition and needs. In the theme of relationship, the two sub-themes of interpersonal relationship and oversight were common amongst the majority of the participants. These themes were also reflected in eleven of the forty-two survey participants who took the time to provide extra comments on their survey form when asked if there was any other comment they would like to make about the program. Table 2 presents the interview themes and sub-themes.

Table 2. Interview themes and sub-themes.

Knowing	Relationship
Data • Making aware • Validation • Empowerment to make choices about their health • Communication tool between clinical team and patient • Oversight drives routine and adherence	Interpersonal relationship • Access, somebody there for them • Caring
Education	Oversight • Environment of safety • Sense of security beyond the health condition

4.2.1. Knowing Theme

The knowing theme explores the sub-themes identified around knowledge, its acquisition and application to care needs during the program. Education and access to education or specialised staff support were identified by all participants in response to both the survey and interview process. Data generated by the participants and communicated to the PHC program also developed a knowledge bank for both the clinical team and the participant, identifying their needs in the moment.

Data Sub-Theme

In the PHC program, data submission included information about any symptom identification that the participant might have noticed. Along with the submission of biometric data, participants were also asked about how they were feeling, for example, if they had noticed if they had a cough. Ten of the thirteen interview participants and three of the survey respondents identified that they were able to track their health day to day, and there was an awareness of their health that grew while being on the program. As one participant noted: “I’m a lot more aware. . . of my health and the way to managed my health” (Patient interview 2).

The feedback of the data drove both adherence to treatment plans and provided participants with the ability to understand clinical indicators more clearly to ensure they respond to these indicators immediately. The data provided a means of understanding their health in the moment. One participant explained: “Yes well I think it’s been good I can see myself blood pressure is not right, If saturations are not right then I can do something about it. I think it’s a good idea” (Patient interview 6).

Education Sub-Theme

Seven of the thirteen interview participants identified that they had received specific education that supported their care needs. It was identified that certain staff members had been integral to helping them understand how to keep themselves healthy, either managing their health through generalist approaches or through correct technique in taking medications such as inhalers. As one participant described: “I probably would have just um stumbled along. That’s virtually what we were virtually doing before this come along anyway we were there searching for information. We were getting what we could from Doctors and um places like that but um until we actually got mixed up with this yeh we were just stumbling along” (Patient interview 2).

4.2.2. Relationship Theme

This theme largely illustrates how the participants felt about having their healthcare delivered in this model. Without exception each participant and 11 of the 42 surveyed participants took the time to provide comment about how they felt about the quality of their interaction with the staff of Personalised Health Care.

Interpersonal Relationship Sub-Theme

Access to staff as a key benefit was identified by seven of the thirteen participants. Identifying that staff were there for them and that access to staff when either the data identified that the participant was in need or when the participant made contact with PHC in relation to their physical, emotional and educational needs provided them with a sense of not being alone. As participants expressed: “I think it was useful, in the fact that you had something, and somebody would listen to you and help you and guide you thru whatever it was” (Patient interview 13), and “Just helpful knowing that you girls are there, and I can get in touch at any time, it has been really helpful that way” (Patient interview 11).

Oversight Sub-Theme

Staff provided oversight of the data by following up with participants when the data they submitted was outside of the parameters for that participant and also if the data had been omitted for more than 24 h. Five participants and five of the survey respondents identified that the oversight for clinical risk supported the positive relationship development between staff and participant. Participants identified feeling safe knowing that the staff were following up on their individual data submission if readings were outside of their usual range. As one participant noted: “Ah you know if I put in high Blood pressures or high sugars somebody will call me, ah, and that’s a real, it’s a good feeling of security” (Patient interview 3).

4.2.3. Supporting Qualitative Evidence from Survey Comments

Eleven of the survey participants provided written comments that further illustrated the interview themes, demonstrating consistency across data collection methods. These qualitative responses confirmed the two main themes identified in interviews:

Knowing Theme—Data-Driven Health Literacy Development: Ten of thirteen participants demonstrated clear development of what we term 'situated health literacy'—the ability to interpret and act upon their personal health data in real-time contexts. Participants reported three specific literacy enhancements: recognition of personal health patterns, improved symptom interpretation skills, and increased confidence in health decision-making.

Knowing Theme—Contextual Education: Seven participants identified receiving targeted, contextually relevant education that directly improved their self-management practices. This education was most effective when delivered in response to their actual health data, confirming our theoretical framework that remote monitoring creates optimal learning opportunities.

Relationship Theme—Technology-Enhanced Clinical Connections: All participants valued the enhanced access to clinical support, with seven specifically describing how technology facilitated rather than hindered their relationships with healthcare providers. This supports our framework that technology serves as a communication platform rather than a replacement for human interaction. Table 3 summaries the qualitative results of the survey by theme.

Table 3. Qualitative results for survey by theme.

Knowing	
Making Aware	*I found this programme was excellent for me and my health issues. Through the daily monitoring, it prevented me from ignoring my body's warning signals that all wasn't well (which I have done in the past). Thank you for helping me learn more about myself and giving me the opportunity to participate in the pilot programme.* Patient survey response 1 *The most important in my case was to become familiar with my body and learn to monitor the working of my weak areas on daily issues. It has been great help to have all the necessary equipment at hand all the time. It has taught me to stay informed about my condition and knowing that the help and advice is available if needed.* Patient survey response 2
Oversight drives routine care	*That it kept me on track as I know that someone else was checking my results also it was a great reminder to check things and do things such as breathing exercises and I have been much better* Patient survey respondent 3 *The help and understanding I have had during this program has helped me understand the importance of regular monitoring of my blood.* Patient survey response 4
Relationship	
Oversight	*Just to know that you were there when needed was a help and relief.* Patient survey response 5 *And talking to the nurses has been great as it helps to put your worries in perspective and you feel that you are not alone. It has been the best thing for me and the last year- my health has been so much better* Patient survey response 3
Interpersonal Relationship	*During my twelve months as a participant in the program I found all members of the staff to be true carers showing interest and concern. Best wishes for the future.* Patient survey response 7 *This program was very well presented, the staff very friendly caring and understanding, nothing too much trouble. If possible I would love to do it again. Love to all.* Patient survey response 8 *The attitude of all the staff in making you feel that they were interested in me personally was very important.* Survey respondent 6

4.3. Quantitative Findings from Survey

4.3.1. Survey Demographics and Response Patterns

A total of forty-three respondents completed the five-item survey. This represents a total of fifty-six percent of the total pilot participants for Personalised Health Care. Of the forty-three surveys returned, sixty-five percent enriched their response with a comment about their experience of the program. Table 4 presents the survey population characteristics.

Table 4. Survey population characteristics.

Variable	Amount
Sex, males %	57%
Age, mean	71 years
Time in PHC program, mean	12 months

4.3.2. Statistical Analysis and Theme Validation

Following the entry and cleaning of the data, a Cronbach's Alpha test was conducted across all five survey items ($\alpha = 0.67$). However, this analysis was methodologically inappropriate because the five items assess disparate constructs (video conferencing technology, staff availability, staff skill, staff understanding, and data oversight) rather than a single unidimensional construct required for Cronbach's alpha. Additionally, $\alpha = 0.67$ falls below the widely accepted minimum threshold of 0.70 for acceptable internal consistency. Therefore, survey results should be interpreted as individual item responses providing descriptive information rather than reliable scale measurements. Only the first item of the survey was evenly distributed within an acceptable level of skewness (−0.35). All other items were skewed to the right of the scale (−1.7–−3.1), indicating a need to use median and IQR to describe their central tendency. Given these results, items two to five demonstrate a severe ceiling effect, with median scores of 6 (maximum) and interquartile ranges of 0 or 1. This ceiling effect has critical implications for data interpretation. First, the instrument's ability to measure true variation is compromised, as it cannot distinguish between patients who are merely satisfied versus exceptionally satisfied. Second, the positive findings regarding the 'relationship' theme may be artificially inflated due to the combination of selection bias (highly satisfied volunteers) and an insensitive instrument unable to detect meaningful differences at the high end of the scale. Table 5 shows the Survey statistical analysis.

Table 5. Survey statistical analysis.

Statistics	**Survey Items**				
	Video Conferencing with Staff	**Staff Availability 24/7**	**Staff Skill to Help When Your Health Was Not Good**	**Staff's Level of Understanding and Ability to Help You Improve Your Health**	**The Ability to Record Your Data and Know That Someone Was Able to Review It**
n	41	41	41	41	41
Mean (SD)	3.9 (1.54)	5.41 (1.05)	5.51 (0.87)	5.68 (0.69)	5.66 (0.79)
Median (IQR)	4 (2)	6 (1)	6 (1)	6 (0)	6 (0)
Skewness	−0.35	−1.75	−2.20	−2.41	−3.10

4.3.3. Technology Acceptance Patterns

Interestingly, the video conferencing system was not seen as of high importance to the participants, with a broad spread of responses, with some considering it not important at all. Figure 2 shows the histogram for Item one—Video Conferencing with staff.

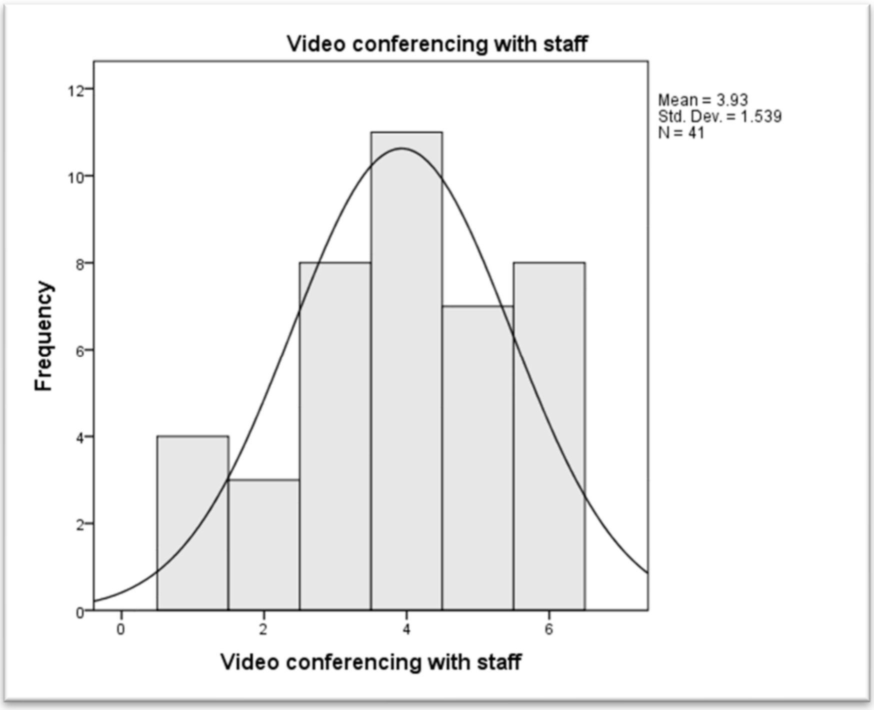

Figure 2. Histogram, Item one- Video Conferencing with staff.

During the interview phase, participants were asked about the technology; all of them identified it as easy to use, although there was some hesitation noted by three participants in the early phases of working with the program. Two of the participant identified that they were now using or intending to use technology in their daily lives because of the experience.

4.4. Integration of Qualitative and Quantitative Findings

The quantitative survey results strongly supported the qualitative interview themes:

- **Knowing Theme Support**: Survey items measuring data recording importance and staff understanding scored highest (median = 6), confirming interview findings about the value of data-driven awareness and educational support.
- **Relationship Theme Support:** Staff availability and clinical skill items received the highest ratings (medians = 6), validating the interview emphasis on interpersonal connections and clinical oversight as central to patient experience.
- **Technology Perspective Confirmation:** Lower video conferencing scores (median = 4) supported interview findings that patients valued clinical support and relationship quality over specific technological features.

5. Discussion

The integration of qualitative and survey findings reveals both convergence and important limitations. While interview themes showed descriptive correspondence with survey response patterns—such as rich descriptions of 'caring' relationships aligning with high satisfaction scores—the survey's ceiling effects and selection bias mean these high scores lack meaningful differentiation. The interviews provide a nuanced understanding of how patients experience relationships and learning, while the survey's uniformly high scores may reflect participant selection rather than true program impact. This convergence should be interpreted cautiously, as both data sources likely represent the experiences of highly engaged, satisfied participants rather than typical patient populations.

This research provides empirical evidence for our theoretical convergence framework, demonstrating that remote monitoring programs succeed by creating dynamic intersections between health literacy development and therapeutic relationship enhancement. Our findings show that patients do not simply collect health data—they engage in continuous learning processes that simultaneously improve their health understanding and strengthen their connections with healthcare providers.

Specific Mechanisms Identified:

1. **Situated Health Literacy Development:** Remote monitoring creates personalized learning environments where patients develop health understanding through their own data rather than abstract information.
2. **Technology-Mediated Relationship Building:** Clinical oversight and responsive communication through monitoring platforms enhance rather than diminish patient-provider relationships.
3. **Iterative Capability Enhancement:** Continuous monitoring cycles create repeated opportunities for both literacy development and relationship strengthening".

Our findings must be understood within the broader healthcare context that necessitates remote monitoring solutions. The global burden of chronic disease and aging populations creates both the opportunity and urgency for technology-mediated care approaches [1,19]. However, our results demonstrate that successful implementation depends not merely on technological capability but on understanding and addressing patient-level factors that influence engagement and benefit.

This research offers a significant contribution to our understanding of remote patient monitoring for chronic disease management by illuminating the patient perspective, an often-overlooked dimension in telehealth evaluation. While previous studies have focused primarily on clinical outcomes and cost-effectiveness, this paper reveals the mechanisms through which remote monitoring supports self-management behaviours. By identifying "knowing" and "relationship" as central to the patient experience, we provide a framework for understanding how technology-mediated care can simultaneously enhance health literacy and maintain therapeutic connections. The findings demonstrate that technology serves not as a replacement for clinical care but as a platform facilitating meaningful patient-provider interactions that support chronic disease self-management.

For practitioners implementing remote monitoring programs, these findings highlight the need to design services that balance technology with human connection. The results suggest that clinicians should prioritize relationship-building even in virtual environments, as patients valued the sense of oversight and access to responsive support. Additionally, practitioners should leverage the real-time data generated through monitoring to provide contextually relevant education at teachable moments, when patients are most receptive to information. Developing protocols that trigger appropriate clinical responses to patient data, while maintaining personalized care, will likely enhance patient engagement and satisfaction with remote monitoring services.

For researchers, this study opens several avenues for future investigation. Further research should explore the efficiency of technology-delivered education compared to traditional face-to-face interventions, particularly examining how real-time, contextually relevant information impacts knowledge retention and behavior change. Additional studies might investigate the minimum level of patient-clinician relationship required to support effective remote monitoring, as well as how these relationships evolve over time. Finally, researchers should examine how different patient populations experience remote monitoring, considering factors such as digital literacy, age, and disease severity that may influence engagement with telehealth services and the development of self-management capabilities.

5.1. Research Limitation

While demonstrating valuable insights into patient perspectives, important study limitations must be acknowledged. The interview sample size (*n* = 13) was designed for thematic exploration rather than statistical generalization, and findings should be interpreted within this methodological framework. The division across two chronic conditions (COPD = 6, diabetes = 7) limits disease-specific conclusions and prevents meaningful between-condition comparisons. The wide age range (57–92 years) reflects the reality of chronic disease demographics but introduces potential age-related variation in technology acceptance and health literacy that our sample size cannot adequately address [22,29].

Our findings align with the broader trajectory of remote monitoring research, which increasingly emphasizes patient-centered outcomes and satisfaction measures. Recent systematic reviews and patient satisfaction studies in this field continue to validate the importance of the themes we identified—particularly the critical role of clinical relationships and health literacy development in remote monitoring success. This convergence across multiple research approaches strengthens confidence in our framework while highlighting the need for continued investigation of patient perspectives in technology-mediated care. A critical methodological limitation is our inappropriate use of Cronbach's alpha across multidimensional survey items measuring disparate constructs. The proper approach would have required Exploratory Factor Analysis to assess underlying factor structure before calculating reliability coefficients for unidimensional subscales. This psychometric error limits the interpretability of survey results to descriptive response patterns rather than validated measurements.

Survey Ceiling Effects: The severe ceiling effects observed in four of five survey items (median scores at maximum with minimal variability) fundamentally compromise the instrument's utility for measuring patient satisfaction and confirming qualitative findings. Rather than providing robust quantitative support, the survey offers a likely biased snapshot that cannot differentiate levels of satisfaction or detect potential improvements over time. This limitation undermines claims that survey data confirms our qualitative themes.

These limitations mean our findings represent an in-depth exploration of patient experiences within one specific remote monitoring program rather than generalizable conclusions about all remote monitoring initiatives. Critical Selection Bias Limitation: Our participants represent a highly selected group who first volunteered for the RPM program and then volunteered again for research participation, with response rates of only 57% for both surveys (43/76) and interviews (13/23). This creates significant non-response bias, which is a critical threat to both internal and external validity. Participants are likely more motivated, technologically adept, satisfied with their care, or positively disposed toward the healthcare system than typical COPD and diabetes patients. The overwhelmingly positive findings, including strong relationship themes and survey ceiling effects, may be artifacts of this selection bias rather than true reflections of program impact on average patients. This severely limits generalizability, as policymakers and program designers cannot rely on data from a small, atypical group to plan services for diverse patient populations that include less engaged, less healthy, or harder-to-reach individuals. Using a purpose-developed survey instrument without comprehensive psychometric validation further limits quantitative conclusions. However, the consistency between qualitative themes and survey responses, combined with alignment with existing literature [9,14,28], suggests our findings offer valuable insights for program development and future research directions.

5.2. Future Research Directions

Given the exploratory nature of this study, several research priorities emerge. Large-scale quantitative studies with adequate power for subgroup analyses by disease type, age group, and baseline health literacy levels are needed to validate these preliminary themes. Longitudinal research examining how patient experiences evolve over extended monitoring periods would address temporal limitations in our cross-sectional design [28]. Comparative studies across different remote monitoring platforms and healthcare contexts would establish the transferability of our findings beyond this specific program. Additionally, intervention studies testing the integration of health literacy enhancement strategies within remote monitoring programs could evaluate the practical applications of our theoretical framework [15,23].

6. Conclusions

This exploratory study examined patient experiences within a specific home-based remote patient monitoring program supporting chronic disease self-management. Using a mixed-methods approach with COPD and diabetes participants, two key themes emerged: "knowing" and "relationship." These themes provide a framework for understanding how patients experience technology-mediated care within this program context, though findings require validation across larger, more diverse populations. The "knowing" theme revealed how patients used daily data submission to develop greater awareness of their health conditions, while targeted education enhanced their self-management capabilities. The "relationship" theme highlighted the critical importance of meaningful connections with healthcare providers and the reassurance provided by clinical oversight.

Rather than definitive conclusions about remote monitoring effectiveness, these findings offer preliminary insights that warrant further investigation with larger, more representative samples. For practitioners implementing similar telehealth services, our results suggest potential design principles emphasizing both knowledge development and relationship-building components, though these require validation across diverse patient populations and program contexts. Future research should examine these themes with adequate sample sizes for statistical analysis and include diverse demographic and clinical characteristics to establish broader generalizability.

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