

Assessing the Viability of Remote Patient Monitoring in High-Risk Oncology Populations

Irene Alcoceba-Herrero^{1,2}, María Begoña Coco-Martín^{1*}, José María Jiménez-Pérez², Luis Leal-Vega¹, Adrián Martín-Gutiérrez¹, Carlos Dueñas-Gutiérrez³, José Pablo Miramontes-González⁴, Luis Corral-Gudino⁴, Flor de Castro-Rodríguez⁵, Pablo Royuela-Ruiz⁶, Juan Francisco Arenillas-Lara^{1,7}

¹Applied Clinical Neurosciences Research Group, Department of Medicine, Dermatology and Toxicology, University of Valladolid, 47005 Valladolid, Spain.

²Department of Nursing, University of Valladolid, 47005 Valladolid, Spain.

³Department of Internal Medicine, University Clinical Hospital of Valladolid, 47003 Valladolid, Spain.

⁴Department of Internal Medicine, Rio Hortega University Hospital, 47012 Valladolid, Spain.

⁵Emergency Medical Services Direction, SACyL, 47006 Valladolid, Spain.

⁶Technical Direction of Primary Care, SACyL, 47006 Valladolid, Spain.

⁷Department of Neurology, University Clinical Hospital of Valladolid, 47003 Valladolid, Spain.

*E-mail ✉ mbcoco@uva.es

Abstract

Posthospital care aims to enhance patient access to providers and reduce avoidable readmissions. This study assessed the feasibility, barriers, and influencing factors associated with implementing remote patient monitoring (RPM) for oncology patients at the Hartford HealthCare Cancer Institute (HHC) in Hartford, CT, and across a statewide health system. A mixed-methods approach was employed, combining quantitative surveys with qualitative interviews and focus groups to gather insights from hospital stakeholders. The focus was on organizational culture, leadership, learning capacity, and available resources for RPM implementation. Surveys were distributed between September 1 and 30, 2022, and responses were analyzed based on frequency and percentage. Items with the highest rates of neutral or negative responses informed subsequent qualitative data collection. Purposeful sampling was employed to recruit stakeholders and patients for interviews and focus groups conducted between January 1 and 30, 2023. Organizational maps were created to visualize current and prospective clinical workflows. Of 63 stakeholders invited to complete the readiness for implementation survey, 53 responded (84% response rate), with 67% supporting RPM to improve patient care. The interviews and focus group discussions revealed stakeholder perspectives on readiness for change, organizational climate, resource availability, and perceived barriers and facilitators to change. In total, 78 participants—including survey respondents, Patient and Family Advisory Council (PFAC) members, and hospital staff—were invited to participate in qualitative data collection, with 52 individuals (67%) agreeing to participate. 8 one-on-one interviews and six focus groups were conducted. Key themes included integrating RPM into existing systems, relevance to care teams, and prioritizing patient- and family-centered care. Additional subthemes were also identified. Stakeholders supported RPM as a means to enhance communication and improve access to care for patients with oncology. Providers emphasized critical success factors, including dedicated intervention teams, effective response protocols for symptom alerts, and system-wide access to clinical data. Patient participants underlined the importance of incorporating patient-centered design into RPM program development.

Keywords: Sexual oncology, Cancer, Remote patient monitoring, Feasibility, Usability, Stakeholders

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Introduction

The primary objective of post-hospital oncology care is to prevent unnecessary readmissions by improving patient access to care and communication with healthcare providers [1–5]. Traditional care models often struggle with symptom management and continuous

communication after discharge—gaps that proactive RPM programs may help address [6–9].

RPM supports care transitions from the hospital to the home, enabling clinicians to manage symptoms through digital platforms, mobile technologies, and electronic patient-reported outcomes (ePROs) [8, 9]. Despite general support, RPM implementation faces challenges, including patient engagement, clinician workflows, provider responses to ePROs, and integration with electronic medical records (EMRs) [10, 11].

For RPM programs to succeed, especially on a broad scale, critical factors such as feasibility, provider buy-in, and infrastructure readiness must be assessed. Failure to identify these elements risks unsuccessful implementation of ePRO-integrated systems [10, 11].

This study focuses on understanding organizational factors that affect RPM adoption at Hartford HealthCare Cancer Institute (HHC), particularly for oncology patients. The study includes four specific aims:

1. Assess current care models and processes used for symptom management from admission to post-discharge.
2. Evaluate the perceived utility, control, and technical requirements of an organizational RPM program.
3. Explore communication dynamics and challenges faced by nurses and providers.
4. Identify barriers and facilitators to scaling RPM systems for oncology patients after hospital discharge.

This research was conducted in partnership with Memorial Sloan Kettering Cancer Center (MSK), a leader in RPM innovation [10–14]. The study's findings aim to guide future strategies at HHC for identifying high-risk oncology patients and utilizing digital tools to effectively monitor clinical and ePRO data [11].

Materials and Methods

The feasibility study was conducted at HHC, a statewide medical and cancer center, in collaboration with MSK, a nationally recognized comprehensive cancer center located in the northeastern United States. A holistic, multimodal approach was used:

- Quantitative surveys were administered in aim 2.
- Qualitative interviews and focus groups informed aims 3 and 4 [15–19].

In aim 1, researchers mapped both current-state and future-state clinical workflows [20, 21], identifying patient pathways from pre-admission to post-discharge, and key integration points for future RPM systems.

The Consolidated Framework for Implementation Research (CFIR) [20, 21] guided the study, enabling the evaluation of stakeholder experiences, satisfaction, perceived value, and concerns regarding RPM implementation. A visual representation of the RPM study structure is provided in **Figure 1**.



Figure 1. RPM changing how we provide care for our patients.

Ethical considerations: data privacy and security

All participants received email invitations detailing the study scope and data collection process. Participation was entirely voluntary, with the option to withdraw at any point. Since all stakeholders were employees of Hartford HealthCare (HHC), only role- and department-level

demographic data were collected to ensure anonymity and confidentiality. Smaller participant categories were combined when necessary to prevent potential identification. Consent was considered obtained when stakeholders accessed the secure, password-protected survey portal and were assigned an anonymized

identification number. For interviews and focus groups, participants provided verbal consent to be recorded and were also assigned ID numbers to maintain confidentiality.

Sample

The study sample included key stakeholders involved in developing and implementing RPM systems. Participants represented a range of roles, including nurses, technicians, administrators, IT professionals, medical and radiation oncologists, and advanced practice providers (APPs). APP responses were grouped with physicians and radiation oncologists, reflecting their collaborative clinical practice. Additionally, patient participants from the HHC Cancer Patient and Family Advisory Council (PFAC) were recruited to participate in both surveys and qualitative sessions.

Data collection

Stakeholders were recruited via an internal email that included a link to the web-based consent form and a 15-minute online survey [22]. Data collection occurred between September 1 and September 30, 2022. The survey instrument used was the Readiness for Implementation Survey [23], a validated 38-item tool assessing organizational readiness across various domains, including culture, climate, leadership engagement, and available resources. Responses were scored using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree), and subscales were computed by averaging responses within units and across construct items. Internal consistency reliability scores ranged from good ($\alpha \geq 0.7$) to excellent ($\alpha \geq 0.9$). Demographic information related to the participants' organizational roles ensured representation across departments.

Based on survey findings [23], an interview guide was developed using a funnel approach [24], beginning with general prompts and narrowing to specific, open-ended questions. The guide focused on four main areas:

1. General understanding of the RPM program
2. Barriers and challenges encountered
3. Impact of RPM on clinical workflows
4. Recommendations for improvement.

Qualitative methods

Semi-structured interviews and focus groups were conducted by principal investigators (AMME, RMD, HDY) between January 1 and January 30, 2023. Stakeholders who were unable to attend the focus groups were offered individual interviews. Focus groups

averaged 8–10 participants from similar clinical or administrative roles. One session was integrated into a scheduled provider staff meeting, accommodating approximately 20 participants, who had the option to opt out. A separate focus group with adult patients ensured incorporation of the patient voice into RPM development.

All participants provided verbal consent before their sessions, which were audio-recorded using encrypted devices. Each session lasted approximately 60 minutes and was transcribed verbatim by the research team for further analysis.

Analysis plan

Survey responses

Survey data were first reviewed for completeness and missing values, then exported to a de-identified Excel spreadsheet for further analysis. Demographics and survey results were summarized descriptively. Due to low representation in specific roles, responses were aggregated across stakeholder groups. Frequencies and percentages were calculated for each Likert response category: strongly agree, agree, neutral, disagree, and strongly disagree [23]. Survey items with 40% or more neutral or disagreement responses were flagged to inform the development of the qualitative interview guide.

Interview and focus group analysis

Qualitative data were analyzed following the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines [25]. To ensure rigor and accuracy, researchers confirmed interpretations of stakeholder statements by restating responses and seeking verbal confirmation. Transcripts were analyzed independently by two researchers using thematic content analysis [26]. A qualitative methods expert (MBB), in collaboration with the interviewers, reviewed stakeholder responses and collaboratively developed overarching themes and subthemes, achieving consensus on the most accurate representation of participant perspectives.

Results and Discussion

Organizational workflow mapping

A comparative analysis of pre- and post-study workflow maps [20, 21] revealed that existing ePRO pathways already incorporate validated patient self-management tools. These tools have the potential to be enhanced and

aligned with evidence-based practices to support RPM-based symptom management.

Readiness for implementation survey

Out of 63 invited stakeholders, 53 completed the survey, yielding an 84% response rate. Respondents represented a wide range of roles across the healthcare organization (**Table 1**). Results reflected strong agreement with statements indicating an organizational culture that supports innovation, particularly around adopting RPM. Respondents also agreed (67%) that RPM could enhance patient engagement after discharge.

However, the “available resources” subscale showed a higher proportion of neutral responses, reflecting uncertainty or concern regarding organizational readiness, especially around funding (41%), staff training (33%), and equipment availability (33%). Additionally, notable percentages of stakeholders expressed neutral or disagreeing views on key areas seen as potential barriers to RPM implementation: patient education and awareness (46%), clinician buy-in (46%), and the need for a dedicated intervention team (41%).

Table 1. Distribution of survey participants by organizational role (total respondents: 53 out of 63 invited (84% response rate))

Role in organization	Percentage (%)	Number of respondents*
Inpatient nurses	22	11
Outpatient nurses, radiation oncology nurses, and technicians*	35	17
Physicians (medical/surgical), radiation oncologists, and advanced practice providers*	27	13
Administrators (all levels)	12	6
Information technology specialists	4	2

*Note: Some roles (e.g., radiation oncology nurses and technicians, advanced practice providers with physicians and radiation oncologists) were grouped to preserve anonymity due to small group sizes. Four respondents did not provide demographic information related to their role.

Interviews and focus groups

Invitations to participate in interviews were extended to 78 stakeholders, including the original 63 survey recipients, as well as an additional 15 individuals: 9 patients from the HHC Cancer Patient and Family Advisory Council (PFAC) and six staff members. The final group consisted of 52 participants, with 8 completing individual interviews and six participating in focus groups. Notably, approximately 67% of those who

completed the survey also participated in the qualitative sessions (**Table 2**).

Stakeholders shared a mix of enthusiasm and concerns regarding the integration of RPM into existing clinical workflows. Analysis of their feedback revealed three key themes: incorporating change within hospital systems, the importance of RPM to patient care teams, and prioritizing patient- and family-centered care. These central themes were broken down into several related subthemes for deeper exploration (**Table 3**).

Table 2. Participant distribution for interviews and focus groups (invitations sent: 78; participants: 52 responded and took part (67% response/participation rate))

Role/Organization	Percentage (%)	Number of participants
Patients*	13	7
Radiation oncology staff and technicians	10	5
Nurse leaders	17	9
Staff nurses	10	5
Medical, surgical, radiation oncologists, and advanced practice providers (APPs)	25	13
Administrators	15	8
Information technology specialists	10	5

Average tenure: Years at organization: 11.2 years (range: 0.1–40.0 years); years in current role: 4.3 years (range: 0.1–22 years)

*Note: Patients were not asked about years at the organization or their role.

Table 3. Themes and subthemes

Theme no.	Theme	Description	Subthemes
1	Drivers for change: incorporating change into hospital systems	Focus on key factors influencing organizational transformation	- Availability of resources - Measuring return on investment and performance indicators - Organizational support for change initiatives
2	Significance to patient care teams	Emphasizes teamwork and improving clinical workflows	- Team collaboration - Enhancing communication among all healthcare professionals - Implementing and maintaining operational systems
3	Patient- and family-focused care	Prioritizing patient experience and engagement	- Patient access and overall care experience - Challenges patients face when using technology - Respecting patient choices and preferences

Theme 1: Why change? integrating change into hospital systems

Stakeholders were generally supportive of implementing RPM, but emphasized that successful adoption depends heavily on the availability of resources and evidence of a return on investment. Three key subthemes emerged: necessary resources, return on investment, and measurable outcomes, and institutional support for change. Selected quotes illustrate these points.

Subtheme: resources

Concerns were raised about insufficient resources to develop and implement RPM programs. Many stakeholders noted that nursing staff are already at full capacity, and adding RPM responsibilities without additional personnel would be challenging. They recommended having dedicated staff with relevant expertise and specialized training on RPM to enhance program success.

“One barrier I see is that our nurses are already stretched thin. It’s uncertain how much more workload this would add. Even if it’s not much long term, the concern about overburdening existing staff is real when implementing something like this.” (59r3p4).

Subtheme: return on investment and metrics

Stakeholders suggested conducting preliminary evaluations or proof-of-concept studies to assess RPM’s impact, especially regarding reimbursement and proactive symptom management to reduce morbidity and mortality. They also highlighted the need to consider social determinants of health that might affect patients’ ability to use technology for ePRO and RPM. Some concerns were expressed about integrating RPM software with community hospitals’ existing enterprise systems;

however, confidence remained high in the IT team’s ability to support the integration.

“We need to define clear metrics. Starting with a small proof-of-concept could help us learn and gradually build, instead of waiting to have everything perfectly in place before beginning.” (53r1p10).

Subtheme: support for change

Stakeholders endorsed the RPM implementation and highlighted a culture of innovation within the institution as a key enabler of its success. They viewed the organization’s flexibility and willingness to adapt as crucial for supporting new initiatives. Many felt RPM should be expanded across oncology and other services. Patient representatives appreciated the care providers’ dedication, but also noted that complex healthcare systems can hinder seamless communication. The success of RPM depends on its ability to overcome these communication challenges and integrate seamlessly into existing workflows.

“I believe the Harry Gray Center has the capacity, and the physicians and nursing staff have grown tremendously over the past four years. The care provided is excellent.” (65r1p3-4).

Theme 2: relevance to patient care teams

The importance of fostering strong relationships and communication among hospital-wide healthcare teams was highlighted to improve care coordination. Key areas include teamwork, enhancing information sharing, and integrating RPM systems into clinical workflows.

Subtheme: collaboration among teams

Effective patient care depends on collaboration across clinical and healthcare provider teams. Stakeholders noted communication gaps, such as when attending physicians are unaware of patient admissions until

discharge. There were concerns about how providers access patient information within the EMR and the need to facilitate smooth transitions from inpatient to outpatient care by sharing key data. Access to ePRO results by all relevant providers was deemed essential, regardless of their direct responsibility for symptom management. Managing alerts from ePRO responses was a significant concern, leading to strong support for a dedicated central team—comprising providers and nurses—to handle these alerts and ensure program effectiveness.

“For example, a patient admitted with a pulmonary embolism—should the hospitalist or pulmonologist manage it? Why wasn’t Hematology-Oncology consulted? The patient might stay several days, go home, and only then do we find out about it.” (54r1p7).

Subtheme: enhancing communication of information across healthcare teams

Stakeholders consistently emphasized that RPM data should be integrated into dashboards and/or the EMR and made accessible throughout the organization’s complete care continuum, especially across consulting teams such as home care and regional sites. They noted that medical oncology and home care operate in silos regarding who is responsible for addressing patient information in the EMR. Currently, patients must contact each oncology specialty—medical, surgical, or radiation—separately, based on their individual needs. Medical oncology services are based regionally, while other departments are on the main hospital campus. Stakeholders emphasized that ensuring transparency and sharing information across departments and locations is crucial for keeping the entire care team informed and enhancing communication organization-wide. This also raised concerns about the logistics of coordinating patient care related to home services and hospital access. The findings highlighted the need for a dedicated individual to oversee and facilitate enterprise-wide patient care coordination.

“That’s another aspect. Perhaps patients should respond to surveys as best they can, but you also need someone to triage symptoms. For instance, hives, high blood pressure, and dizziness likely fall under the purview of medical oncology, whereas bleeding or difficulty moving an arm might require surgical intervention. So, you’d need someone to filter these.” (62r4p11).

Subtheme: operationalizing systems

Stakeholders emphasized the need for RPM systems to efficiently generate alerts from ePRO assessments, routing them promptly to the appropriate providers and care teams. In high-functioning teams, all relevant providers should receive alerts to support patient management. However, concerns were raised about the workflow burden caused by the volume and timing of ePRO alerts, including those after hours and on weekends, which disrupt everyday workflows. Stakeholders suggested reviewing existing provider workflows and ensuring RPM systems allow customization, enabling providers and consultants to tailor alert settings and track their patients across various regional sites for admissions, discharges, or emergency visits.

“There’s a technical side to managing this, but also a question of how we reorganize daily workflows to integrate this properly.” (52r1p3).

Theme 3: patient- and family-centered care

Alongside staff stakeholders, members of the Patient and Family Advisory Council (PFAC) shared their perspectives on access to care, challenges with technology, and RPM preferences.

Subtheme: patient experience and access to care

Patient stakeholders emphasized that RPMs must be user-friendly. If the technology is challenging to use, prone to issues, or if patients don’t perceive any benefit, engagement will decline, undermining program success. PFAC members emphasized that accessible, reliable RPMs foster stronger connections between patients and their care teams.

“I mentioned earlier the lack of resources and proper technology. People are excited at first and willing to try it, but if problems persist, their tolerance will quickly wear out.” (56r1p3).

Subtheme: patients struggling with technology

PFAC participants noted that some patients can manage mobile technology independently, while others require assistance from caregivers to complete ePRO responses. Challenges include language barriers, elderly patients, and those with cognitive impairments. They recommended program designs that allow shared access among patients, caregivers, and providers, along with technology support during initial education and follow-up after discharge. “Many Hispanic women with breast cancer use MyChart, but the problem arises when they submit something in Spanish—nurses who don’t speak

Spanish receive it, creating barriers. This is something to consider for the feasibility of the program and how to minimize such issues.” (59r10p11).

Subtheme: patient preferences

Members of the PFAC group supported the program’s goal to enhance direct communication between patients and healthcare providers through timely responses using RPM messaging. They expressed that reaching physician offices by phone is often difficult and rarely results in prompt replies from the medical team. PFAC participants expressed discomfort with relying on technology, recalling frustrating experiences with automated call systems and lengthy hold times that often resulted in not speaking to a live representative. They strongly emphasized the need for human connection and respect for patients’ time, physical symptoms, and emotional needs when designing the RPM system. Their ideal RPM was described as combining “high tech with high heart.” “Every patient wonders, ‘Am I just a part of a text program?’ Is there real human interaction? That’s the reality of the world now. However, after watching the video example from MSK, it seemed straightforward and clear. One promising feature was the promise of a callback within a set number of hours, which is far better than calling an office and waiting endlessly. If all these elements could be implemented, blending high tech with high heart would be ideal.” (65r2p4).

This feasibility study investigated the perspectives of key staff, patients, and administrators regarding barriers and facilitators to implementing community-based RPM programs for oncology patients. Currently, HHC’s cancer institute does not have an RPM program; thus, it partnered with MSK, which has an established RPM system, to lay the groundwork for future implementation at HHC. Given this context, the study did not collect data on patient adherence, satisfaction, or health outcomes such as engagement, readmission rates, or symptom improvements. Instead, it focused on factors like readmission metrics, labor costs, and necessary resources to support feasibility planning. While these findings are not fully generalizable to HHC, previous studies on MSK RPM implementation have been reported from an oncology perspective [1–3, 6, 10–13, 27, 28]. Stakeholders indicated intentions to assess patient engagement, symptom control, and 30-day post-discharge readmissions in future pilot studies to evaluate potential costs and return on investment for RPMs.

The project team and stakeholders created an organizational map that detailed the patient’s journey from pre-hospital admission through post-discharge care. This mapping highlighted clinical points where oncology patients experience the most significant symptom burden, particularly after discharge. RPMs are designed to support patient self-management and provide immediate responses to symptoms and healthcare concerns. Early MSK RPM results demonstrated patient satisfaction and proactive symptom management after discharge [1–3, 6, 10–14].

Stakeholder survey responses demonstrated strong overall support for RPM, but also highlighted several barriers, including limited system resources, the need for user buy-in, and the necessity of a dedicated intervention team to ensure success. These findings aligned with themes from interviews and focus groups, where participants underscored the importance of having a dedicated individual—ideally an experienced nurse clinician—who understands clinical workflows and can lead the intervention team. This lead responder would manage alerts and communicate with all clinicians involved in patient care.

Another major challenge was handling the volume of symptom alerts generated by RPM, which could overwhelm nursing workflows—an issue noted in previous RPM research [1–4, 10–14]. Initial RPM development plans should consider personnel costs and workflow adjustments to effectively manage incoming alerts. Future efforts will focus on evaluating resources to support communication among nurses, providers, and patients, as well as addressing barriers to patient access to care through electronic patient-reported outcomes (ePROs) [29–31].

Both hospital staff and patient stakeholders acknowledged the value of RPM as a crucial initial step toward expanding oncology patient care across the organization’s statewide network. The overall positive attitudes align with results from a multisite study on electronic patient-reported outcomes (ePROs) [27] and similar organizational research [10–14]. However, a significant challenge for HHC’s RPM implementation lies in managing how alerts are viewed and handled by providers and consulting teams throughout the state. Addressing this workflow issue is essential to establish clear accountability for responding to RPM alerts and deciding whether alerts should be entered into the electronic medical record (EMR) immediately or after action is taken. Successfully resolving this issue will

improve communication among patients, providers, nurses, and consulting teams, as well as enhance data sharing and patient care statewide [9, 27].

The IT team strongly advised stakeholders first to define the specific outcomes they expect from the RPM program, alongside gaining a thorough understanding of patient care workflows and staff workload [8]. Staff emphasized that optimizing the system largely depends on enabling all providers and healthcare teams to access symptom alerts [27]. They believe that RPM initiatives will enhance oncology care and provide a solid foundation for expanding implementation statewide [32, 33]. Integrating RPM tools within the organization's EMR allows providers to view patient information and communications across hospitals and regional centers, improving care coordination. Providers can customize their dashboards to receive or opt out of alert notifications depending on their preferences and clinical locations. This flexibility ensures timely and visible access to relevant patient information [27].

PFAC members valued RPMs especially for providing prompt responses to symptom concerns. They also highlighted potential barriers, including limited access to technology, language challenges, and difficulties some patients may face in using RPMs. They suggested incorporating strategies to engage patients less familiar with technology [34]. Several patients noted the importance of shared access for caregivers to respond to provider messages on their behalf. The insights gained from this study will guide future larger-scale research testing RPM implementation with oncology patients at community hospitals and cancer centers, evaluating investments in technology and staffing [14].

This study's strengths include comprehensive survey feedback and candid interviews from hospital stakeholders, which offered detailed guidance for designing patient care workflows that support RPM programs. The study was limited to assessing feasibility within a single community hospital and cancer institute oncology population; however, the stakeholder perspectives may inform the expansion of RPM initiatives to other departments and healthcare facilities worldwide.

Conclusion

Hospital and patient stakeholders agreed that RPM programs will enhance oncology care and lay the groundwork for wider state-level adoption. Providers

emphasized the need for dedicated healthcare teams to manage RPM programs and develop effective strategies for handling symptom alerts. Patients noted that RPM systems should integrate patient-centered support with digital tools, including features that enable families and caregivers to access medical records, thereby enhancing communication among patients, providers, and caregivers.

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