

---

This is an electronic reprint of the original article.  
This reprint may differ from the original in pagination and typographic detail.

Hölsä, Sini; Viitanen, Johanna; Valkonen, Paula; Lääveri, Tinja; Rauta, Virpi

**Developing eHealth for Home Dialysis : Clinicians' Needs for a Digital Patient Engagement Platform**

*Published in:*  
MEDINFO 2023 — The Future Is Accessible

*DOI:*  
[10.3233/SHTI231137](https://doi.org/10.3233/SHTI231137)

Published: 25/01/2024

*Document Version*  
Publisher's PDF, also known as Version of record

*Published under the following license:*  
CC BY-NC

*Please cite the original version:*  
Hölsä, S., Viitanen, J., Valkonen, P., Lääveri, T., & Rauta, V. (2024). Developing eHealth for Home Dialysis : Clinicians' Needs for a Digital Patient Engagement Platform. In MEDINFO 2023 — The Future Is Accessible: Proceedings of the 19th World Congress on Medical and Health Informatics (pp. 1111-1115). (Studies in Health Technology and Informatics; Vol. 310). IOS Press. <https://doi.org/10.3233/SHTI231137>

---

This material is protected by copyright and other intellectual property rights, and duplication or sale of all or part of any of the repository collections is not permitted, except that material may be duplicated by you for your research use or educational purposes in electronic or print form. You must obtain permission for any other use. Electronic or print copies may not be offered, whether for sale or otherwise to anyone who is not an authorised user.

# Developing eHealth for Home Dialysis: Clinicians' Needs for a Digital Patient Engagement Platform

Sini HÖLSÄ<sup>a</sup>, Johanna VIITANEN<sup>a,1</sup>, Paula VALKONEN<sup>a</sup>, Tinja LÄÄVERI<sup>a,b</sup> and Virpi RAUTA<sup>c</sup>

<sup>a</sup>Department of Computer Science, Aalto University, Espoo, Finland

<sup>b</sup>Department of Infectious Diseases, Inflammation Center, University of Helsinki and Helsinki University Hospital, Helsinki, Finland

<sup>c</sup>Department of Nephrology, Abdominal Center, University of Helsinki and Helsinki University Hospital, Helsinki, Finland

ORCID ID: Sini Hölsä <https://orcid.org/0000-0002-1655-7650>, Johanna Viitanen <https://orcid.org/0000-0002-6659-5022>, Paula Valkonen <https://orcid.org/0000-0002-4954-9585>, Tinja Lääveri <https://orcid.org/0000-0003-4124-6667>, Virpi Rauta <https://orcid.org/0000-0003-0239-2661>

**Abstract.** eHealth solutions such as digital patient engagement platforms (DPEPs) aim at enhancing communication and collaboration between patients and clinicians. From the clinicians' viewpoint, concerns exist about new information systems (IS) leading to increased workload and interoperability problems. This article aims to support the development and implementation of DPEPs from the end-users' perspective. We studied clinicians' needs for a new DPEP developed to support home dialysis (HD) care. Eight clinicians participated in remote semi-structured interviews. Clinicians had positive expectations for the new DPEP as it could provide an overall picture of patients' status, support patients' self-care, and save time during patient visits. However, they had concerns about successful implementation, changes to workflows, and integration issues. To conclude, it is important to design and agree on changes in work practices, patient care, and complex IS environments when implementing new DPEP solutions in clinics.

**Keywords.** Clinical systems implementation, digital health, human-computer interaction, user-centered design methods, virtual care, and telehealth

## 1. Introduction

eHealth solutions such as digital patient engagement platforms (DPEPs) targeting the chronically ill aim to support self-care and motivate patients, enhance communication and information exchange between patients and clinicians, and support care coordination [1,2]. Patients are often seen as the primary users of these applications; however, if clinicians are unmotivated or find these solutions difficult to integrate into their daily workflows, the practical benefits cannot be achieved.

---

<sup>1</sup> Corresponding Author: Johanna Viitanen, email: [johanna.viitanen@aalto.fi](mailto:johanna.viitanen@aalto.fi).

From the clinician's perspective, DPEPs not only change their role in supporting self-management, but they may also increase workload [3]. Moreover, easy access and use [2,4-6], customizability [2-4], data visualization [4,6-8], and possible interoperability problems [9] may emerge when implementing eHealth solutions, such as DPEPs or other digital tools for improving patient engagement.

The aim of this article is to support the development of a new DPEP. We focus on a home dialysis (HD) care and DPEP solution ('eCare For Me'), which is currently in development for clinicians and patients with chronic kidney disease (predialysis, home peritoneal dialysis, and home hemodialysis) [10]. The solution aims to support communication between patients and clinicians, enable individualized care, improve patient safety, increase patients' comprehension and responsibility for their care, and enhance motivation. In addition to being a digital platform where patients can document information from each dialysis treatment, order dialysis supplies, and respond to symptom questionnaires, the solution includes a smart scale, blood pressure monitor, wristband actigraphy, and sleep tracking device, all of which provide data to the DPEP solution. In addition, artificial intelligence-based decision support notifications are being designed to alert the patient of risk for adverse outcomes.

Our study is part of a larger project [10], which includes studies on patients' and clinicians' perspectives on eHealth for HD development. This study focuses on understanding clinicians' needs for the new DPEP solution, i.e., the early phases of interactive system development following the principles of human-centered design [11]. The research questions were as follows: What kinds of benefits related to patient care can HD clinicians (physicians and nurses) expect from the new DPEP for HD care? What kinds of user needs do they have for the implementation and use of this solution?

## 2. Methods

The research data were collected from semi-structured interviews with eight clinicians (two physicians and six nurses) from the Home Dialysis Unit in a large Finnish university hospital. Due to the COVID-19 pandemic, interviews were held remotely via Microsoft Teams in fall 2020. The interviews included two parts: 1) pre-tasks, where clinicians described the HD care path on a visual timeline [12] and their work-related digital tools and communication channels; and 2) one-hour semi-structured interviews, which provided an overview of dialysis patients and their care, training and follow-up of HD patients, roles and responsibilities of clinicians, and work-related digital solutions for patient-clinician collaboration. At the time of the interviews, clinicians had not used the DPEP in their work, but the solution had been introduced to them.

The data were analyzed following a thematic analysis method [13] by two researchers who had conducted the semi-structured interviews and were experienced in qualitative data analysis. During the analysis, three themes including eight codes were identified and used in Atlas.ti: 1) work-related tasks with *clinicians' work tasks*, *patients' tasks*, and *care pathway*; 2) digital solutions with *digital solutions and experiences*, *communication practices and experiences*, and *stakeholders*; and 3) future with *future hopes and fears* and *challenges in dialysis care*.

### 3. Results

Clinicians reported using multiple information systems (ISs) and channels to communicate with patients: electronic health record (EHR) systems (including a patient portal), the Digital Care Pathways in Health Village platform (DiaMyn solution) [14], and telephone (both phone calls and text messages). Additionally, data from the dialysis machines can be accessed via separate ISs, such as Baxter's Sharesource [15]. In addition, EHRs, Microsoft Teams, email and telephone were used in communication between professionals. The clinicians also mentioned various platforms for professional knowledge and reporting, such as "Terveysportti" (evidence-based medicine guidelines) [16] and the Finnish Registry for Kidney Diseases [17].

During the interviews, clinicians pointed out challenges posed by multiple ISs and channels. However, they reported that they allow patients to choose the mode of contact (e.g., telephone calls, text messages, patient portal). Clinicians were satisfied with ISs that automatically collect patient data. Overall, easy access to patient data, informative materials for patients, remote communication, and the ability to motivate patients in self-care were reported as benefits of the various digital solutions.

The needs identified during the interviews regarding patient care and requirements for implementation of the new DPEP solution are presented in Table 1.

**Table 1.** Clinicians' needs for the new DPEP solution for HD patient care.

| Needs related to HD patient care   | Needs related to a new DPEP solution as an integrated part of clinicians' existing socio-technological work environment |
|--|---|
| Release time during the patient visit  | A fluent and usable entity of different ISs   |
| Get an overall picture of a patient's situation                              | Common practices solution use   |
| Enhance patient's self-care  | Implementation (change of work routines)  |
| Support patients between follow-up visits                                    | IT support  |
| Follow-up and monitor patients' overall situation together with the patients | Customizability   |

Overall, clinicians reported optimism toward the DPEP solution; they expected time-savings during patient visits as they would no longer need to gather various measurement values from patients. In addition, the solution was expected to support gaining an overall picture of the patient and help to motivate patients' self-care. Moreover, the support and guidance between follow-up visits could be more efficient via the new DPEP solution. All in all, the solution was seen as a modern way to organize care as it enables monitoring and following-up on patients' overall situations as a team.

The clinicians raised concerns about adding one more solution to the already complex body of ISs in clinics. Moreover, they identified the need for a common understanding of how the new solution is used: How often and by whom should data from the solution be reviewed? What can patients expect, and what is the organization's future vision for the numerous ISs? They also expressed a need for support in implementing the new solution to their work environment and in using the digital solution. Finally, they noted that the solution should support the needs of different patient groups. The fact that some patients will not want to use the system should be considered when developing the solution and possible changes in clinical workflows.

#### **4. Discussion**

It is essential to consider clinicians' end-user needs when developing and implementing new eHealth solutions such as DPEPs [11,18]. We found that clinicians had positive expectations of the new DPEP solution, especially regarding patient care: it could help provide an overall picture of the patient's situation and save time during visits. Previous research has also identified improvements in patient care by enhancing monitoring and discussing measurements and symptoms [7], helping to understand changes in symptoms over time [5,6], raising awareness of symptoms [7] and their severity [5], supporting targeted symptom management [6] and clinical decision-making [5,7], supporting patients in taking action, and offering educational materials [3].

Beyond patient care, DPEP solutions affect clinical work routines. The use of different eHealth solutions changes the nature of patient encounters [3]. The utilization of clinicians' time has improved [3], but these solutions may also require more time for reviewing the increased amount of patient data [3,6]. DPEP solutions change clinicians' role in the self-management of patients with chronic diseases [3]. To achieve the benefits of the new DPEP in clinical work, it is paramount to understand the variety and amount of separate ISs and communication channels. The usability of DPEP solutions along with their fluent use among other ISs should be considered when developing and implementing new digital solutions [4,6,8,18]. Only after this process can the effectiveness and quality of work and patient care be improved.

Increasing clinical workload [19], long wait times for patients [20], and an aging and ailing population pose challenges for the healthcare sector [21]. This study aimed to understand how DPEP solutions could help to address these problems. Because the number of participants in the study was limited, and the participants had not yet used the new DPEP solution, more research is needed to study clinicians' experiences in clinical work contexts. Moreover, further research is needed on HD patients' experiences with the new DPEP solution [18] and the effects of the new solution on patients' quality of life. In addition, the practical impact of the various eHealth solutions on patient care and clinical work should be studied with a wider scope throughout the healthcare sector.

#### **5. Conclusions**

Digital solutions enable new ways of organizing patient care and communicating with chronically ill patients. However, complexity in clinical ISs, poor usability of eHealth solutions, and lack of integration may interfere with clinicians' workflows and create challenges for efficient work. Therefore, it is important to design and agree on changes in work practices and patient care when implementing new DPEP solutions. Understanding the socio-technological work environment when developing and implementing new DPEP solutions is an important part of this process.

#### **Acknowledgements**

The eHealth in Home Dialysis project was part of the CleverHealth Network ecosystem. The project (eCare For Me Homedialysis) was funded by participating companies, the

Hospital District of Helsinki and Uusimaa (HUS), and Business Finland. We thank our participants, project partners, and colleagues: S. Leinonen and N. Karisalmi from Aalto University and T. Puurtinen, P. Silvast-Äikäs, and A. Varila from HUS.

## References

- [1] Shaw T, McGregor D, Brunner M, Keep M, Janssen A, Barnett S. What is eHealth (6)? Development of a Conceptual Model for eHealth: Qualitative Study with Key Informants. *J Med Internet Res*. 2017 Oct;19(10):e324, doi: 10.2196/jmir.8106.
- [2] Campbell K, Louie P, Levine B, Gililland J. Using Patient Engagement Platforms in the Postoperative Management of Patients. *Curr Rev Musculoskelet Med*. 2020 Aug;13(4):479-84.
- [3] Ayre J, Bonner C, Bramwell S, McClelland S, Jayaballa R, Maberly G, McCaffery K. Factors for Supporting Primary Care Physician Engagement With Patient Apps for Type 2 Diabetes Self-Management That Link to Primary Care: Interview Study. *JMIR Mhealth Uhealth*. 2019 Jan;7(1):e11885.
- [4] Sandhu S, King Z, Wong M, Bissell S, Sperling J, Gray M, Ratliff W, Herring K, LeBlanc TW. Implementation of Electronic Patient-Reported Outcomes in Routine Cancer Care at an Academic Center: Identifying Opportunities and Challenges. *JCO Oncol Pract*. 2020 Nov;16(11):e1255-63.
- [5] Basch E, Barbera L, Kerrigan CL, Velikova G. Implementation of Patient-Reported Outcomes in Routine Medical Care. *Am Soc Clin Oncol Educ Book*. 2018 May;38:122-34.
- [6] Watson L, Delure A, Qi S, Link C, Chmielewski L, Photitai É, Smith L. Utilizing Patient Reported Outcome Measures (PROMs) in ambulatory oncology in Alberta: Digital reporting at the micro, meso and macro level. *J Patient Rep Outcomes*. 2021 Oct;5(Suppl 2):97.
- [7] Rotenstein LS, Agarwal A, O'Neil K, Kelly A, Keaty M, Whitehouse C, Kalinowski B, Orio PF 3rd, Wagle N, Martin NE. Implementing patient-reported outcome surveys as part of routine care: lessons from an academic radiation oncology department. *J Am Med Inform Assoc*. 2017 Sep;24(5):964-8.
- [8] Pollack AH, Pratt W. Association of Health Record Visualizations With Physicians' Cognitive Load When Prioritizing Hospitalized Patients. *JAMA Netw Open*. 2020 Jan;3(1):e1919301.
- [9] Jacob C, Sanchez-Vazquez A, Ivory C. Clinicians' Role in the Adoption of an Oncology Decision Support App in Europe and Its Implications for Organizational Practices: Qualitative Case Study. *JMIR Mhealth Uhealth*. 2019 May;7(5):e13555.
- [10] CleverHealth Network, Development of Home Dialysis, available: <https://www.cleverhealth.fi/en/development-of-home-dialysis/> [Referenced March 4th, 2023]
- [11] International Organization for Standardization, ISO 9241-210:2019 Ergonomics of human-system interaction — Part 210: Human-centred design for interactive systems.
- [12] Valkonen P, Karisalmi N, Kaipio J, Kujala S. Remote interviews and visual timelines with patients: Lessons Learned. *Stud Health Technol Inform*. 2021 May;281:845-9.
- [13] Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006 Jan;3(2):77-101.
- [14] Digital Health Village, DiaMyn solution, available: <https://www.digitalhealthvillage.com/en/diamyn> [Referenced March 4th, 2023]
- [15] Baxter, Sharesource, available: <https://renalcare.baxter.com/products/sharesource> [Referenced March 4th, 2023]
- [16] Duodecim, Evidence-Based Medicine Guidelines, available: <https://www.duodecim.fi/english/products/ebmg/> [Referenced March 4th, 2023]
- [17] The Finnish Kidney and Liver Association, Finnish Registry for Kidney Diseases, available: [https://www.muma.fi/liitto/suomen\\_munuaistautirekisteri/finnish\\_registry\\_for\\_kidney\\_diseases](https://www.muma.fi/liitto/suomen_munuaistautirekisteri/finnish_registry_for_kidney_diseases) [Referenced March 4th, 2023]
- [18] Hölsä S, Valkonen P, Viitanen J, Rauta V. Kohti käyttäjälähtöisiä kotidialyysin sähköisiä terveyspalveluita: Potilaskokemus ja ammattilaisten tarpeet suunnittelun lähtökohtana. *Finnish Journal of eHealth and eWelfare* 14(2). 2022
- [19] Hobbs FDR, Bankhead C, Mukhtar T, Stevens S, Perera-Salazar R, Holt T, Salisbury C; National Institute for Health Research School for Primary Care Research. Clinical workload in UK primary care: a retrospective analysis of 100 million consultations in England, 2007-14. *Lancet*. 2016 Jun;387(10035):2323-30.
- [20] Siciliani L, Moran V, Borowitz M. Measuring and comparing health care waiting times in OECD countries. *Health Policy*. 2014 Dec;118(3):292-303.
- [21] Christensen K, Doblhammer G, Rau R, Vaupel JW. Ageing populations: the challenges ahead. *Lancet*. 2009 Oct;374(9696):1196-208.