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DOI
10.1145/3679318.3685399

Publication date
2024

Document Version
Final published version

Published in
NordiCHI '24

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ABSTRACT

Remote Patient Management systems (RPM) are crucial for addressing healthcare workforce shortages. These systems are often designed with a specified focus on clinical functionalities, without proper consideration for human-centric concerns. A *care* perspective is essential not only to acknowledge patients as people, but also to foster better quality of care and, ultimately, adoption. This highlights the gap of how RPM can embed caring. This work offers a systematic literature review aimed at developing "Caring RPM", a normative framework that integrates the philosophy of caring from nursing theory into RPMs. This framework underwrites the practical, moral, and relational aspects of patient care, including actionable recommendations to recalibrate RPM systems for more effective human-centric design. The framework can inspire new ways of embedding the caring dimension into HCI design practices.

CCS CONCEPTS

• **Human-centered computing → HCI theory, concepts and models**; **Interaction design theory, concepts and paradigms**; **HCI theory, concepts and models**.

KEYWORDS

health, care, human-centric care, caring, RPM, human-centered design, patient-centered design

ACM Reference Format:
Céline Offerman, Jacky Bourgeois, and Alessandro Bozzon. 2024. Embedding caring into remote patient management systems. In *Nordic Conference on Human-Computer Interaction (NordiCHI 2024), October 13–16, 2024, Uppsala, Sweden.* ACM, New York, NY, USA, 13 pages. https://doi.org/10.1145/3679318.3685399

1 INTRODUCTION

Remote Patient Management systems (RPM) are increasingly recognised as critical in addressing the healthcare workforce shortages. With projections indicating a need to triple the healthcare workforce by 2060 [91], RPM represents a necessary technological response to a looming healthcare crisis. Functioning as medical feedback loops, RPMs facilitate healthcare delivery to patients' homes [19]. The primary objectives of RPM include but are not limited to early detection of health issues, support for chronic disease management, and reduced hospital visits. This marks a move towards a more resilient healthcare model suited to meet the demands of a growing population requiring care [9].

However, Czech et al. [14] and Soubutts et al. [85] stress the absence of human-centric care. Human-centric care views patients as whole persons with needs extending beyond medical treatment. Simply sending a patient home with a box of sensors and an app without considering the broader social and personal context can lead to numerous issues. RPM often treat patients as isolated entities, ignoring the broader network of informal caregivers—partners, relatives, friends, and others—who play crucial roles in the caregiving process [25]. Next to its limited scope, RPM can lead to ethical issues, such as privacy violations [8], aggravated inequalities in the distribution of care [84], and the undervaluation and undercompensation of informal caregivers [68]. An example of this is seen in the deployment of homecare technology. These technologies are designed to support caregiving activities through features like remote monitoring. On the one hand, these features can enhance the caregiver's ability to provide timely and effective support. On the other hand, remote monitoring introduces serious concerns regarding the privacy and autonomy of those being cared for [28]. There emerges a need for RPM that not only pushes the envelope in technological capabilities but also resonates with the lived experiences of patients and their informal caregivers. We conclude that integrating human-centric care into RPM is not only a technical challenge but also a social and ethical one.

The HCI community has provided some insights into homecare and self-tracking via design manifestos and frameworks [31, 32]. These works provide meaningful knowledge on how to care for someone from the lens of HCI. Instead of learning what it is *to care* from a HCI perspective, we turn to the the experts on caring, by capturing theoretical insights from nursing. Kari Martinsen, a prominent nursing theorist, offers an understanding of caring rooted in phenomenology and existential philosophies [46–60]. She advocates recognising and responding to patients as whole persons with unique experiences and needs. We decided upon this philosophy for it is not only theoretically rich but also practically applicable, as demonstrated by its successful integration into nursing education and practice, particularly in Scandinavia [4].

In this paper, we address the question: **how could the philosophy of caring inform the design of human-centric remote patient management systems?**. To clarify our approach, in this paper, we specifically discuss "human-centric care" as opposed to "care" as it can be ambiguous and overly broad, occasionally mixed up with a disease-oriented focus. Human-centric care, as we define it, considers patients as whole persons with diverse needs that extend beyond medical treatment, aligning with the definition of comprehensive patient care [21].

To address our research question, we conduct a systematic literature review to understand how this philosophy has been applied

NordiCHI 2024, October 13–16, 2024, Uppsala, Sweden

ACM ISBN 979-8-4007-0966-1/24/10
https://doi.org/10.1145/3679318.3685399

in existing care practices. Through reflexive thematic analysis, we extract and integrate insights on the application and expansion of the philosophy of caring within the RPM context (Figure 1). With this approach, we do not aim to provide an exhaustive overview of the philosophy of caring, but rather to investigate its intersections with RPM.

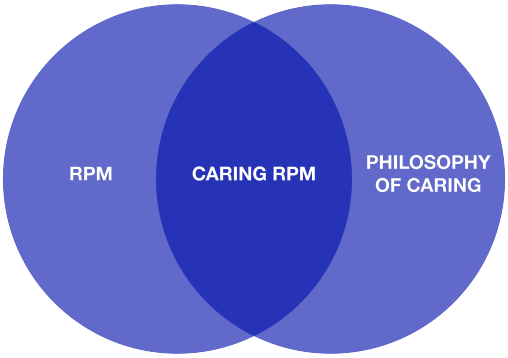

Figure 1: This paper introduces the concept of "Caring RPM", sitting at the intersection of RPM and the philosophy of caring.

We contribute a normative framework named "Caring RPM", designed to integrate the philosophy of caring into RPM. Our framework emerges from the analysis as a set of actionable recommendations designed to embed a human-centric approach into RPM. "Caring RPM" is created to benefit HCI researchers, developers and designers to add caring to their technical systems. We are profoundly inspired by Alfrink et al. [3] for our understanding of what a design framework entails. Directly following their footsteps, we view a design framework as "generative intermediate-level design knowledge" [39]. "Generative" indicates that it provides the initial idea for a design solution with specific characteristics, without dictating the exact form it should take. "Intermediate-level" suggests it bridges the gap between individual design examples and generalised theory. Our framework focuses on the specific attributes of RPM within a caring context, based on existing insights about caring. It is intended to guide the development of RPM. Our understanding of a "design framework," following Obrenović [72], is that it outlines the qualities a design solution needs to possess to meet certain objectives within a specific situation. In our case, the aim is to incorporate caring within the context of RPM.

2 BACKGROUND

2.1 Remote patient management systems

RPM are medical feedback loops with interconnected components for effective healthcare delivery at-home [19]. This section synthesises an overview of RPM's structure, as detailed in Figure 2. These systems are specifically designed for the disease and patient group they serve, meaning that no single system can meet the needs of all patient types. The core components of RPMs can be divided into three main categories: data collection, system functionalities, and communication facilitation, primarily between patients and healthcare providers. These components are mapped in Figure 2 across the existing structure of RPM, which can be described in four key levels. These levels can be categorised under design philosophy (the *why* and *how*), and its manifestation in RPM (the *what*). In Section 4, we map the "Caring RPM" framework onto these levels, demonstrating how human-centric care can be embedded within each aspect of RPM. The four levels include:

- Design philosophy, purpose: why the RPM is created.
- Design philosophy, design method: how the RPM is created.
- Manifestation in RPM, business logic: the operational rules and processes that govern the functioning of the RPM.
- Manifestation in RPM, UX/UI: elements that shape how users interact with the RPM.

It is important to note that the design methods used for RPMs are rarely disclosed in existing literature, and are therefore not included in our comprehensive overview. Accordingly, they are depicted in grey in Figure 2.

2.1.1 Data collection. At the core of RPM lies its ability to collect health data from patients via a variety of modalities, for it enables us to actively see how the patient is doing over a distance. This typically involves deploying sensors [35, 37, 67, 86], which may be wearable devices integrated into phones [12, 88], clothing [73, 90], or worn separately [2, 41], sensors embedded in the living environment [1, 90], and even implanted devices [22]. Additionally, data collection extends beyond sensor use to include annotations [33, 36], self-reported measures [38, 74, 86], and other human-in-the-medical-feedback-loop approaches. This data informs clinical decisions, such as when concerning at-home blood values prompt further hospital-based analyses like CT scans [93].

2.1.2 System functionalities. The effectiveness of at-home collected data largely depends on the patient's (or informal caregiver's) willingness and ability to engage with the data collection methods. However, only a few RPM systems focus on enhancing usability. These systems incorporate features such as e-learning modules, user-friendly interface interactions, and timely alerts for actions [34, 64, 94]. For example, only one system uses AI to optimise the timing of prompts, aiming to increase response rates while minimising disruptions during inconvenient times [5].

2.1.3 Communication facilitation. These systems often include communication channels that enable interactions between patients and healthcare providers, facilitating the exchange of messages or video calls to enhance the care process [5, 37, 43, 61, 67]. However, informal caregivers are rarely included as key participants in these communications. An example of effective use of these communication lines is providing patients with specific measurement results that may impact their treatment decisions [93].

This section has delineated how the three core components of RPM are mapped on the four key levels of the system. A review of a substantial amount of studies indicates a predominant emphasis on technical capabilities, neglecting the the caring aspect of healthcare. We will now transition to exploring the philosophical underpinnings of the philosophy of caring, providing a comprehensive picture of the lens we aim to integrate into RPM.

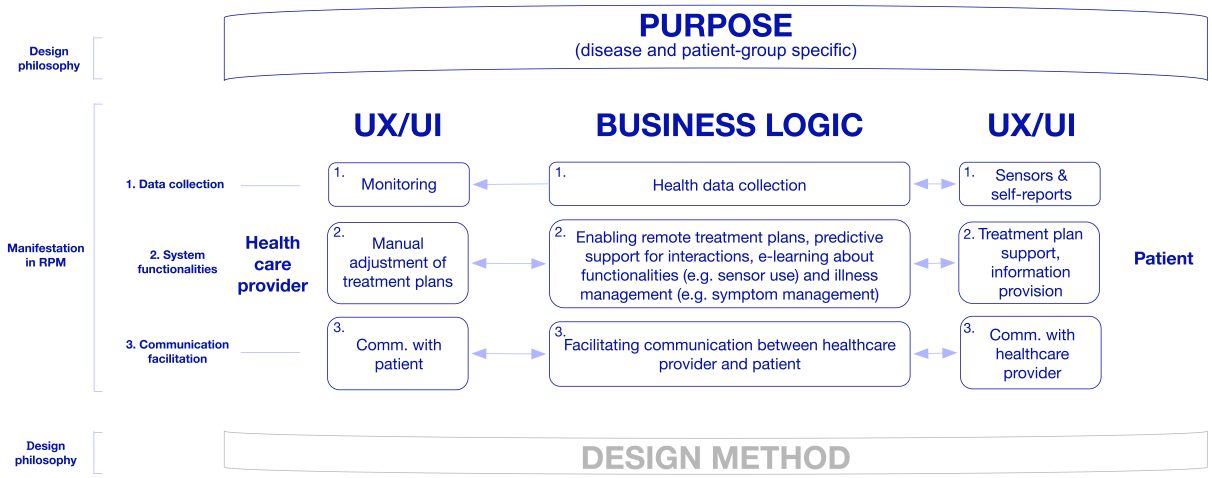

Figure 2: Structure of current RPM. Each horizontal row within the "Manifestation in RPM" section corresponds to a core component category: "1" represents data collection, "2" denotes system functionalities, and "3" indicates communication facilitation. The design method is coloured in grey to highlight its rare mention in existing RPM literature.

2.2 Philosophical underpinnings that inform the philosophy of caring

Understanding Kari Martinsen's philosophy of caring requires placing her ideas within a broader philosophical context. Kari Martinsen, a Norwegian nurse and philosopher, explores the essence of caring in healthcare, challenging the reductionist tendencies of medical science and promoting a comprehensive, human-centric approach to patient care [4]. Starting her career as a nurse, she questioned how care could be provided when medical science focuses primarily on diseases, which led her to pursue a degree in philosophy [4]. Martinsen's philosophy of caring advocates for nurses to "not only see, listen and touch clinically, but to see, listen and touch clinically in a good way" [50, p. 147]. Her background informs her critique of the objectification of patients, stressing the importance of seeing them as whole persons. Foucault describes the 'clinical eye' as analytic, breaking down medical phenomena to understand their genesis [16]. Martinsen argues that medicine needs to develop a 'perceiving eye' to facilitate care in medical encounters [59].

Martinsen draws on the philosophies of Edmund Husserl, Maurice Merleau-Ponty, Martin Heidegger, and Paul Ricœur, among others [4]. From these thinkers, she develops a multidimensional view of caring that opposes the dominant positivist and objectivist paradigms prevalent in medical science [16]. This philosophical discourse supports a care approach that deeply considers the human aspects of health, making a case for empathy, dignity, and the autonomy of patients.

2.2.1 Challenging positivism: from Husserl to human-centric care. Drawing from Husserl's phenomenology, Martinsen critiques positivism, as Husserl himself challenges this paradigm through his phenomenological approach [30]. Husserl's critique highlights positivism's inclination for objectification and its impersonal stance toward individuals, aspects that Martinsen identifies as limiting within biomedical scientific inquiry and patient care. She advocates for a focus on the lived experiences of patients beyond their clinical diagnoses [45, 52, 57]. This phenomenological discourse substantiates her holistic and human-centric perspective on patient care.

2.2.2 The embodied nature of care: Merleau-Ponty's influence. Merleau-Ponty's philosophy, rooted in phenomenology, understands the body not merely as a physical object but as central to human perception and interaction with the world [63]. In the realm of caregiving, this perspective challenges us to see care as an engagement with the whole person, including their bodily experiences. This viewpoint offers an ethical perspective on care that values the embodied nature of human existence, contesting the traditional separation between caring for the mind and the body. True care, from this angle, treats the individual as an integrated entity where physical states, emotions, and thoughts are interconnected. This holistic view on caring, advocated by [45, 52, 57], respects the complexity of individuals, acknowledging how the body influences identity and experience. This sensitivity to the patient experiencing through their body means acknowledging their pain, discomfort, and other bodily states not just as symptoms to be treated but as experiences that affect the person's overall well-being and dignity.

2.2.3 Existence and interconnectedness, Heidegerian perspectives on care. Martinsen's philosophy of caring is enriched by Heidegger's phenomenology and existentialism. Central to Heidegger's thinking is the concept of Mitsein (being-together), which underscores the inherently social nature of human existence. According to Heidegger [26], we are not isolated entities but are always immersed in a world that we share with others. This notion of fundamental interconnectedness forms the basis for Martinsen's view that care extends beyond a discretionary aspect of human relationships to become an integral part of our existence and how we understand and relate to the world [46].

Care, in this context, is posited as an existential structure, thus framing caring as an ontological condition that transcends mere physical or emotional support [46]. Such a perspective redefines care from a duty to a profound aspect of what it means to be human [46, 47, 53]. Integrating care as an ontological condition also implicates the notion of Eigentlichkeit (authenticity) in Heidegger's philosophy. Authentic existence involves recognising and embracing our interconnectedness with others and the responsibilities that come with it [26]. From this, Martinsen [45] concludes that an existential approach to care focuses on the situatedness of persons, their relationships, and their context-specific needs and concerns.

Heidegger also discussed the concept of Wohnen (dwelling). He posited that dwelling is living amidst things, not merely in a physical sense but in a manner that these things become integral to one's life[27]. Martinsen applies this to healthcare environments, suggesting that objects, spaces, and the architecture of care settings play a substantive role in the caregiving process, not merely serving as a backdrop but as active elements that influence care [54–56].

2.2.4 Bridging understanding: Ricoeur's hermeneutics in caring. Martinsen integrates Paul Ricoeur's philosophical insights on hermeneutic phenomenology into her exploration of caring. Ricoeur's theory of interpretation, which sees the act of understanding as an engagement between self and other, is mirrored in Martinsen's emphasis on the relational dimension of care. According to Ricoeur, meaningful communication transcends information exchange, involving the interpretive act that makes language resonate with the unique life contexts of individuals [78, 79].

Martinsen critiques the often abstract language of medical science, advocating for a communication style that is both expressive and grounded in the concrete, practical realities of patient care. This approach ensures that medical dialogue is not only technically accurate but also accessible and meaningful to all involved parties [52].

2.3 The three ingredients of caring: practical, relational, moral

Kari Martinsen delineates three ingredients of caring interactions in the philosophy of caring: practical, relational, and moral. Practically, caring involves actions that directly address the recipient's needs. Relationally, it entails establishing a compassionate connection, where the caregiver empathetically engages with the individual's experiences to alleviate their suffering. Morally, caring respects the dignity and autonomy of the individual, which underlines an ethical approach where caregivers recognise and value the recipient's dignity and autonomy. This includes supporting the individual's involvement in their own care and providing assistance that empowers rather than diminishes. The moral dimension requires a balance, advocating for a respectful partnership that acknowledges each person's unique strengths and vulnerabilities [46, 59].

Figure 3 illustrates the the lens we adopt in this study, and how the three sub-sections of Section 2 contribute to it. In Section 2.1, we detailed the system-centric perspective prevalent in current RPM literature and described the existing structure of RPM. This structure will serve as the basis for mapping the "Caring RPM" framework. Sections 2.2 and 2.3 provided the foundation for the philosophy of caring, which serves as part of our lens. Section 2.3, in particular, described the essential ingredients of caring, which have been used as the dimensions of our reflexive thematic analysis. In Section 3, we explain our method for capturing how others have engaged with the philosophy of caring. Section 4 will further discuss how subsequent literature has expanded upon or operationalised this philosophy, interpreted within the context of RPM. This will help us bridge RPM from a system-centric to a human-centric perspective.

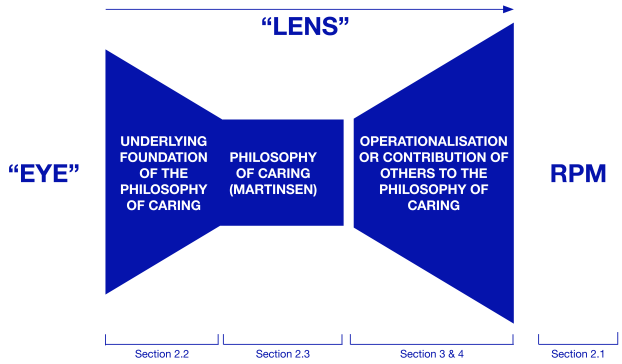

Figure 3: "Seeing" through the lens we apply to RPM, starting from foundational philosophies (Section 2.2) and essential ingredients of caring defined by Kari Martinsen (Section 2.3), to how others have used this philosophy (Section 3 & 4). By exploring how others have applied it in their work, we learn to operationalise this philosophy and embed it into the system structure of RPM.

3 METHODOLOGY

Our study explores the integration of the philosophy of caring within the context of RPM, using a systematic literature review (SLR).

3.1 Systematic literature review

Our selection process generally aligns with the PRISMA guidelines outlined by Moher et al. [65]. We used Scopus for its comprehensive indexing of peer-reviewed literature. Our SLR sought to uncover how others have expanded upon or operationalised Martinsen's philosophy of caring. Initially, we identified all papers citing Kari Martinsen, totaling 297 documents. We then refined this list by excluding documents that did not meet our specific criteria: we only included articles or reviews in their final publication stages and published in English. This filtering reduced the number to 253 documents. To further focus on our research interest, we selected papers specifically mentioning "philosophy of care" or "philosophy of caring," which brought the number down to 153 documents. After applying an open access filter, 68 documents remained, but one was inaccessible, leaving us with 67 papers for eligibility assessment. We ultimately excluded 24 papers that provided only cursory mentions of the philosophy of caring, resulting in 43 papers being included in our qualitative analysis. We excluded 24 papers only offering cursory mentions without a substantial discourse on the philosophy

of caring. This led to 43 papers that were included in our literature analysis.

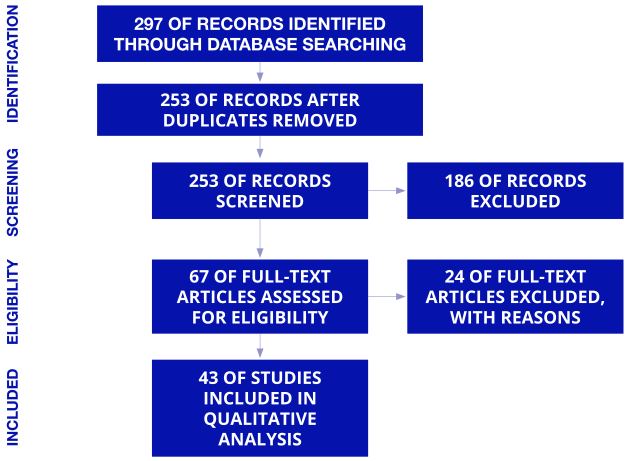

Figure 4: Identification and selection protocol.

3.2 Analysis and synthesis

Our study employs a method inspired by reflexive thematic analysis, as outlined by Braun and Clarke [7], to interpret how other scholars have expanded upon or operationalised the philosophy of caring, specifically within the context of RPM. This approach aligns with practices demonstrated by Alfrink et al. [3] and others who have successfully applied the same methodology in their systematic literature reviews. By following their lead, we ensure that our analysis adheres to established methods within the HCI community, providing a solid foundation for our framework.

This method is selected for its flexibility in application and depth in findings, allowing us to explore the nuanced ways in which the philosophy of caring has been adapted or interpreted in various settings, which we then re-contextualise within the context of RPM.

Initially, the first author close read the included sources to identify contributions to the philosophy of caring as operationalised within different caregiving scenarios. The first author identified passages that demonstrated the practical, relational, and moral dimensions of caring, as defined by Kari Martinsen and applicable to RPM. These are the three ingredients of caring as described in Section 2.3.

The first author grouped these passages based on their thematic content, assigning labels that captured their essence. This process involved clustering similar passages together and categorising them under the themes of personalised and experience-informed care, user-centric communication, upholding dignity and personhood, strength and encouragement to support recovery and integrated relational care dynamics.

After forming the initial framework, the first author conducted a thorough review by re-evaluating the selected passages and re-assessing all the source literature to ensure the framework accurately reflected the findings. This iterative process of reflexive thematic analysis involved critically evaluating and refining the themes to ensure they represented the integration of the philosophy of caring into RPM.

4 DEVELOPING THE FRAMEWORK: THEMES AND RECOMMENDATIONS FOR "CARING RPM"

This section outlines the "Caring RPM" framework, which consolidates the themes identified from the systematic literature review into actionable recommendations for RPM. We decided to present each theme directly alongside its corresponding recommendations to provide a clear and direct translation from theoretical insights to its practical application. This framework is first depicted through designerly sketches to underscore the shift towards human-centric care. These visuals describe how to adapt systems around human needs, rather than constraining human interactions to fit within predefined technology. The framework concludes with an updated system overview as illustrated in Figure 10. Each recommendation is categorised by the RPM level at which it occurs, as also detailed in Figure 10. This new overview should be seen as an added layer of caring over the current foundation of clinical capabilities, as shown in Figure 2.

The recommendations are generalisable across different RPM contexts. They are not intended to be prescriptive but rather to provide guidance that can be tailored to specific project needs. This includes considerations for systems designed for patients without any social support or non-burdensome personal informatics projects.

Figure 10 shows how these recommendations integrate into an RPM architecture, introducing new functionalities, interaction dynamics, and roles based on the comprehensive system overview from Section 2.1. The recommendations address four key levels of RPM, which we will here reiterate from Section 2.1. Firstly, the design philosophy describes the purpose why the RPM is being created. Secondly, the design philosophy outlines the design method used to create the RPM. Thirdly, how caring manifests in RPM, the business logic encompasses the operational rules and processes that govern the function of the RPM. Lastly, on how caring manifests in RPM, the UX/UI or design components that determine how users interact with the RPM.

These levels ensure that the recommendations encapsulate both the conceptual approach and the tangible aspects of RPM design, fostering a system that reflects caring on all its aspects.

4.1 Theme 1: personalised and experience-informed care

Personalised and experience-informed care emphasises customising RPM functionalities to suit each patient's unique life circumstances, moving beyond standardised recovery paths to integrate individual contexts, needs and preferences into care planning and delivery.

Tailoring care to individual needs flows from experience-informed care, which aligns with Martinsen's emphasis on understanding and responding to the unique experiences and contexts of patients [45, 52, 57]. This human-centric approach challenges traditional disease-focused one.

Researchers such as Norlyk et al. [69], Nygård and Clancy [71], and Ranheim et al. [76] document the benefits of customising care

to patient experiences, highlighting the importance of active listening and empathy in comprehending patient needs. This shift towards personalised care not only respects patient individuality but also improves care effectiveness by aligning medical interventions with each patient's life context. Additionally, Ferstad and Rykkje [15], along with Sundberg et al. [87], advocate for healthcare environments that prioritise patient dignity, autonomy, and humanity, emphasising the need for adaptable and responsive care settings.

Fæø et al. [18] and Sandnes and Uhrenfeldt [81] argue for care practices that are not only adaptable and responsive but also deeply considerate of the individual circumstances and ethical dilemmas that may arise in everyday care.

This theme illustrates that a one-size-fits-all approach is inadequate for RPM. Inspired by Martinsen's philosophy and the research of Ranheim et al. and Nygård et al., we underwrite the need for care tailored to the unique circumstances and experiences of each patient. Such an approach not only upholds patient dignity and autonomy but also enhances care effectiveness by being sensitive to specific contexts.

4.1.1 Recommendation derived from theme 1: integrate personalisation and experience-informed care.

(1) Design philosophy - purpose: broaden the scope of care to include psychological and social aspects of patients' health journeys. E.g., expand data collection, with a thorough intake concerning the informal caring system the patient can rely on, and perform regular check-ins to get a feel for the patient's mental state.
(2) Manifestation in RPM - business logic: personalise the patient journey by adapting recovery plans to each patient's unique situation. E.g. when the in-take surfaces that the patient can rely on limited informal care, the system can flag this to the healthcare provider, who in turn can reach out to homecare providers to see if there are possibilities in additionally supporting this specific patient.
(3) manifestation in RPM - business logic: customise RPM functionalities to respond to patients' particular circumstances. E.g., capture mood changes, suggesting peer support or professional help as needed.

(See Figure 5).

4.2 Theme 2: User-centric communication

User-centric communication in RPM focuses on designing interfaces and interactions that are accessible and responsive, prioritising clear and empathetic dialogue that respects the diverse sensory and cognitive experiences of users. This approach enhances users' ability to actively engage with and manage their healthcare effectively.

Accessible language is fundamental in RPM, aligning with Martinsen's advocacy for language that is both expressive and grounded, making it understandable for all parties involved [52, 78, 79]. Ranheim et al. [76] argue that our sensory experiences influence how we connect with others, which highlights the need for communication that respects these sense-aesthetic interactions.

Nygård and Clancy [71] stress the importance of attentive listening and meaningful questioning in building trust, critical for genuine dialogue. Sundberg et al. [87] distinguish between merely

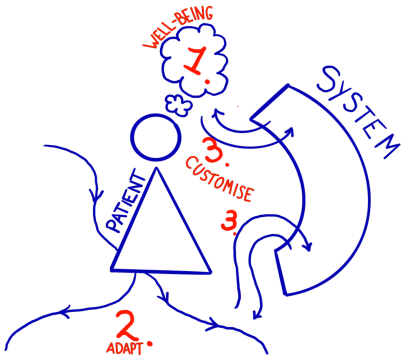

Figure 5: Illustration of the recommendations from theme 1. "1" highlights the recommendation to broaden the scope of care to include psychological and social aspects of patients' health journeys. "2" depicts the need to personalise the patient journey by adapting recovery plans to each patient's unique circumstances. "3" indicates the customisation of RPM functionalities to respond to patients' specific circumstances.

"inhabiting" a space and "dwelling" in it, which can transform patient interactions into more comforting and secure experiences.

Nygaard et al. [70] and Fæø et al. [18] discuss the importance of acknowledging and managing the power dynamics and emotional engagements inherent in caring relationships. This includes being receptive to the patient's perspective and ensuring that professional judgments do not overshadow the relational and emotional aspects of care [40].

Our recommendations aim to make RPM systems more accessible, empathetic, and responsive, catering to the varied needs of patients and caregivers by focusing on nuanced communication strategies highlighted by these scholars.

4.2.1 Recommendation derived from theme 2: facilitate user-centric language and interaction:

(1) Manifestation in RPM - UX/UI: design RPM interfaces with accessible language and intuitive interfaces. E.g., consider the varying literacy and technical skills of the target user group, ensuring that the system is intuitive for all users. This approach aims to ensure that all patients can effectively manage their health without feeling overwhelmed by complex functionalities or medical jargon.
(2) Manifestation in RPM - UX/UI: focus on empathetic and responsive communication. E.g. tailor the tone of voice and content to resonate with the specific user group.
(3) Manifestation in RPM - UX/UI: present material that considers patients' informational needs, also paying attention to what they might prefer not to receive, to ensure relevance and sensitivity. E.g. the RPM interface could focus on actionable health insights rather than overwhelming patients with excessive data, thereby maintaining a balance between informative and manageable content.

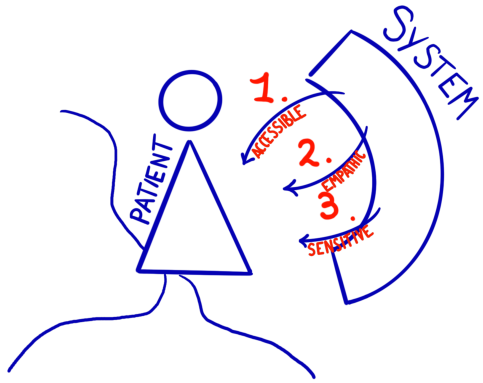

Figure 6: Illustration of the sub-recommendations from theme 2. "1" signifies designing RPM interfaces with accessible language and intuitive navigation. "2" symbolises focusing on empathetic and responsive communication. "3" refers to presenting material that considers patients' informational needs.

4.3 Theme 3: Upholding dignity and personhood

Upholding dignity and personhood focuses on respecting and empowering patients by ensuring RPM systems facilitate their active participation in healthcare decisions to honor their autonomy.
Respecting individual autonomy and encouraging active participation in healthcare decisions is essential for patient care, aligning with Martinsen's ethical perspective on care [46, 59].

Sundberg et al. [87] stress the importance of creating healthcare environments that foster a sense of belonging, enhancing patient comfort and contributing to their dignity and overall well-being. Similarly, Rasmussen and Delmar [77] and Clancy and Gürgens Gjaerum [11] emphasise considering the home as a crucial space for care. They discuss how personal connections and surroundings shape patient interactions, making the environment a fundamental component of supportive care. This perspective reinforces the need for RPM systems to be adaptable to home settings where care is not only about health monitoring but also about integrating into the patient's daily life and personal space.

Fæø et al. [18] advocates for openness and balanced emotional involvement in care, which ensures sensitivity to patient needs without compromising professional standards. This approach promotes care that is attuned to patient conditions without being either detached or overly sentimental.

Further, Ferstad and Rykkje [15] discusses the need for caregivers to be attuned to patients' conditions, suggesting that caregivers should sometimes defer their judgments to let patients' perspectives lead the care process.Fredriksen and Svensson [17] point out the importance of moral recognition in caregiving relationships, suggesting that recognising and respecting patient dignity is not only an ethical obligation but also essential for effective care.

These insights underscore the need for RPM systems that go beyond mere health monitoring to empower patients as active participants in their care. This empowerment involves systems that fully respect patient autonomy and individuality, making RPM a tool for enhanced patient engagement and care.

4.3.1 Recommendation derived from theme 3: prioritise patient dignity and personhood:

(1) Design philosophy - design method: ensure RPM respects patients as active stakeholders in their health. E.g. involve patients directly in the RPM design process through focus groups or co-design sessions, where they can provide input on their needs and preferences. Incorporate iterative feedback into the development of RPM prototypes, allowing adjustments based on patient input, to ensure that the final product supports comprehensive care.

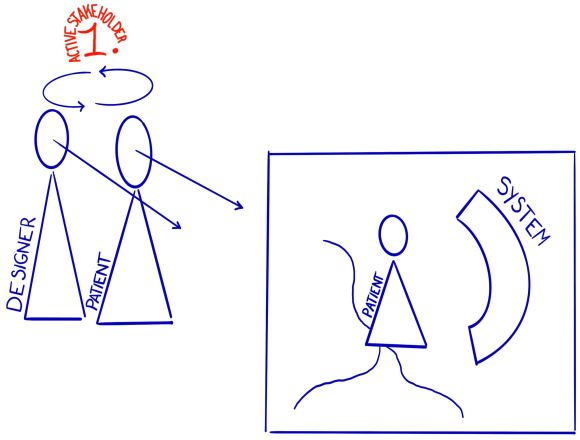

Figure 7: Illustration of the sub-recommendations from theme 3. "1" shows the patient as an active stakeholder in their health.

4.4 Theme 4: Strength and encouragement to support recovery

Strength and encouragement to support recovery in RPM involves designing systems that extend beyond mere health monitoring to actively foster patient resilience, incorporating functionalities and communication that provide psychological support.

Recovery is a crucial phase where RPM can play a transformative role—not only in tracking health metrics but also in enhancing patient resilience. The philosophy of caring highlights creating an environment where patients are motivated to face challenges and supported through adversity [82].

This theme describes the need for a balance between professional judgment and emotional engagement. Fæø et al. [18] underscores the importance of engaging with patients not merely as clinicians but as empathetic partners in care. Hereby, we recognise their strengths, and foster a supportive environment that encourages resilience and self-management.

Additionally, Ferstad and Rykkje [15] suggests caregivers should sometimes step back to let the patient's voice and perspective lead the recovery process, underwriting patient autonomy and making recovery a collaborative journey.

Ethical considerations in patient engagement are crucial, as Maagaard and Laerkner [40] argues for respecting each individual's dignity and personal narrative in the care process.

By engaging patients proactively in managing their health, RPM systems can empower them, aligning with Martinsen's vision where care aids recovery and fosters a sense of agency and resilience. Interactive technologies within RPM can thus support patients' recovery journeys, ensuring they feel seen, heard, and valued.

4.4.1 Recommendation derived from theme 4: encourage patient resilience:

(1) Manifestation in RPM - business logic: educate patients on coping strategies by offering resources within the RPM. E.g. incorporating e-learning modules on coping with setbacks, activated based on the patient's health data.
(2) Manifestation in RPM - business logic: enable peer support and community building by integrating features that allow patients to connect with others facing similar challenges. E.g. the system can connect individuals to a supportive community of peers facing similar challenges, facilitating shared learning and encouragement.
(3) Manifestation in RPM - UX/UI: provide the option to request professional mental health support. E.g., ensure easy access to professional mental health support within the RPM interface, allowing patients to seek help whenever necessary.

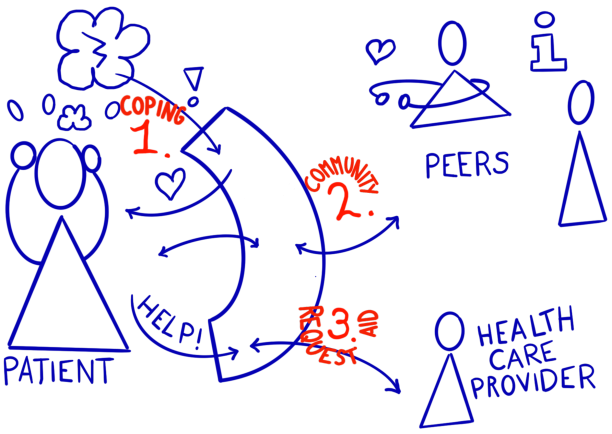

Figure 8: Illustration of the sub-recommendations from theme 4. "1" represents educating patients on coping strategies by offering resources within the RPM. "2" indicates enabling peer support and community building by integrating features that allow patients to connect with others facing similar challenges. "3" highlights the option to request professional mental health support.

4.5 Theme 5: Integrated relational care dynamics

Integrated relational care dynamics in RPM focus on designing systems that account for the complex web of relationships between patients, informal caregivers, and healthcare providers. This theme describes ethical interactions and a collaborative caring approach that respects each participant's role.

Understanding the multifaceted interactions among patients, healthcare providers, and informal caregivers is crucial in RPM. According to Martinsen, caregiving is inherently relational, involving deep ethical considerations and managing power dynamics [26, 45, 46, 59]. Ferstad and Rykkje [15] stresses the importance of addressing the asymmetry in caregiving relationships and the ethical responsibilities arising from our inherent power over those we care for. This necessitates a caregiving approach that is sensitive to the vulnerability of patients and is based on a solidarity that respects the patient as an individual, not merely a recipient of care [70].

Mortensen et al. [66] and Maagaard and Laerkner [40] highlight the need for caregivers to recognise their own vulnerabilities and those of the people they care for, promoting an empathetic caregiving process that respects patient dignity and agency without dominating the caregiving space.

Incorporating these insights into RPM can enrich the systems not only in clinical care but also in nurturing the relational and ethical dimensions of caregiving. Effective communication strategies within RPM should foster trust and ensure mutual respect, making all stakeholders feel valued and heard.

4.5.1 Recommendation derived from theme 5: foster integrated relational care dynamics:

(1) Design philosophy - design method: address the shift in care responsibilities by moving from traditional to at-home management. Mitigate the burden on informal caregivers by providing access to educational and support resources, thereby prioritising their well-being. E.g. involve informal caregivers in co-creation sessions to integrate their insights and needs directly into the system's design.
(2) Design philosophy - design method: incorporate healthcare providers' perspective to align the system with their capacity to deliver care over a distance. E.g. healthcare providers are engaged through interviews, playing a role in shaping design decisions.
(3) Manifestation in RPM - business logic: facilitate communication among patients, informal caregivers, and healthcare providers. This with the purpose that each actor's perspective is heard and integrated into care planning and execution. E.g. integrate a versatile chat feature within the RPM to facilitate seamless and respectful communication across all actors.

Following the detailed exploration of each theme and its corresponding recommendations, Figure 10 visually demonstrates how these can be embedded into the existing structure of RPMs, as originally depicted in Figure 2. This illustration serves as a practical blueprint, highlighting the transformation across all levels of the system by introducing a human-centric layer to the existing clinical base (currently not illustrated in Figure 10 (page 13), but can be found in Figure 2). It illustrates how the normative "Caring RPM" framework recalibrates the RPM architecture.

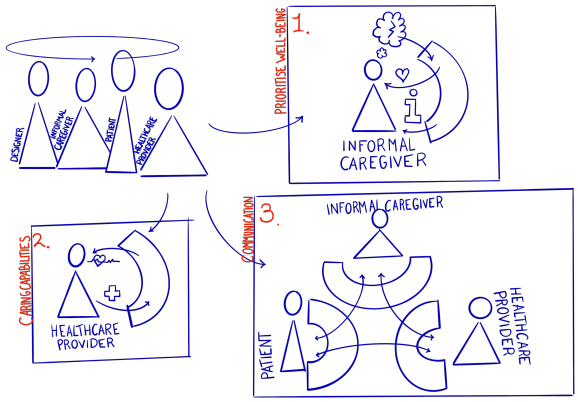

Figure 9: Illustration of the sub-recommendations from theme 5. "1" shows addressing the shift in care responsibilities to at-home management and reducing the burden on informal caregivers by providing educational and support resources. "2" illustrates incorporating healthcare providers' perspectives to align the system with their remote care capabilities. "3" represents facilitating communication among patients, informal caregivers, and healthcare providers to ensure that each actor's perspective is integrated into the care planning and execution.

5 DISCUSSION

The integration of technology in homecare is characterised by Helms and Fernaeus [28] as a "wicked problem" due to its ever-changing nature and contradictory elements, making it challenging to find definitive solutions. For instance, while RPM are designed to enhance caregiving by providing timely support, they simultaneously raise serious concerns about privacy and autonomy, illustrating the complexities of technology use in personal care spaces, as also described in Section 1.

Additionally, there are broader societal issues tied to RPM. For example, the undervaluation and under-compensation of informal caregiving roles, predominantly undertaken by women [68], reflect systemic disparities in how care responsibilities are distributed and recognised. Also, the limited access to digital health tools among disadvantaged groups or those with low technical literacy [84] suggests that the benefits of RPM are not universally accessible. Furthermore, not everyone has the luxury of having persons who can and want to provide informal care for them, which further underwrites this inequity. Being able to enjoy RPM can be seen as a privilege, and not a given. This adds complexity to the social and ethical challenges when designing RPM, as earlier stated in Section 1.

We do not claim that our recommendations solve the complex societal issues currently at play. However, we aim to take a step in the right direction, by proposing ways to mitigate these problems as much as possible. To address these challenges, RPM systems could be deliberately designed with the goal of creating systems that adapt to the needs of humans, as opposed to having humans fit the system. Deliberate design, in this sense, means considering the situatedness of each patient.

While other frameworks cover patient-centered care for various technologies (such as guidelines for information displays in hospitals [92] and online patient communities [29]), and even RPM (such as [89], which focuses solely on caregivers, and [32], which approaches care from a designer perspective), none integrate the philosophy of caring from nursing theory into RPM design. By incorporating insights from nursing theory, our framework aims to ensure that RPM are contextually informed to be not only functional but also empathetic and responsive to the lived experiences of patients and their caregivers.

In our framework, each theme (personalised and experience-informed care, user-centric communication, upholding dignity and personhood, strength and encouragement to support recovery, integrated relational care dynamics) and their subsequent recommendations address and contribute to this. These recommendations embed caring at every system level — from design philosophy in purpose and design method to its manifestation in RPM via the business logic and UX/UI.

Moreover, RPM must adhere to local regulatory restrictions to ensure clinical efficacy. The "Caring RPM" framework focuses on the caring aspect, adding a human-centric care layer to the existing clinical infrastructure. The clinical component is outside the scope of this paper, as Subsection 2.1 indicates that current literature already covers this effectively.

Having detailed the recommendations that describe why and how RPM can be created, in addition to what could be created to align the system with human-centric care, we will now detail specific strategies designers/developers can adopt to effectively incorporate "Caring RPM" recommendations into their system.

5.1 Strategies for integrating the "Caring RPM" recommendations

Integrating the "Caring RPM" framework effectively into development processes can be achieved by employing Human-Centered Design (HCD), also widely recognised by the HCI community. HCD in healthcare prioritises understanding and meeting human needs, facilitating designs that are understandable, usable and fit within the dynamics of users' sociotechnical systems [62].

Participatory design, a core element of HCD, involves stakeholders directly in the design process. Grönvall and Kyng [20] and Christensen and Grönvall [10] describe participatory design considerations for home-based health care. Because these contexts often include users who are weak or ill, they propose methodological adjustments like more flexible scheduling, reducing physical and cognitive demands during participation, and ensuring that the users' energy and time are respected. Techniques such as contextmapping, co-creation, and usability testing can be employed to ensure that RPM adapt to the lives of all users rather than requiring the users to adapt to the RPM [80, 83].

Continuous evaluation and iterative improvement are integral to this strategy, involving regular assessments through user interviews, surveys, and other feedback mechanisms. This ongoing process ensures that RPM are responsive to individual needs and maintain equitable care delivery. Addressing and mitigating biases

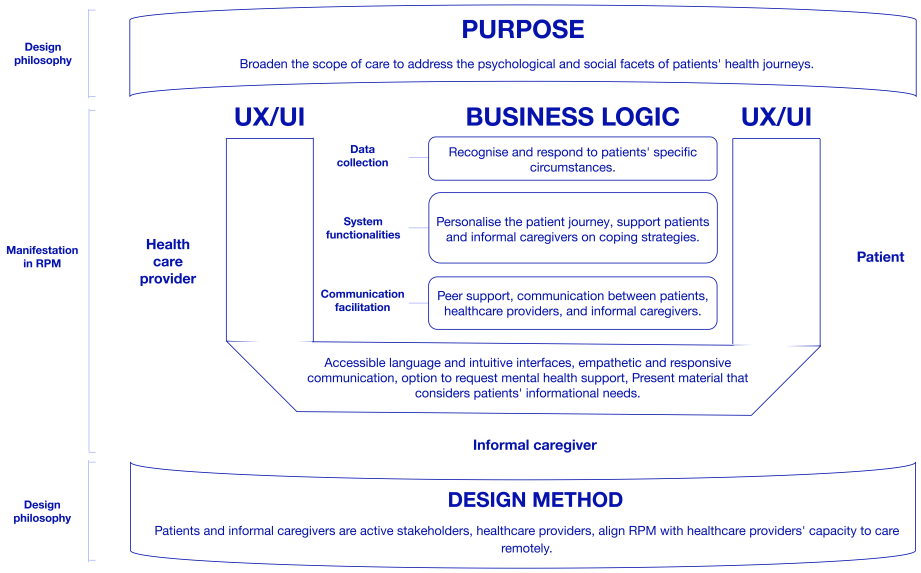

Figure 10: Updated system overview, integrating the "Caring RPM" framework into the existing RPM structure. It illustrates how the recommendations from Section 4 can complement the existing clinical base (as detailed in Figure 2), by adding a layer of caring functionalities. This visual demonstrates the practical application of the "Caring RPM" recommendations across all system levels.

within the development process is also crucial to uphold fairness and effectiveness in care delivery. By employing these strategies, the "Caring RPM" recommendations can be integrated into the development process, resulting in RPM that are not only technically proficient but also aligned with human-centric care.

5.2 Addressing critique on the philosophy of caring

Our "Caring RPM" framework incorporates the philosophy of caring into RPM systems, and considers the nuance needed to translating caring into technology-driven healthcare.

Critique of a focus on caring in medical practice has emerged from various directions [44]. Mackenzie [42] and Beauchamp and Childress [6] express concerns that a strong focus on care could overshadow critical reasoning and impartial reflection, potentially overwhelming healthcare professionals. This suggests that the emotive elements of care might compromise the objectivity required for effective decision-making.

Curzer [13] highlights the risk of favouritism, which could impact equitable care delivery. This critique questions how healthcare providers can maintain fairness without letting personal biases affect the quality of care. Moreover, there are concerns that excessive empathy may hinder physicians' ability to perform necessary but painful procedures or deliver unfavourable diagnoses effectively.

The sustainability of a care-focused approach is also debated. Critics argue that it might lead to healthcare professional burnout [23, 24]. Pettersen [75] warns that the altruism advocated in the philosophy of caring could promote self-sacrifice among caregivers, underscoring the need for balance to protect caregivers' well-being.

These critiques illuminate the complex ethical dimensions of applying the philosophy of caring in healthcare. As we developed the "Caring RPM" framework, we leveraged these insights to refine our themes and recommendations, ensuring that the integration of caring into RPM is both effective and ethically sound.

Our recommendation derived from theme 5: integrated relational care dynamics reinterprets concerns about emotional burdens on healthcare providers by acknowledging that a part of the caring burden is shifted towards the informal caregiver, and advocating for their active participation and consideration during development, adding a focus on their well-being. Another critique which is relevant is the potential for favouritism. Even though RPM are likely to provide more equitable care than a healthcare provider, developers must critically examine potential system biases, particularly when integrating AI features like chatbots.

5.3 Implications of the "Caring RPM" recommendations on practice

Our "Caring RPM" framework contributes to a paradigm shift in RPM by outlining themes of personalised and experience-informed care, user-centric communication, upholding dignity and personhood, strength and encouragement to support recovery and integrated relational care dynamics. This approach adds to meeting clinical needs by additionally also supporting whole-person care comprising of physical, emotional, and social aspects of comprehensive patient care [21].

Our findings highlight the need for inclusive design processes that involve patients, informal caregivers, and healthcare professionals, aligning RPM development with the real-world needs and preferences of its users. This has the potential to transform how

care is delivered in HCI homecare contexts, by enriching our understanding of what caring means from a nursing theory perspective, and hereby making it more human-centric.

5.4 Limitations

This study adopts a normative approach, using a value-based lens from nursing theory to embed the philosophy of caring within RPM. While we decided upon this perspective with good reason, it represents one of several potential approaches to integrating caring into RPM.

The reflexive thematic analysis conducted in this study was primarily carried out by the first author, with periodic feedback from the co-authors. This methodological choice might affect the breadth of interpretations and analysis presented.

Additionally, our literature review primarily focused on works citing Kari Martinsen, the nursing theorist who extensively developed the philosophy of caring. Consequently, relevant studies that discuss the philosophy of caring without directly citing Martinsen may have been overlooked.

Future work should include an external evaluation to further enhance the credibility of the Caring RPM framework.

6 CONCLUSION

This paper has introduced the normative "Caring RPM" framework, an approach that integrates the philosophy of caring, as conceptualised by Kari Martinsen, into RPM. This framework is designed to enhance RPM by incorporating comprehensive patient care alongside clinical functionalities, as illustrated in Figure 10.

We identified a critical gap in RPM design—the lack of integration of comprehensive, human-centric care. The "Caring RPM" framework addresses this gap by providing actionable recommendations that align RPM with the practical, relational, and moral dimensions of caring, ensuring that these systems extend beyond clinical management to support the full spectrum of patient needs, thereby addressing their dignity and situatedness.

Furthermore, we proposed strategies for embedding human-centric care within RPM, with participatory design processes that incorporate all stakeholders, including patients, informal caregivers, and healthcare providers. This ensures that RPM systems are developed not only for technical capabilities but with empathy and responsiveness, making them more adaptable to real-world contexts.

Our contribution extends the discourse in HCI regarding homecare, by reimagining RPM through the lens of the philosophy of caring.

ACKNOWLEDGMENTS

This paper is part of research funded by KWF Kankerbestrijding, a foundation dedicated to fighting cancer.

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