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Stakeholders barriers and facilitators for the implementation of a personalised digital care pathway: a qualitative study

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Keywords

patient-centred care, implementation, facilitators and barriers, digital communication, patient information, stakeholder involvement

Strengths and limitations of this study

- Perspectives of all stakeholders, including patients and non-medical (supporting) staff, were incorporated in this qualitative study.

- The co-design approach in this project enhanced successful implementation as it ensured input and feedback by stakeholders and end-users and created commitment for further implementation.
- Investigator triangulation was assured since the interviews were conducted by multiple researchers.
- Due to the COVID-19 pandemic, the interviews were conducted both by video call and face-to-face, which may have led to differences in understanding and data interpretation between the interviews.
- Participants were recruited using snowball sampling techniques, which could have resulted in selection bias. However, this effect was minimised by including stakeholders both familiar and unfamiliar with the PDCP tool.

ABSTRACT

Objective

A prerequisite for patient-centeredness in healthcare organisations is offering patients access to adequate health information which fits their needs. A personalised digital care pathway (PDCP) is a tool that facilitates the provision of tailored and timely information. Despite its potential, barriers influence the implementation of digital tools in healthcare organisations. Therefore, we investigated the perceived barriers and facilitators for implementation of the PDCP among stakeholders.

Design

A qualitative study was conducted to acquire insight into perceptions of the stakeholders involved in the implementation of a digital care pathway in three diverse patient groups.

Setting

This study is part of the "PersonalisedDigitalCarePathway" (PDCP) research project in a large academic hospital in the Netherlands.

Participants

Purposive sampling was used to recruit internal stakeholders (e.g., healthcare professionals, employees of the supporting departments) and external stakeholders (e.g., employees of the external PDCP supplier). In addition, existing semi-structured interviews with patients involved in pilot implementation (n=24) were used to verify the findings.

Results

We conducted 25 semi-structured interviews using the Consolidated Framework for Implementation Research. Content analyses yielded four themes:. 1) stakeholders' perceptions of the PDCP (e.g., perceived usefulness); 2)characteristics of the individuals involved and the implementation process (e.g., individuals express resistance to change); 3)'Organisational readiness' (e.g., lack of resources); and 4) 'Collaboration within the organisation' (e.g., mutual communication, multidisciplinary co-design). The main barriers mentioned by patients were duration of first activation and necessity for up-to-date content. In addition, the most facilitating factor for patients was user-friendliness.

Conclusion

Our findings emphasise the importance of gaining insights into the various perspectives of stakeholder groups, including patients, regarding the implementation of the PDCP. The perceived barriers and facilitators can be used to improve the PDCP implementation plan and tailor the development and improvement of other digital patient communication tools.

Trial registration number

N/A

INTRODUCTION

In recent years, the emphasis on patient-centred care has increased in the Dutch healthcare system (1). Patient-centeredness is a key element of high-quality care and entails collaboration between the healthcare professional (HCP), the patient and their families, in which the needs, values and preferences of patients are the focus of care (2, 3). Patients no longer want to be passive recipients of care, but increasingly want and need to proactively manage their own health. They also wish to be empowered and involved in decision-making that relates to their care, which can contribute to patient-centred care (4-9). To achieve this, it is important that HCPs and patients share the same information (10, 11).

To achieve patient-centred care including shared decision-making, health information should be tailored. Personalised health information includes details about the diagnosis and treatment options of the individual, and practical information about their care pathway (12, 13). This concerns information about possible choices and the advantages and disadvantages of these choices, along with outcomes and uncertainties (8, 13, 14). Information provision should match the patient's wishes, needs and their ability to process information, which ensures a better experience for the patient (15). In addition, optimally dosing and timing the information provision is crucial, to prevent patients from an information overload (7, 15, 16). Also, health literacy studies show that general health information is frequently not understood to a sufficient extent (17).

Both patients and HCPs have expressed their willingness to contribute to patient-centred care, but often have insufficient knowledge on how to put this into practice (4, 5, 7). Therefore, HCPs should be instructed on how to provide their patients with suitable information (7, 18). Providing the HCP and patient with tools to improve information provision facilitates effective

communication (4, 11). A digital care pathway is an example of a tool that facilitates HCPs and their patients in accessing adequate information (4, 16, 19). This can be described as an overview of appointments and the coordination of care, specified for a certain patient group, which leads to greater information symmetry between the HCP and patient (20).

Despite the potential of digital care pathways, there appear to be barriers to the implementation of digital tools in healthcare organisations (11, 21-24). An innovation that has been poorly implemented by HCPs may end up not being used in daily routines or used in the wrong way, which results in a low uptake by end-users (24, 25). Gathering information about the organisation, such as the context and responses to change before and during implementation, can determine the factors that affect implementation (25-27). All stakeholders act within their own contexts and expectations (28). Therefore, to implement a digital care pathway in practice, it is essential to explore the perceptions of all stakeholders involved including end-users (29).

Information about implementation is often expressed in barriers and facilitators (27, 30). This information contributes to selecting tailored implementation strategies, which in turn can help overcome the hurdles of implementing (27, 31). As example, previous studies have shown that low health literacy and inadequate staffing were barriers to the implementation of digital tools. On the other hand, the perceived usefulness of an intervention and good multidisciplinary communication were identified as facilitating for implementation (3, 19, 32). However, some of these studies mainly focused on implementation in one specific patient group and the perceived barriers and facilitators from an organisational perspective. As a result, there is a lack of insight into the hospital-wide embedding in diverse patient groups and visions of all the different stakeholders involved, including end users.

Therefore, the aim of this study was to identify the perceived facilitators and barriers among various internal and external stakeholders (i.e., patients, healthcare professionals, non-medical professionals, external supplier) regarding the implementation of personalised digital care pathways within a large academic hospital, Amsterdam UMC.

METHODS

Study design

A qualitative study was conducted to acquire insight into perceptions of the stakeholders involved in the implementation of a digital care pathway in three diverse patient groups.

Context and setting

This study is part of the "PersonalisedDigitalCarePathway" (PDCP) research project. As basis for initiating this project, we used previous patient-reported experience measurements and patient participation sessions during the start of the value-based healthcare program at Amsterdam UMC, a large academic hospital in Amsterdam, the Netherlands. Patients indicated that information was outdated and not easily accessible. Furthermore, they experienced a low level of self-management. Development and subsequent implementation of a PDCP was anticipated to remedy these shortcomings. The project included two phases:

1. Adaptive development including pilot implementation, based on experience-based co-design. PDCPs were created in close collaboration with 1) patients with excessive scars (Scar Clinic), 2) cleft lip and/or palate (Cleft Care) and 3) people who experience gender dysphoria (Gender Care) and their healthcare professionals, communication advisors and the eHealth team of our electronic health record service centre (EvA-SC).
2. Evaluation of implementation in practice of the PDCPs at Amsterdam UMC for the three patient groups as described above.

We conducted this qualitative study at the end of phase 1.

Personalised Digital Care Pathway (PDCP)

In this study we define a PDCP as a digital tool which provides patients and their healthcare

professionals an overview of a the personal care pathway, with adequate and dosed information at appropriate time points. An example is shown in Figure 1 (web- and mobile version). In this customised tool, relevant content will become available gradually to end-users as the care pathway progresses over time - including appointments and practical information. Patients can access this tool after a two-factor authentication (33). Healthcare professionals have access to the patients' PDCP via the electronic health record (EHR). The IT system used for this project was developed by an external supplier (Soulve Innovations) (34).

<PLEASE INSERT FIGURE 1 HERE>

Study participants

Stakeholders were recruited by purposive sampling. To identify further relevant stakeholders, we used snowball sampling (35). Internal stakeholders were healthcare professionals and employees of the supporting departments, divided into managers and team members. Employees of the external supplier participated as external stakeholders. All stakeholders were contacted through email. Once the stakeholder had agreed to participate an interview was scheduled, digitally via Microsoft Teams or on location. Informed consent was signed after the participant was informed about the purpose of the study. Verbal consent for audio recording was obtained from every participant.

Theoretical framework

We used the Consolidated Framework of Implementation Research (CFIR), as this framework can help to explain why implementation of the PDCP may or may not be successful. It provides a practical guide for evaluating perceived facilitators and barriers. In this framework the context, complexity, multi-level aspects and interaction of the implementation are considered (31, 36). The five domains of the CFIR framework are: intervention (e.g., advantage, adaptability), outer setting (e.g., patient needs, external policies), inner setting (e.g., culture, readiness for implementation), the individuals involved (e.g., knowledge and beliefs, self-efficacy), and the implementation process (e.g., engaging, executing) (36, 37).

Data collection

We conducted individual, semi-structured, in-depth interviews guided by CFIR. The list of topics (Appendix 1) was amended minimally for stakeholders who work as healthcare professionals. All audio-recorded interviews were conducted by trained researchers (JS, JG, FH, FvN) and transcribed verbatim.

Patient and Public Involvement

Patients were actively involved during adaptive development of the PDCP. In this study pragmatic semi-structured interviews with patients (n=24) which had been conducted after taking part in the pilot implementation, were used for verification of our findings about the facilitators and barriers for implementation of the PDCP. The purpose of these interviews was to collect patients' experiences concerning the content and use of the application during the pilot implementation and verify the gathered findings. This data was also collected as part of the PDCP research project during phase 1 and will be used for further implementation.

Data analysis

To ensure data saturation, data analysis was initiated during data collection, so that missing information, themes or perspectives could be gathered (38). Data was analysed using content analysis in Atlas.ti version 9 (Berlin, Germany). First, three researchers (FH, JS, FvN) coded six transcripts openly and inductively. During several meetings (FH, JS, FvN) codes were discussed, grouped in overarching codes, and revised to reach a consensus and ensure quality of the analysis. The codes used in Atlas.ti 9 were described in a final codebook (appendix 2), which was used to analyse the remaining transcripts by two independent researchers (FH, JS). After coding the transcripts, categories were formed by deductive axial coding. These categories were used to form themes and subthemes, described in the results section. In the final step, quotes were selected for representation. All data were analysed and presented pseudonymously.

RESULTS

In total, 25 interviews were conducted between November 2020 and June 2021. Most of the interviews were held digitally due to the COVID-19 pandemic (n=22) and three were held face-to-face. Interviews lasted on average an hour (37 minutes min; 67 minutes max). Table 1 shows characteristics of the interviewees. The group of 'non-medical professionals' included supporting staff on department and division level (decentral), supporting staff of organisation (central) and external participants. Median employment duration of stakeholders in their current position was 2 years (min 1 – max 20 years).

Table 1. Characteristics of study participants (N=25)

[1]EvA-SC: electronic health record service centre, [2]PDCP: Personalised Digital Care Pathway

Gender, N(%)		**Professional roles in organisation, N(%)**			**Employment context of participants, N(%)**	
Male	7 (28%)	*Healthcare professionals*	***TOTAL***	***10 (40%)***	Excessive scars (Scar Clinic)	4 (16%)
Female	18 (72%)		Doctor	5 (20%)	Cleft Lip or/and Palate (Cleft Care)	4 (16%)
			Nurse (specialist)	3 (12%)	Gender Incongruence (Gender Care)	6 (24%)
			Other roles	2 (8%)	Internal and External Communication	2 (8%)
		Non-medical professionals	***TOTAL***	***15 (60%)***	EvA Service Center[1]	4 (16%)
		Decentral staff	Consultant	2 (8%)	Strategy & Innovation	3 (12%)
			Other roles	2 (8%)	External PDCP[2] supplier	2 (8%)
		Central staff	Manager	3 (12%)		
			Application specialist	2 (8%)		
			Consultant	4 (16%)		
		External staff	Other roles	2 (8%)		

Content analyses yielded four main themes, subdivided in 24 subthemes (Table 2).

Table 2. Themes and perceived barriers and facilitators regarding implementation of a digital care pathway

[1]PDCP: Personalised Digital Care Pathway, [2]HCP: Healthcare professional

Themes	Subthemes	
1. Stakeholders' perceptions of the PDCP[1]	*Barriers*	Duration of first activation
		Not suitable for every patient group
		Necessity of up-to-date content
		Still unclear effectiveness
	Facilitators	User friendliness
		Perceived usefulness by patients
		Potential efficiency in practice
		Contribution to patient-centred care
2. Implementation by HCP[2] in daily practice	*Barriers*	Individuals express resistance to change
		Time-consuming implementation
		Non-optimal facilities
	Facilitators	Possibility of incorporation in daily practice
		Providing feedback on adoption
		Created support in the medical department by enlisting co-design
3. Organisational readiness	*Barriers*	Lack of long term capacity and resources
		Rigidity of organisation
		Ongoing merger
	Facilitators	Focus of national policy on digital healthcare
		Support from different levels in organisation
		Patients providing incentives for change
4. Collaboration within thein organisation	*Barriers*	Mutual communication
		Lack of clear process agreements
	Facilitators	Multidisciplinary co-design

		Appointing a clinical and operational lead

1. Stakeholders' perceptions of the PDCP

Patients willing to use the PDCP for the first time needed different applications (apps) for first activation, including a two-factor authentication. This time consuming process, and that patients experienced practical difficulties was identified as a barrier by patients and HCPs. It was also mentioned that this may affect its suitability for patients in acute care settings or for end-users lacking digital skills. In addition, to access the PDCP through the EHR as a healthcare professional, the HCP must first manually install the tool.

- *"We want them [patients] to create and activate a MyChart account, but they also have to create another, separate account for MediMapp." [HCP]*

For the PDCP to permanently match the needs of the patients, one patient indicated that it is necessary for the application to remain up-to-date:

- *"It [the application] has to stay up-to-date. It should not be another tool that is produced but never updated. That is often what tends to happen with these kinds of innovations." [patient, gender care]*

The final barrier relates to the unknown effectiveness of the PDCP innovation in the context of an academic hospital. Respondents mentioned that the precise value of the PDCP tool for the organisation is still unclear. This meant that some HCPs and supporting staff were unconvinced by the innovation, which made it difficult to assess whether is it worth the investment in time and resources during implementation.

One of the main experienced facilitators was the user friendliness of the PDCP. All stakeholders, including patients, regarded the PDCP as visually attractive with a user-friendly interface and an easily understandable overview of the care pathway.

- *"It [MediMapp] looks clear and welcoming, you know exactly where to find what you need." [patient, cleft care]*

Mainly HCPs and patients expressed that the perceived usefulness would facilitate PDCP implementation. The innovation met the information needs of patients and created better accessibility of high quality and dosed information. In addition, the PDCP is linked to the EHR, which ensures completeness and reliability for end-users.

- *"The integration with electronic health records is one of the unique selling points of this tool, because that allows patients access to their own [personal] app environment." [HCP]*

HCPs indicated that using a PDCP might improve efficiency in their daily practice. Firstly, patients know what to expect and what a consultation entails. Secondly, a PDCP could reduce patient questions, since patients can access information before and after a consultation.

HCPs and supporting staff perceived that implementing a PDCP contributed to the provision of patient-centred care within the hospital. Important reasons were; 1) placing the patient at the centre of care and using digital tools to support this aligns with the strategy of Amsterdam UMC, 2) the PDCP may ensure a higher level of involvement by patients in their treatment and 3) it may facilitate better interaction between the patient and the HCP.

- *"In my opinion, the relationship between the patient and the specialist will actually improve … They [patients] know that the specialist is offering the best possible option at that moment, because they [patients] can read up on the available information themselves."[HCP]*

2. Implementation by HCP in daily practice

As indicated by a HCP, changing people's behaviour is difficult and resistance may occur. Since HCP's individual change is necessary for implementation of PDCP, this resistance was

perceived as a barrier.. Breaking routines and demonstrating that the new way is better, was perceived as a difficult transition:

- *"Doctors are often creatures of habit, and ... you [HCP] often have a routine that works effectively for yourself. Changes can then be more difficult to implement." [HCP]*

Since each department and organisation has its own routine in daily practice, it was mentioned that the innovation must also fit into the routine - including the departments' character and setting:

- *"The risk is that there is no room for innovation, because of the kind of person or doctor, and the type of work you do. The setting does not immediately allow innovation." [HCP]*

In relation to this, it also often takes time to embed and apply an innovation into practice. Since using the tool required an initial (manually) action by the HCP, which costs time and motivation, this was perceived as a barrier. Moreover, some HCPs indicated that if the consultation room facilities were not optimal this hindered use in practice.

- *"The screen cannot always be turned to face the patient because it is wired up with locked cables. … This can make it quite a challenge to ensure a good view of the screen for both the HCP and patient. … This raises the question: if I cannot show the screen to the patient, what added value does using it [PDCP] offer me? If I cannot show the patient my screen, it makes no sense to use it [PDCP]." [HCP]*

However, most HCPs concluded that the consultation room facilities are currently adequate to apply the PDCP in practice.

Due to mainly routine work, especially in the outpatient clinic, it should be possible to implement the PDCP in their daily practice in the consultation room.

To ensure long-term adoption, almost all stakeholders suggested that providing feedback on adoption can facilitate the implementation for HCPs. It was also mentioned by HCPs that sharing positive experiences, preferably those of their own colleagues, can also enthuse non-users by showing added value for patients. Sharing experiences could also be a way of explaining how the application works in practice. This can be promoted by internal ambassadors. In addition, HCPs indicated that reminders may be needed to stimulate users to continue using the app.

- *"If I could notice a couple of times that the tool really helped a patient, then it would be sold to me. My own experiences would really contribute, but the experiences shared by colleagues would make a big difference." [HCP]*

Lastly, mentioned by HCPs, the experience of being involved during the process of developing the tool from an early stage would work as a facilitator. An internal staff member also indicated that it would be conducive to ensure commitment from the department via a financial contribution.

- *"What I like about this [development of the PDCP], is how we have been closely involved in the design phase and content development. … I would have difficulty in adopting something new if I felt that my input was not taken seriously." [HCP]*

3. Organisational readiness

Almost all stakeholders mentioned that in order to innovate, an organisation must provide sufficient capacity and resources. One contradicting finding was that most HCPs suggested that long-term implementation support from central departments can facilitate adoption and maintenance, but these central departments indicated that due to a lack of capacity and resources this was not sustainable. This dilemma was perceived as a barrier:

- *"The realisation that you need to make significant investments in digital support to achieve the level of ambitions has not yet penetrated our governance structure and the Board of Directors….. For example, the eHealth team has to devote quite some time and effort to managing the PDCP." [organisational staff]*

Furthermore, certain restrictive characteristics of this large organisation were mentioned as an obstacle to implementation. Due to the rigidity and bureaucratic structure, the stakeholders, including the external supplier, stated that decision-making in the organisation was difficult and that all processes took a lot of time. These aspects negatively influenced the agility and ability to change of the organisation:

- *"I know Amsterdam UMC as an extensive organisation, where many administrative processes must be proceeded through to effect relatively minor changes … In my opinion, it [Amsterdam UMC] can be rigid and unwieldy. I hope this will not be the case regarding the implementation of the PDCP." [HCP]*

Another hindering characteristic was the current, ongoing merger of the two locations of Amsterdam UMC. This was mainly perceived as a barrier for implementation. When mandatory change is imposed by an organisation, employees perceived this as not having a choice. The merger implied numerous changes (e.g., working at new locations, observing new medical protocols, and working with new colleagues) to which employees were expected to adapt. In

view of the extent of the impending changes, one HCP expressed that it would be challenging to expect additional changes to be accepted too. However, it was also mentioned by a HCP that as so much change was already taking place, it would be better to introduce all the changes at once:

- *"We are already experiencing so much change, we can cope with this change as well." [HCP]*

Frustration was observed among some HCPs. As the merger was creating insecurity concerning their position as employees, this made additional changes even harder because they need to focus on themselves first before focusing on changes in the organisation. In contrast, internal staff stated that the merger was also having a positive impact on the organisation. Since the formerly two hospitals had different cultures, merging them had a positive influence on collaboration:

- *"Combining the teams at the VUmc and AMC is actually quite a relief. Bringing the two cultures together creates positive energy … I always characterised the culture of AMC as more individualistic and the culture of the VUmc more as a group … the merger has been very healthy." [organisational staff]*

With regard to facilitators, as mentioned by the external supplier, the national policy of the Dutch Ministry of Health, Welfare and Sport (VWS) was focused on digital healthcare at the time of this study. This created momentum and drove a sense of urgency to innovate for healthcare organisations, as illustrated by the following quote:

- *"As soon as there is a sense of urgency, you see that change suddenly takes place. That was also the case with COVID-19, digitalisation was rapidly embraced." [organisational staff]*

From the organisation itself, at department and division level, support was perceived as a facilitator for the stakeholders involved:

- *"The 'gender' board and different department heads widely support the implementation of the PDCP. In addition, attention was given to the project on the policy day. This support is very visible, which I think is very important." [organisational staff]*

To ensure sustainable implementation, it became clear that support is needed at various levels, including from the Board of Directors. As a final facilitator, patients expressing a clear desire and need for more digital information by requesting access to patient information in this way could also act as a major incentive to implementation. Within these three patient groups, the majority of the patients are relatively young and digital natives. This generates a stronger demand for more digitalisation, which ultimately creates the motivation to innovate and change.

- *"In my opinion, the gender outpatient clinic is one of the outpatient clinics that already has a high level of digitalisation, in terms of video consultation." [HCP]*

4. Collaboration within the organisation (support)

At the start of the PDCP project, the extent of collaboration between all stakeholders involved was inadequate and there was a certain unwillingness to open up to cooperation with others.

- *"Due to the sheer size of Amsterdam UMC, I think that we still tend to work from individual, isolated perspectives." [organisational staff]*

In addition, this was also reinforced by disparities in the definitions of common terms used in mutual communication. Stakeholders gave different definitions of important interpretive concepts such as implementation and maintenance.

To ensure successful implementation and embedding in the organisation, clear process

agreements were necessary between the external supplier, EvA Service Center, ICT and the end-users. Most of the supporting staff regarded these agreements to be lacking during the pilot implementation. It was experienced as important to also describe the division of roles and ownership. Moreover, it was often unclear who held responsibility for what part of the process and which tasks were assigned to which department. This emphasises the importance of agreeing and coordinating these points beforehand:

- *"I think we should have paid more attention to project adoption and assurance from the beginning. We should have appointed someone within the project team to be responsible for this adoption and assurance." [organisational staff]*

At a certain point in phase 1, the project team had been formed with the appropriate representatives from medical and supporting staff to collaborate in the design of the PDCP. This collaboration was perceived as very useful and resulted in regular multidisciplinary meetings during the implementation phase, in which both positive findings and issues were shared. This ensured a very approachable collaboration.

- *"The communication, care support, strategy and innovation departments, and the EvA Service Center worked together … This greatly contributed to making this project a success, because all stakeholders were involved. … This is a very positive development and should be repeated in future projects." [organisational staff]*

A complementary clinical and operational leader were both assigned from the start, based on personal motivation and availability. As indicated by multiple stakeholders, this facilitated good cooperation, both substantively and operationally with prospective implementation in mind.

DISCUSSION

We investigated factors influencing the implementation of a digital care pathway that was developed using experience-based co-design. We identified 4 themes: 1)'Stakeholders' perceptions of the PDCP' (e.g., duration of first activation, perceived usefulness PDCP); 2)'Implementation by healthcare professionals in daily practice' (e.g., individuals express resistance to change, providing feedback on adoption); 3) 'Organisational readiness' (e.g., lack of resources, patients providing incentives for change); and 4) 'Collaboration within the organisation' (e.g., mutual communication, multidisciplinary co-design). Main barriers mentioned by patients were duration of first activation and necessity for up-to-date content. In addition, the most facilitating factor for patients was user-friendliness.

There were several common factors among stakeholders (e.g., user friendliness, lack of resources and rigidity of the organisation). For example, all stakeholders agreed that more resources are needed for sustainable implementation. However, what resources needed depended on the stakeholder (e.g. funds, time, workforce). It was also expressed that this funding should be made available by the central board.

Nilsson et al. also stated that it is recommended to have sufficient support from the Board of Directors and align the organisation from the initial stage of the development and implementation of an innovation to embed the innovation well in the organisation. in line with that, the Board of Directors should facilitate sufficient capacity and resources (39). These findings imply that it is vital to invest in sufficient resources from the start of such a project (3). Previous literature has also shown that *resistance to change* was not only found among HCPs, but also among the broader stakeholders group (40). Since resistance to change could cause an implementation to fail, the impact of this perceived barrier should be minimised (36). Explaining what the precise changes are for stakeholders, including end-users, emphasising

the added value, and involving different stakeholder groups, including patients, during the design from an early stage can help alleviate resistance (32, 36, 41-47).

The perception of *rigidity of the organisation*, mainly due to the size of the organisation, was also mentioned by different stakeholders. This rigidity negatively influenced the decision-making speed and action taking. This was also experienced in the collaboration by the external supplier. Granja et al stated that this rigidity is typical for a healthcare organisation and adapting and adjusting to eHealth interventions is not suited for these kind of organisations (48). Our findings nuanced this, as there was a sense of urgency that created the first steps of organisational readiness and willingness of HCPs to implement this innovation, since the added value was certainly recognised and acknowledged by almost all stakeholders. However, as also mentioned by Threapleton et al., implementing a change in an organisation can take several years (15). Therefore, transformation requires *organisational readiness* for change among healthcare professionals, including cultural change (49-52). There were also remarkable differences between stakeholders, for example, regarding the impact of the *ongoing merger.* Some stakeholders perceived this as an opportunity for change, while others, due to the merger, sometimes felt it was too much change at once. These differences were also reflected in terms of the facilities required.

Strengths and limitations

A major strength of this study is that we incorporated the perspectives of all stakeholders, including the non-medical (supporting) staff. We collected views and opinions of those directly involved in implementation from an organisational perspective, and those of external stakeholders (patients and supplier). The authors chose to include the patient's perspective through the verification of findings with data from existing patient interviews, since these

interviews had already been conducted within the same scope. Other recent studies only focused on the organisational perspective or just on the experiences with eHealth implementation and adoption among healthcare professionals and patients. The inclusion of all perspectives contributed to the representativeness of this study, which took place in the complexity of a large organisation (3, 53-55).

Other strengths related to the fact that this study adds to the limited implementation studies by providing insight into the development and the subsequent implementation process in daily practice (56). The use of co-design in this project enhanced successful implementation as it ensured input and feedback by stakeholders and end-users and created commitment for further implementation. Furthermore, the data was structured according to the framework of CFIR for examining the numerous influences during the implementation of complex innovations, making comparison with other studies possible (57). The final strength of this study is that investigator triangulation was assured, since the interviews were conducted by multiple researchers (58).

This study also has some limitations. Firstly, participants were recruited using snowball sampling techniques, which could have resulted in selection bias (59). However, this effect was minimised by including stakeholders both familiar and unfamiliar with the PDCP tool. Secondly, analyses of qualitative data relies on the subjective interpretation of researchers. To reduce this bias, two researchers independently analysed the data which positively affected the validity (60). Thirdly, due to the COVID-19 pandemic, the interviews were conducted both by video call and face-to-face, which may have led to differences in understanding and data interpretation between the interviews. Lastly, CFIR does not include the patients' perspectives as a separate domain, which is an identified gap in CFIR (57). To include this domain, Flottorp's

model could be considered (61). In this study, the authors aspired to add this perspective by using data from patient interviews.

Practical implications

Based on the results of this study, we have formulated three practical implications to improve and enhance implementation of a PDCP. Firstly, it is essential to translate the facilitating aspects into evidence-based implementation strategies (62). For example, the added value and effectiveness of the PDCP for HCPs and patients should be made clear to every stakeholder involved, in a manner tailored to stakeholder. Secondly, it is vital to establish a multidisciplinary team comprising a wide selection of stakeholders (e.g., patients, technicians, HCPs and communication experts) right from the start of the project. This facilitates effective collaboration in the subsequent adoption and implementation phase. In addition, it is recommended to create change readiness and take advantage of momentum if change readiness has already been created. This may take the form, for instance, of implementing innovations in parallel or as part of ongoing organisational changes, such as the hospital's merger.

Future research

At the time of data collection, the PDCP was implemented as a pilot phase in three departments. Subsequent process and effect evaluation research is planned to assess the full implementation of the PDCP. In addition, conducting research on comparable implementation processes in other departments or organisations to elaborate on the generalisability of our findings is also recommended.

CONCLUSION

In conclusion, this qualitative study has identified factors facilitating or hindering the implementation of a PDCP in a large Dutch academic hospital. There were several similarities between the experienced facilitators or barriers among all stakeholders (e.g., user friendliness, lack of resources and rigidity of the organisation). Influential factors were related to the perceived usefulness of PCDP, yet need for keeping the content up to date. Resistance to change and expected time investment hindered implementation, whilst possibility of incorporation in daily practice worked as facilitator. Organisational readiness worked both as facilitator and barrier, and clear process agreements and communication are needed in place for strong collaboration. The co-creation process facilitated this collaboration. Findings were echoed by patients, and their main barriers were duration of first activation and necessity for up-to-date content. Our findings emphasise the importance of gaining insight into the various perspectives of stakeholder groups, including patients. It is recommended to tailor implementation strategies for each stakeholder group, adjusted to their perceived facilitators and barriers. Our findings can be used to improve and enhance PDCP implementation and tailor the development and improvement of other digital patient communication tools.

APPENDIX

1. Topic list and interview guide
2. Final codebook

ETHICAL APPROVAL

The need for approval for this study was waived by the Medical Ethical Committee at Amsterdam UMC, Vrije Universiteit Amsterdam (2019.651). Participation was voluntarily and all respondents gave verbal and written informed consent before taking part in our project.

ABBREVIATIONS

SDM: shared decision-making

PCC: patient centred care

PDCP: personalised digital care pathway

CFIR: Consolidated Framework for Implementation Research

EHR: electronic health record

EvA-SC: EvA Service Center, electronic health record service centre

eHealth: electronic health

Amsterdam UMC: Amsterdam University Centres

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AUTHOR CONTRIBUTION

Each author made substantial contributions to the work and writing of this manuscript: FH, FvN, MM, MB and MdB participated in the design of the study; FH and JS were responsible for data collection; FH, JS, and FvN participated in the analysis of the interviews; writing the initial draft, FH and JS; review and editing, FH, FvN, MM, MB and MdB. All team members

approved the version of the manuscript submitted for publishing and have agreed to be accountable for all aspects of the work.

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COMPETING INTERESTS

None declared. All authors had full access to all the study data and take responsibility for the integrity of the data and accuracy of the data analysis.

DATA SHARING STATEMENT

The character and identifiability of the qualitative data does not allow for distribution. All data relevant to the study are included in the article or uploaded as supplementary information.

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FIGURE LEGEND

Figure 1. An example of Personalised Digital Care Pathway (web- and mobile version) in Amsterdam UMC.

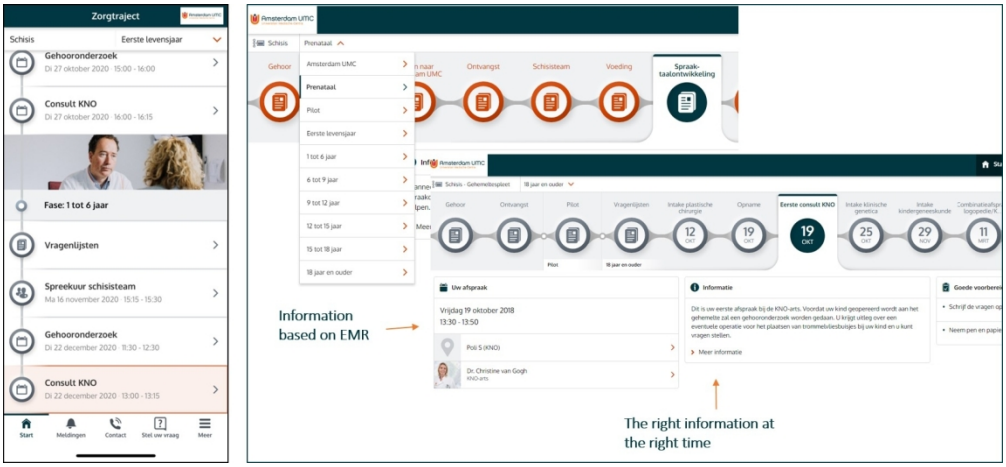

Figure 1. An example of Personalised Digital Care Pathway (web- and mobile version) in Amsterdam UMC.

154x70mm (300 x 300 DPI)

APPENDIX 1. TOPIC LIST AND INTERVIEW GUIDE

Introductie:
Hartelijk dank voor uw deelname aan dit interview. <introductie van mezelf en doel van onderzoek>
Het interview zal ongeveer drie kwartier tot een uur duren.

Heeft u nog vragen voor we beginnen?
Mag ik dit interview opnemen? Dan kunnen we nu starten met het interview en de opname.
<recorder aanzetten>
<nogmaals bevestiging vragen op recording voor opnemen>

Om u een idee te geven hoe het interview eruit gaat zien zijn dit de onderwerpen die we gaan behandelen: informatievoorziening huidige situatie, de gewenste situatie en MediMapp en wat uw verwachtingen zijn van MediMapp

Ik zou graag willen beginnen met de vraag of u kunt vertellen wie u bent en wat u doet?
(geslacht, welke afdeling, functie: hoe lang en eindverantwoordelijke, patiëntgroep)

Omdat dit interview over een digitale tool gaat, namelijk MediMapp, ben ik benieuwd of u affiniteit heeft met het gebruik van eHealth? Kunt u dit scoren van 1-5?

- En hoe kijkt u aan tegen het digitaliseren van informatievoorziening voor patiënten?
- Bent u al eens in aanraking geweest met MediMapp?
    - In hoeverre bent u betrokken geweest bij de ontwikkeling van MediMapp?

Informatievoorziening huidige situatie
Kunt u kort beschrijven hoe de informatievoorziening er op dit moment uit ziet? Wij definiëren informatievoorziening als het faciliteren van informatie voor patiënten, met de beschikbare middelen, zowel mondeling als schriftelijk.

- Wat vindt u hier goed gaan? En wat kan nog verbeterd worden?
- Wat denkt u dat patiënten zouden willen veranderen?

Gewenste situatie
- Als u nu de informatievoorziening *opnieuw* zou mogen *inrichten*, hoe ziet dit er dan voor u uit? *(vorm, proces, hoeveelheid, kwaliteit, begrijpelijkheid, toegankelijkheid, personalisatie)*
- Wat hoopt/denkt u dat goede informatievoorziening kan *opleveren*? *(vertrouwen, gesprek, arts-patiëntrelatie, overzicht, verwachtingen, voorbereiding)*
- Wat ziet u als de belangrijkste risico's in deze gewenste situatie?

Kan MediMapp de oplossing zijn?
<korte uitleg MediMapp, digitaal patiëntpad waar nodig>

Verwachting MediMapp
- Wat verwacht u dat MediMapp kan bijdragen aan uw dagelijkse werkzaamheden?
    - Voor u om informatie makkelijker te voorzien? *(kennis, vaardigheden, motivatie, tijd, ondersteuning, patiënt kenmerken)*
    - Voor patiënt? *(vertrouwen, gesprek, arts-patiëntrelatie, overzicht, verwachtingen, voorbereiding)*
    - Wat zou voor u de meerwaarde zijn? *(En voor verpleegkundige / baliemedewerker / overig)*
- Verwacht u MediMapp te gaan gebruiken?
    - *Hoe? Geloof in MediMapp?*
- Als u MediMapp wilt gaan gebruiken, wat heeft u dan nodig in de praktijk?
  Voordeel** t.o.v. huidige situatie / **aanpasbaarheid, veranderbaar, verfijndheid etc. / complexiteit
- Verwacht u dat er veel gaat veranderen aan uw dagelijkse werkzaamheden als u MediMapp gaat gebruiken?
    - Hoe kijkt u aan tegen zo'n verandering?
- Hoe verwacht u dat uw collega's zullen reageren op het gebruik van MediMapp?

kennis en geloof *in innovatie / Mening over MediMapp / Kijk tegenover* ***verandering*** */* ***verhouding*** *met organisatie / Andere persoonlijke kenmerken (motivatie, capaciteit, leiderschap stijl)*

- Denkt u dat MediMapp kan landen binnen uw afdeling?
    - *Waarom? Hoe?*
      Netwerk en communicatie */* ***bereidwilligheid*** *van afdeling t.o.v. implementatie (cultuur, normen, waardes en aannames) /* ***implementatie klimaat*** *van afdeling*
- Is MediMapp **passend** bij het Amsterdam UMC? (normen, waardes, werksystemen en stromen)
  Bereidwilligheid van Amsterdam UMC t.o.v. implementatie / verbintenis van medewerkers / informatie en kennis beschikbaar

Implementatie:

- Hoe denkt u dat MediMapp het best geïmplementeerd kan worden? En waarom?
    - Wat heeft uw afdeling hiervoor nodig?

  Netwerk en communicatie / cultuur, normen, waardes en aannames / implementatie klimaat / kijk tegen verandering / actieve implementatie
    - Waar gaan we tegenaan lopen tijdens de implementatie?
    - Wat gaat ons helpen tijdens de implementatie?
    - Waar ging het mis bij de implementatie van vorige projecten / oplossingen?
      Klinische formulieren in Epic
    - Tijdens een implementatieproces is het belangrijk dat er actieve betrokkenheid is van de organisatie. Hoe ervaart u dat dit wordt gedaan bij het Amsterdam UMC?
      Planning / *(actief)* ***meedoen*** */ (actief)* ***meegenomen worden*** *(door manager, leider, collega) /* ***uitvoering*** */* ***terugkijken en evalueren***
- Zijn er nog factoren in het Amsterdam UMC die de implementatie van MediMapp makkelijker maken of moeilijker maken?
  (beleid, draagvlak, expertise, samenwerking andere afdelingen, financiën, EPD, etc).
- Zijn er nog andere factoren in de *bredere context* die invloed hebben op de implementatie van MediMapp?
  l(everancier, zorgverzekeraar, betaalbaarheid voor organisatie etc.)
- DUS Wat zijn bevorderende factoren voor de implementatie van MediMapp? En wat zijn belemmerende factoren?
  Op de afdeling, gehele organisatie en bredere context

Afsluiting

Dit was mijn laatste vraag. Zijn er nog dingen die we niet besproken hebben, maar waarvan u denkt dat deze wel relevant zijn voor dit project?

Vervolg uitleggen: verdere interviews doen en het verwerken van deze interviews, bevorderende en belemmerende factoren in kaart brengen. Hierop ga ik dan een advies uitbrengen voor implementatie strategieën die we kunnen toepassen.

Mochten we nog meer deelnemers nodig hebben, mag ik u dan benaderen voor contactlegging met andere collega's?

APPENDIX 2. FINAL CODEBOOK

Appendix 2: Final codebook with domains, sub-domains and definitions (in Dutch).

Domain	*Sub-domain*	*Code Atlas.ti*	*Definition*
1. Inner setting	*1.1 Afdeling*	1.1.1 + Draagvlak voor PDCP	Alles wat er gezegd wordt over de aanwezigheid van draagvlak op afdelingen (werknemers op afdeling zijn enthousiast over PDCP)
		1.1.2 - Draagvlak voor PDCP	Alles wat er gezegd wordt over afwezigheid van draagvlak op afdelingen (werknemers op afdeling zijn niet enthousiast over PDCP)
		1.1.3 + Teamsamenwerking afdeling	Alles wat gezegd wordt over factoren die een positieve invloed hebben op samenwerking binnen Amsterdam UMC
		1.1.4 - Inspanning door afdeling	Alles wat gezegd wordt over de inspanning die een afdeling levert met negatief effect
		1.1.5 + Inspanning door afdeling	Alles wat gezegd wordt over de inspanning die een afdeling levert
		1.1.7 + Kijk tegen verandering	Alles wat wordt gezegd over veranderingen binnen een afdeling met een bevorderende effect
		1.1.8 - Kijk tegen verandering	Alles wat wordt gezegd over veranderingen binnen een afdeling met een belemmerend effect
		1.1.9 - Medewerkers moeilijk te bereiken	Alles wat wordt gezegd over de bereikbaarheid van medewerkers
		1.1.10 - Resultaat van fuseren op samenwerking	Alles wat gezegd wordt over de nadelige invloed van de fusie op samenwerking binnen een team / afdeling
		1.1.11 - Verandering moe	Alles wat gezegd wordt over veranderingen wat aanduidt dat medewerkers klaar zijn met de veranderingen
		1.1.12 - Onbekendheid van medewerkers over zorgproces en informatie binnen aandoening	Alles wat gezegd wordt over de onbekendheid die medewerkers ervaren over wat er binnen een aandoening precies gebeurt in het zorgproces

	1.2 Ziekenhuis-breed	1.2.1 - Amsterdam UMC loopt achter qua innovatie	Alles wat gezegd wordt over het innovatieve karakter van Amsterdam UMC t.o.v. andere organisaties en de samenleving
		1.2.2 + Capaciteit om te innoveren	Alles wat gezegd wordt over het hebben van voldoende capaciteit van afdelingen om te innoveren
		1.2.3 - Capaciteit om te innoveren	Alles wat gezegd wordt over de capaciteit van afdelingen om te innoveren
		1.2.4 - Cultuur Amsterdam UMC	Alles wat gezegd wordt over de cultuur van Amsterdam UMC
		1.2.5 - Dingen opleggen werkt niet	Alles wat gezegd wordt over dat medewerkers het idee krijgen dat ze iets wordt opgelegd door besturende organen (RvB, managers etc.), waar ze zelf geen mening over hebben kunnen geven
		1.2.6 + Draagvlak nodig voor uitvoering	Alles wat gezegd wordt over het draagvlak wat nodig is voor het gebruik van een innovatie
		1.2.7 - Draagvlak nodig voor uitvoering	Alles wat gezegd wordt over het draagvlak wat nodig is voor het gebruik van een innovatie
		1.2.8 + Eerdere ervaringen met innovaties beïnvloeden adoptie	Alles wat gezegd wordt over eerdere ervaringen met soortgelijke innovaties, wat adoptie van innovatie positief kan beïnvloeden
		1.2.9 - Eerdere ervaringen met innovaties beïnvloeden adoptie	Alles wat gezegd wordt over eerdere ervaringen met soortgelijke innovaties, wat adoptie van innovatie negatief kan beïnvloeden
		1.2.10 + Financieren innovaties	Alles wat er gezegd wordt over het financieren van innovaties en de invloed hiervan op adoptie
		1.2.11 - Financieren innovaties	Alles wat er gezegd wordt over het financieren van innovaties en de invloed hiervan op adoptie
		1.2.12 - Fuseren twee huizen	Alles wat gezegd wordt over het fuseren van het VUmc en AMC (op organisatieniveau)

		1.2.13 + Helderheid in verdeling van rollen	Alles wat er gezegd wordt over dat het voor stakeholders duidelijk is wat de rolverdeling is
		1.2.14 - Helderheid in verdeling van rollen	Alles wat er gezegd wordt over dat het voor stakeholders duidelijk is wat de rolverdeling is
		1.2.15 + Informatie voorziening voor patiënten	Alles wat wordt gezegd over de informatie dat wordt aangeboden aan patiënten
		1.2.16 - Informatie voorziening voor patiënten	Alles wat wordt gezegd over de informatie dat wordt aangeboden aan patiënten
		1.2.17 + PDCP past binnen beleid Amsterdam UMC	Alles wat gezegd wordt over het passen van PDCP bij het beleid van Amsterdam UMC
		1.2.18 - PDCP past binnen beleid Amsterdam UMC	Alles wat gezegd wordt over het passen van PDCP bij het beleid van Amsterdam UMC
		1.2.19 - Onbekendheid ziekenhuis breed	Alles wat er gezegd wordt over de onbekendheid die medewerkers ervaren over processen en beleid keuzes
		1.2.20 - Teamsamenwerking ziekenhuis	Alles wat gezegd wordt over factoren die een negatieve invloed hebben op samenwerking (ook onderlinge communicatie bijv.) binnen Amsterdam UMC
2. Outer setting		2.1 Landelijk uitwisseling	Alles wat gezegd wordt over de uitwisseling tussen verschillende ziekenhuizen (van patiënt informatie, van informatie, filmpjes etc.)
		2.2 Landelijke druk eHealth	Alles wat gezegd wordt over de druk die de overheid uitoefent op het innoveren in eHealth
		2.3 Leverancier	Alles wat gezegd worden over samenwerking met een externe leverancier
3. Intervention	*3.1 Geen meerwaarde PDCP zorgverlener*	3.1 - Geen meerwaarde PDCP zorgverlener	Alles wat gezegd wordt over de meerwaarde van PDCP voor zorgverleners(groepen)

	3.2 Meerwaarde PDCP	3.2.1 + Goede informatievoorziening voor patiënt	Alles wat gezegd wordt over de toegankelijke en betrouwbare infovoorziening (voor patiënt) met kwaliteit en de juiste hoeveelheid, door PDCP verzorgt
		3.2.2 + Maatwerk voor patiënt	Alles wat gezegd wordt over de mogelijkheid die PDCP biedt om maatwerk te leveren aan de patiënt
		3.2.3 + Meerwaarde zorgverlener	Alles wat gezegd wordt over de meerwaarde van PDCP voor zorgverleners(groepen)
		3.2.4 + PDCP draagt bij aan andere doelen	Alles wat gezegd wordt over andere doelen die bereikt kunnen worden door PDCP (SDM, koppeling PROMs, meer grip zorgtraject voor patiënten)
		3.2.5 + Tijdbesparing / efficiënter werken	Alles wat gezegd wordt over dat PDCP efficiëntie stimuleert
		3.2.6 + PDCP past in huidige werkwijze	Alles wat gezegd wordt over de passendheid van PDCP in de huidige werkwijze
		3.2.7 - PDCP past in huidige werkwijze	Alles wat gezegd wordt over de passendheid van PDCP in de huidige werkwijze
		3.2.8 - Patiënt- arts relatie	Alles wat gezegd wordt over de invloed van PDCP op de arts-patiënt relatie
	3.3 Gebruiks-vriendelijkheid	3.3.1 + Aansluiten behoeftes patiënt	Alles wat gezegd wordt over de behoefte van de patiënt aan PDCP
		3.3.2 - Aansluiten behoeftes patiënt	Alles wat gezegd wordt over de behoefte van de patiënt aan PDCP
		3.3.3 + Aansluiten informatiebehoefte patiënt	Alles wat gezegd wordt over de informatiebehoefte van de patiënt
		3.3.4 - Geschiktheid voor iedereen	Alles wat gezegd wordt over de geschiktheid van PDCP bij ieder type patiënt (zoals laaggeletterden, andere talen)
	3.4 Beheer	3.4.1 - Beheer PDCP	Alles wat gezegd wordt over het beheer van PDCP
		3.4.2 + Koppeling met Epic	Alles wat gezegd wordt over de koppeling tussen EPIC en PDCP

		3.4.3 - Koppeling met Epic	Alles wat gezegd wordt over de koppeling tussen EPIC en PDCP
		3.4.4 + Kosten	Alles wat gezegd wordt over de kosten van PDCP
		3.4.5 - Kosten	Alles wat gezegd wordt over de kosten van PDCP
		3.4.6 - Meerdere apps nodig	Alles wat gezegd wordt over dat er meerdere apps nodig zijn voor patiënten om meer te weten over hun zorg en zorgtraject
		3.4.7 + Gebruik van PDCP	Alles wat er gezegd wordt over hoe PDCP te gebruiken is
		3.4.8 - Gebruik van PDCP	Alles wat er gezegd wordt over hoe PDCP te gebruiken is
		3.4.9 + Uiterlijk PDCP	Alles wat gezegd wordt over de ervaring van hoe PDCP eruit ziet
	3.5 Risico's	3.5.1 + Effect en risico	Alles wat gezegd wordt over risico's van informatie digitaliseren (wat invloed kan hebben op de implementatie van PDCP)
		3.5.2 – Effect en risico	Alles wat gezegd wordt over risico's van informatie digitaliseren (wat invloed kan hebben op de implementatie van PDCP)
4. Individuals		4.1 + Attitude eindgebruikers t.o.v. PDCP	Alles wat gezegd wordt over hoe eindgebruikers tegenover PDCP staan
		4.2 - Attitude eindgebruikers t.o.v. PDCP	Alles wat gezegd wordt over hoe eindgebruikers tegenover PDCP staan
		4.3 + Betrokkenheid van eindgebruikers	Alles wat gezegd wordt over de invloed van de betrokkenheid van eindgebruikers op de implementatie
		4.4 - Betrokkenheid van eindgebruikers	Alles wat gezegd wordt over de invloed van de betrokkenheid van eindgebruikers op de implementatie
		4.5 + Karakteristieken eindgebruikers	Alles wat gezegd wordt over de eigenschappen van eindgebruikers, zoals leeftijd, skills met omgaan eHealth
		4.6 - Karakteristieken eindgebruikers	Alles wat gezegd wordt over de eigenschappen van eindgebruikers, zoals leeftijd, skills met omgaan eHealth

		4.7 + Ervaringen delen motiveert	Alles wat gezegd wordt over ervaringen delen (van eindgebruikers) met de ondersteunende diensten, wat als motiverend wordt ervaren
		4.8 + Motivatie om te veranderen	Alles wat gezegd wordt over de motivatie van medewerkers om hun dagelijkse werkzaamheden te veranderen
		4.9 - Motivatie om te veranderen	Alles wat gezegd wordt over de motivatie van medewerkers om hun dagelijkse werkzaamheden te veranderen
		4.10 + Herinnering voor PDCP nodig	Alles wat gezegd wordt over het herinneren van eindgebruikers aan PDCP
		4.11 - Herinnering voor PDCP nodig	Alles wat gezegd wordt over het herinneren van eindgebruikers aan PDCP
5. Process	*5.1 Bevorderend*	5.1.1 + Randvoorwaarden gebruik	Alles wat gezegd wordt over wat nodig is voor eindgebruikers om PDCP (praktisch) te gebruiken in dagelijkse werkzaamheden
		5.1.2 + Suggesties voor implementatie en gebruik	Suggesties hoe de implementatie en gebruik het best vormgegeven kan worden
		5.1.3 + Suggesties voor verbetering inhoud / ontwikkeling	Suggesties hoe verbeteringen het best aangepakt kunnen worden (feedbackloops)
		5.1.4 + Sense of urgency nodig voor succes	Alles wat gezegd wordt over het gevoel van urgentie, wat een organisatie nodig heeft om een innovatie te laten slagen
	5.2 Belemmerend	5.2.1 - Onduidelijkheid rondom proces PDCP	Alles wat gezegd wordt over onduidelijkheid rondom gebruikers proces van PDCP
		5.2.2 - Randvoorwaarden gebruik	Alles wat gezegd wordt over wat nodig is voor eindgebruikers om PDCP te gebruiken in dagelijkse werkzaamheden
		5.2.3 - Selectie maken is moeilijk	Alles wat wordt gezegd over de selectie welke afdelingen mee mogen doen met gebruik PDCP
		5.2.4 - Uitvoering moeizaam	Alles wat gezegd wordt over hoe de uitvoering van PDCP gaat

	5.2.5 - Verschil in definities	Alles wat gezegd wordt over definities en termen rondom het proces van implementeren van PDCP

COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	
Sample size	12	How many participants were in the study?	
Non-participation	13	How many people refused to participate or dropped out? Reasons?	
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	
Field notes	20	Were field notes made during and/or after the inter view or focus group?	
Duration	21	What was the duration of the inter views or focus group?	
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	
Description of the coding tree	25	Did authors provide a description of the coding tree?	
Derivation of themes	26	Were themes identified in advance or derived from the data?	
Software	27	What software, if applicable, was used to manage the data?	
Participant checking	28	Did participants provide feedback on the findings?	
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	
Clarity of major themes	31	Were major themes clearly presented in the findings?	
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

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BMJ Open

Stakeholders barriers and facilitators for the implementation of a personalised digital care pathway: a qualitative study

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Stakeholders barriers and facilitators for the implementation of a personalised digital care pathway: a qualitative study

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patient-centred care, implementation, facilitators and barriers, digital communication, patient information, stakeholder involvement

ABSTRACT

Objective

A prerequisite for patient-centeredness in healthcare organisations is offering patients access to adequate health information which fits their needs. A personalised digital care pathway (PDCP) is a tool that facilitates the provision of tailored and timely information. Despite its potential, barriers influence the implementation of digital tools in healthcare organisations. Therefore, we investigated the perceived barriers and facilitators for implementation of the PDCP among stakeholders.

Design

A qualitative study was conducted to acquire insight into perceptions of the stakeholders involved in the implementation of a digital care pathway in three diverse patient groups.

Setting

This study is part of the "PersonalisedDigitalCarePathway" (PDCP) research project in a large academic hospital in the Netherlands.

Participants

Purposive sampling was used to recruit internal stakeholders (e.g., healthcare professionals, employees of the supporting departments) and external stakeholders (e.g., employees of the external PDCP supplier). In addition, existing semi-structured interviews with patients involved in pilot implementation (n=24) were used to verify the findings.

Results

We conducted 25 semi-structured interviews using the Consolidated Framework for Implementation Research. Content analyses yielded four themes: 1) stakeholders' perceptions of the PDCP (e.g., perceived usefulness); 2) characteristics of the individuals involved and the implementation process (e.g., individuals express resistance to change); 3) 'Organisational readiness' (e.g., lack of resources); and 4) 'Collaboration within the organisation' (e.g., mutual communication, multidisciplinary co-design). The main barriers mentioned by patients were duration of first activation and necessity for up-to-date content. In addition, the most facilitating factor for patients was user-friendliness.

Conclusion

Our findings emphasise the importance of gaining insights into the various perspectives of stakeholder groups, including patients, regarding the implementation of the PDCP. The perceived barriers and facilitators can be used to improve the PDCP implementation plan and tailor the development and improvement of other digital patient communication tools.

Trial registration number

N/A

Strengths and limitations of this study

- This qualitative study took into account the diverse perspectives of all types of stakeholders.
- A co-design approach was used to enhance successful implementation.
- Due to the COVID-19 pandemic, interviews were conducted both digitally and physically.
- Participants were recruited using snowball sampling techniques, which could have resulted in selection bias.
- Since the interviews were conducted and analysed by multiple researchers, investigator triangulation was applied.

INTRODUCTION

In recent years, the emphasis on patient-centred care has increased in the Dutch healthcare system (1). Patient-centeredness is a key element of high-quality care and entails collaboration between the healthcare professional (HCP), the patient and their families, in which the needs, values and preferences of patients are the focus of care (2, 3). Patients no longer want to be passive recipients of care, but increasingly want and need to proactively manage their own health. They also wish to be empowered and involved in decision-making that relates to their care, which can contribute to patient-centred care (4-9). To achieve this, it is important that HCPs and patients share the same information (10, 11).

To achieve patient-centred care including shared decision-making, health information should be tailored. Personalised health information includes details about the diagnosis and treatment options of the individual, and practical information about their care pathway (12, 13). This concerns information about possible choices and the advantages and disadvantages of these choices, along with outcomes and uncertainties (8, 13, 14). Information provision should match the patient's wishes, needs and their ability to process information, which ensures a better experience for the patient (15). In addition, optimally dosing and timing the information provision is crucial, to prevent patients from an information overload (7, 15, 16). Also, health literacy studies show that general health information is frequently not understood to a sufficient extent (17).

Both patients and HCPs have expressed their willingness to contribute to patient-centred care, but often have insufficient knowledge on how to put this into practice (4, 5, 7). Therefore, HCPs should be instructed on how to provide their patients with suitable information (7, 18). Providing the HCP and patient with tools to improve information provision facilitates effective

communication (4, 11). A personalised digital care pathway is an example of a tool that facilitates HCPs and their patients in accessing adequate information (4, 16, 19). This can be described as a digital tool providing personalised dosed information and an overview of appointments for the coordination of care, tailored to a certain patient group, which leads to greater information symmetry between the HCP and patient (20).

Despite the potential of digital care pathways, there appear to be barriers to the implementation of digital tools in healthcare organisations (11, 21-24). An innovation that has been poorly implemented by HCPs may end up not being used in daily routines or used in the wrong way, which results in a low uptake by end-users (24, 25). Gathering information about the organisation, such as the context and responses to change before and during implementation, can determine the factors that affect implementation (25-27). All stakeholders act within their own contexts and expectations (28). Therefore, to implement a digital care pathway in practice, it is essential to explore the perceptions of all stakeholders involved including end-users (29).

Information about implementation is often expressed in barriers and facilitators (27, 30). This information contributes to selecting tailored implementation strategies, which in turn can help overcome the hurdles of implementing (27, 31). As example, previous studies have shown that low health literacy and inadequate staffing were barriers to the implementation of digital tools. On the other hand, the perceived usefulness of an intervention and good multidisciplinary communication were identified as facilitating for implementation (3, 19, 32). However, some of these studies mainly focused on implementation in one specific patient group and the perceived barriers and facilitators from an organisational perspective. As a result, there is a lack of insight into the hospital-wide embedding in diverse patient groups and visions of all the

different stakeholders involved, including end users.

Therefore, the aim of this study was to identify the perceived facilitators and barriers among various internal and external stakeholders (i.e., patients, healthcare professionals, non-medical professionals, external supplier) regarding the implementation of personalised digital care pathways within a large academic hospital.

METHODS

Study design

A qualitative study was conducted to acquire insight into perceptions of the stakeholders involved in the implementation of a digital care pathway in three diverse patient groups.

Context and setting

This study is part of the "PersonalisedDigitalCarePathway" (PDCP) research project. As basis for initiating this patient-centred project, we used previous patient-reported experience measurements and patient participation sessions during the start of the value-based healthcare (VBHC) program at Amsterdam UMC, a large academic hospital in Amsterdam, the Netherlands (33). Patients indicated that information was outdated and not easily accessible. This was mentioned among all three selected patient groups, all of them were part of the VBHC program. Furthermore, they experienced a low level of self-management with regard to their care healthcare. Development and subsequent implementation of a PDCP was anticipated to remedy these shortcomings. The project included two phases:

1. Adaptive development including pilot implementation, based on experience-based co-design (out of scope in this study). PDCPs were created in close collaboration with 1) patients with excessive scars (Scar Clinic), 2) cleft lip and/or palate (Cleft Care) and 3) people who experience gender dysphoria (Gender Care) and their healthcare professionals, communication advisors and the eHealth team of our electronic health record service centre (EvA-SC).
2. Evaluation of implementation in practice of the PDCPs at Amsterdam UMC for the three patient groups as described above.

We conducted this qualitative study at the end of phase 1.

Personalised Digital Care Pathway (PDCP)

In this study we define a PDCP as a digital tool which provides patients and their healthcare professionals an overview of a the personal care pathway, with adequate and dosed information at appropriate time points. An example is shown in Figure 1 (web- and mobile version). In this customised tool, relevant content will become available gradually to end-users as the care pathway progresses over time - including appointments and practical information. Patients can access the PDCP tool after a two-factor authentication via an app or as a web-based tool (34). Access is given after their first intake to the hospital, and after the initial authentication, patients and/or parents can enter the tool at any time. Healthcare professionals have access to the patients' PDCP via the electronic health record (EHR). The IT system used for this project was developed by an external supplier (Soulve Innovations) (35).

<PLEASE INSERT FIGURE 1 HERE>

Study participants

Stakeholders were recruited by purposive sampling. To identify further relevant stakeholders, we used snowball sampling (36). Internal stakeholders were healthcare professionals of the medical specialties involved (plastic surgery, otorhinolaryngology, psychology and gynaecology) and employees of the supporting departments, divided into managers and team members. Employees of the external supplier participated as external stakeholders. All stakeholders were contacted through email. Once the stakeholder had agreed to participate an interview was scheduled, digitally via Microsoft Teams or on location. Informed consent was signed after the participant was informed about the purpose of the study. Verbal consent for audio recording was obtained from every participant.

Theoretical framework

We used the Consolidated Framework for Implementation Research (CFIR), as this framework can help to explain why implementation of the PDCP may or may not be successful (37). It provides a practical guide for evaluating perceived facilitators and barriers. In this framework the context, complexity, multi-level aspects and interaction of the implementation are considered (31, 37). The five domains of the CFIR framework are: intervention (e.g., advantage, adaptability), outer setting (e.g., patient needs, external policies), inner setting (e.g., culture, readiness for implementation), the individuals involved (e.g., knowledge and beliefs, self-efficacy), and the implementation process (e.g., engaging, executing) (37, 38).

Data collection

We conducted individual, semi-structured, in-depth interviews guided by CFIR. We ordered the themes in a way that was consistent with the care and implementation process, incorporating all components of CFIR. The list of topics (Appendix 1) was amended minimally for stakeholders who work as healthcare professionals. All audio-recorded interviews were conducted by trained researchers (JS, JG, FH, FvN) and transcribed verbatim.

Patient and Public Involvement

Patients were actively involved during adaptive development of the PDCP (phase 1). Patients were selected via their healthcare professional, consultation appointment or inpatient admission. In this study pragmatic semi-structured interviews with patients (n=24) which had been conducted after taking part in the pilot implementation, were used for verification of our findings about the facilitators and barriers for implementation of the PDCP. The purpose of

these interviews was to collect patients' experiences concerning the content and use of the application during the pilot implementation and verify the gathered findings. This data was also collected as part of the PDCP research project during phase 1 and will be used for further implementation.

Data analysis

To ensure data saturation, data analysis was initiated during data collection, so that missing information, themes or perspectives could be gathered during upcoming interviews (39). This process was repeated until no new themes emerged from the data and we mainly heard information we gathered before. Data was analysed using content analysis in Atlas.ti version 9 (Berlin, Germany). First, three researchers (FH, JS, FvN) coded six transcripts openly and inductively. During several meetings (FH, JS, FvN) codes were discussed, grouped in overarching codes, and revised to reach a consensus and ensure quality of the analysis. The codes used in Atlas.ti 9 were described in a final codebook (appendix 2), which was used to analyse the remaining transcripts by two independent researchers (FH, JS). After coding the transcripts, categories were formed by deductive axial coding. These categories were used to form themes and subthemes, described in the results section. In the final step, quotes were selected for representation. All data were analysed and presented pseudonymously.

RESULTS

In total, 25 interviews were conducted between November 2020 and June 2021. Most of the interviews were held digitally due to the COVID-19 pandemic (n=22) and three were held face-to-face. Interviews lasted on average an hour (37 minutes min; 67 minutes max). Table 1 shows characteristics of the interviewees. The group of 'non-medical professionals' included supporting staff of the implicated medical departments level (decentral), supporting staff of the main organisation e.g. strategy, communication and EHR department (central) and employees of the external supplier as external participants. Median employment duration of stakeholders in their current position was 2 years (min 1 – max 20 years).

Table 1. Characteristics of study participants (N=25)

[1]EvA-SC: electronic health record service centre, [2]PDCP: Personalised Digital Care Pathway

Gender, N(%)		**Professional roles in organisation, N(%)**			**Employment context of participants, N(%)**	
Male	7 (28%)	*Healthcare professionals*	***TOTAL***	***10 (40%)***	Excessive scars (Scar Clinic)	4 (16%)
Female	18 (72%)		Doctor	5 (20%)	Cleft Lip or/and Palate (Cleft Care)	4 (16%)
			Nurse (specialist)	3 (12%)	Gender Incongruence (Gender Care)	6 (24%)
			Other roles	2 (8%)	Internal and External Communication	2 (8%)
		Non-medical professionals	***TOTAL***	***15 (60%)***	EvA Service Center[1]	4 (16%)
		Decentral staff	Consultant	2 (8%)	Strategy & Innovation	3 (12%)
			Other roles	2 (8%)	External PDCP[2] supplier	2 (8%)
		Central staff	Manager	3 (12%)		
			Application specialist	2 (8%)		
			Consultant	4 (16%)		
		External staff	Other roles	2 (8%)		

In addition, the 24 interviews with patients were conducted after taking part in the pilot implementation (phase 1) and were included in the results. An interview validity check was used for verification of the themes and findings. Quotes were used for representation.

Content analyses yielded four main themes, subdivided in 24 subthemes (Table 2).

Table 2. Themes and perceived barriers and facilitators regarding implementation of a digital care pathway

[1]PDCP: Personalised Digital Care Pathway, [2]HCP: Healthcare professional

Themes	Subthemes	
1. Stakeholders' perceptions of the PDCP[1]	*Barriers*	Duration of first activation
		Not suitable for every patient group
		Necessity of up-to-date content
		Still unclear effectiveness
	Facilitators	User friendliness
		Perceived usefulness by patients
		Potential efficiency in practice
		Contribution to patient-centred care
2. Implementation by HCP[2] in daily practice	*Barriers*	Individuals express resistance to change
		Time-consuming implementation
		Non-optimal facilities
	Facilitators	Possibility of incorporation in daily practice
		Providing feedback on adoption
		Created support in the medical department by enlisting co-design
3. Organisational readiness	*Barriers*	Lack of long term capacity and resources
		Rigidity of organisation
		Ongoing merger
	Facilitators	Focus of national policy on digital healthcare
		Support from different levels in organisation
		Patients providing incentives for change
4. Collaboration within thein organisation	*Barriers*	Mutual communication
		Lack of clear process agreements
	Facilitators	Multidisciplinary co-design

		Appointing a clinical and operational lead

1. Stakeholders' perceptions of the PDCP

Patients willing to use the PDCP for the first time needed different applications (apps) for first activation, including a two-factor authentication. This time consuming process, and that patients experienced practical difficulties was identified as a barrier by patients and HCPs. It was also mentioned that this may affect its suitability for patients in acute care settings or for end-users lacking digital skills. In addition, to access the PDCP through the EHR as a healthcare professional, the HCP must first manually install the tool.

- *"We want them [patients] to create and activate a MyChart [patient portal] account, but they also have to create another, separate account for MediMapp [PDCP tool]." [HCP]*

For the PDCP to permanently match the needs of the patients, one patient indicated that it is necessary for the application to remain up-to-date:

- *"It [the application] has to stay up-to-date. It should not be another tool that is produced but never updated. That is often what tends to happen with these kinds of innovations." [patient, gender care]*

The final barrier relates to the unknown effectiveness of the PDCP innovation in the context of an academic hospital. Respondents mentioned that the precise value of the PDCP tool for the organisation is still unclear. This meant that some HCPs and supporting staff were unconvinced by the innovation, which made it difficult to assess whether is it worth the investment in time and resources during implementation.

One of the main experienced facilitators was the user friendliness of the PDCP. All stakeholders, including patients, regarded the PDCP as visually attractive with a user-friendly interface and an easily understandable overview of the care pathway.

- *"It [MediMapp] looks clear and welcoming, you know exactly where to find what you need." [patient, cleft care]*

Mainly HCPs and patients expressed that the perceived usefulness would facilitate PDCP implementation. The innovation met the information needs of patients and created better accessibility of high quality and dosed information. In addition, the PDCP is linked to the EHR, which ensures completeness and reliability for end-users.

- *"The integration with electronic health records is one of the unique selling points of this tool, because that allows patients access to their own [personal] app environment." [HCP]*

HCPs indicated that using a PDCP might improve efficiency in their daily practice. Firstly, patients know what to expect and what a consultation entails. Secondly, a PDCP could reduce patient questions, since patients can access information before and after a consultation.

HCPs and supporting staff perceived that implementing a PDCP contributed to the provision of patient-centred care within the hospital. Important reasons were; 1) placing the patient at the centre of care and using digital tools to support this aligns with the strategy of Amsterdam UMC, 2) the PDCP may ensure a higher level of involvement by patients in their treatment and 3) it may facilitate better interaction between the patient and the HCP.

- *"In my opinion, the relationship between the patient and the specialist will actually improve … They [patients] know that the specialist is offering the best possible option at that moment, because they [patients] can read up on the available information themselves."[HCP]*

2. Implementation by HCP in daily practice

As indicated by a HCP, changing people's behaviour is difficult and resistance may occur. Since HCP's individual change is necessary for implementation of PDCP, this resistance was

perceived as a barrier.. Breaking routines and demonstrating that the new way is better, was perceived as a difficult transition:

- *"Doctors are often creatures of habit, and ... you [HCP] often have a routine that works effectively for yourself. Changes can then be more difficult to implement." [HCP]*

Since each department and organisation has its own routine in daily practice, it was mentioned that the innovation must also fit into the routine - including the departments' character and setting:

- *"The risk is that there is no room for innovation, because of the kind of person or doctor, and the type of work you do. The setting does not immediately allow innovation." [HCP]*

In relation to this, it also often takes time to embed and apply an innovation into practice. Since using the tool required an initial (manually) action by the HCP, which costs time and motivation, this was perceived as a barrier. Moreover, some HCPs indicated that if the consultation room facilities were not optimal this hindered use in practice.

- *"The screen cannot always be turned to face the patient because it is wired up with locked cables. … This can make it quite a challenge to ensure a good view of the screen for both the HCP and patient. … This raises the question: if I cannot show the screen to the patient, what added value does using it [PDCP] offer me? If I cannot show the patient my screen, it makes no sense to use it [PDCP]." [HCP]*

However, most HCPs concluded that the consultation room facilities are currently adequate to apply the PDCP in practice.

Due to mainly routine work, especially in the outpatient clinic, it should be possible to implement the PDCP in their daily practice in the consultation room.

To ensure long-term adoption, almost all stakeholders suggested that providing feedback on adoption can facilitate the implementation for HCPs. It was also mentioned by HCPs that sharing positive experiences, preferably those of their own colleagues, can also enthuse non-users by showing added value for patients. Sharing experiences could also be a way of explaining how the application works in practice. This can be promoted by internal ambassadors. In addition, HCPs indicated that reminders may be needed to stimulate users to continue using the app.

- *"If I could notice a couple of times that the tool really helped a patient, then it would be sold to me. My own experiences would really contribute, but the experiences shared by colleagues would make a big difference." [HCP]*

Lastly, mentioned by HCPs, the experience of being involved during the process of developing the tool from an early stage would work as a facilitator. An internal staff member also indicated that it would be conducive to ensure commitment from the department via a financial contribution.

- *"What I like about this [development of the PDCP], is how we have been closely involved in the design phase and content development. … I would have difficulty in adopting something new if I felt that my input was not taken seriously." [HCP]*

3. Organisational readiness

Almost all stakeholders mentioned that in order to innovate, an organisation must provide sufficient capacity and resources. One contradicting finding was that most HCPs suggested that long-term implementation support from central departments can facilitate adoption and maintenance, but these central departments indicated that due to a lack of capacity and resources this was not sustainable. This dilemma was perceived as a barrier:

- *"The realisation that you need to make significant investments in digital support to achieve the level of ambitions has not yet penetrated our governance structure and the Board of Directors….. For example, the eHealth team has to devote quite some time and effort to managing the PDCP." [organisational staff]*

Furthermore, certain restrictive characteristics of this large organisation were mentioned as an obstacle to implementation. Due to the rigidity and bureaucratic structure, the stakeholders, including the external supplier, stated that decision-making in the organisation was difficult and that all processes took a lot of time. These aspects negatively influenced the agility and ability to change of the organisation:

- *"I know Amsterdam UMC as an extensive organisation, where many administrative processes must be proceeded through to effect relatively minor changes … In my opinion, it [Amsterdam UMC] can be rigid and unwieldy. I hope this will not be the case regarding the implementation of the PDCP." [HCP]*

Another hindering characteristic was the current, ongoing merger of the two locations of Amsterdam UMC. This was mainly perceived as a barrier for implementation. When mandatory change is imposed by an organisation, employees perceived this as not having a choice. The merger implied numerous changes (e.g., working at new locations, observing new medical protocols, and working with new colleagues) to which employees were expected to adapt. In

view of the extent of the impending changes, one HCP expressed that it would be challenging to expect additional changes to be accepted too. However, it was also mentioned by a HCP that as so much change was already taking place, it would be better to introduce all the changes at once:

- *"We are already experiencing so much change, we can cope with this change as well." [HCP]*

Frustration was observed among some HCPs. As the merger was creating insecurity concerning their position as employees, this made additional changes even harder because they need to focus on themselves first before focusing on changes in the organisation. In contrast, internal staff stated that the merger was also having a positive impact on the organisation. Since the formerly two hospitals had different cultures, merging them had a positive influence on collaboration:

- *"Combining the teams at the VUmc and AMC is actually quite a relief. Bringing the two cultures together creates positive energy … I always characterised the culture of AMC as more individualistic and the culture of the VUmc more as a group … the merger has been very healthy." [organisational staff]*

With regard to facilitators, as mentioned by the external supplier, the national policy of the Dutch Ministry of Health, Welfare and Sport (VWS) was focused on digital healthcare at the time of this study. This created momentum and drove a sense of urgency to innovate for healthcare organisations, as illustrated by the following quote:

- *"As soon as there is a sense of urgency, you see that change suddenly takes place. That was also the case with COVID-19, digitalisation was rapidly embraced." [organisational staff]*

From the organisation itself, at department and division level, support was perceived as a facilitator for the stakeholders involved:

- *"The 'gender' board and different department heads widely support the implementation of the PDCP. In addition, attention was given to the project on the policy day. This support is very visible, which I think is very important." [organisational staff]*

To ensure sustainable implementation, it became clear that support is needed at various levels, including from the Board of Directors. As a final facilitator, patients expressing a clear desire and need for more digital information by requesting access to patient information in this way could also act as a major incentive to implementation. Within these three patient groups, the majority of the patients are relatively young and digital natives. This generates a stronger demand for more digitalisation, which ultimately creates the motivation to innovate and change.

- *"In my opinion, the gender outpatient clinic is one of the outpatient clinics that already has a high level of digitalisation, in terms of video consultation." [HCP]*

4. Collaboration within the organisation (support)

At the start of the PDCP project, the extent of collaboration between all stakeholders involved was inadequate and there was a certain unwillingness to open up to cooperation with others.

- *"Due to the sheer size of Amsterdam UMC, I think that we still tend to work from individual, isolated perspectives." [organisational staff]*

In addition, this was also reinforced by disparities in the definitions of common terms used in mutual communication. Stakeholders gave different definitions of important interpretive concepts such as implementation and maintenance.

To ensure successful implementation and embedding in the organisation, clear process

agreements were necessary between the external supplier, EvA Service Center, ICT and the end-users. Most of the supporting staff regarded these agreements to be lacking during the pilot implementation. It was experienced as important to also describe the division of roles and ownership. Moreover, it was often unclear who held responsibility for what part of the process and which tasks were assigned to which department. This emphasises the importance of agreeing and coordinating these points beforehand:

- *"I think we should have paid more attention to project adoption and assurance from the beginning. We should have appointed someone within the project team to be responsible for this adoption and assurance." [organisational staff]*

At a certain point in phase 1, the project team had been formed with the appropriate representatives from medical and supporting staff to collaborate in the design of the PDCP. This collaboration was perceived as very useful and resulted in regular multidisciplinary meetings during the implementation phase, in which both positive findings and issues were shared. This ensured a very approachable collaboration.

- *"The communication, care support, strategy and innovation departments, and the EvA Service Center worked together … This greatly contributed to making this project a success, because all stakeholders were involved. … This is a very positive development and should be repeated in future projects." [organisational staff]*

A complementary clinical and operational leader were both assigned from the start, based on personal motivation and availability. As indicated by multiple stakeholders, this facilitated good cooperation, both substantively and operationally with prospective implementation in mind.

DISCUSSION

We investigated factors influencing the implementation of a digital care pathway that was developed using experience-based co-design. We identified 4 themes: 1)'Stakeholders' perceptions of the PDCP' (e.g., duration of first activation, perceived usefulness PDCP); 2)'Implementation by healthcare professionals in daily practice' (e.g., individuals express resistance to change, providing feedback on adoption); 3) 'Organisational readiness' (e.g., lack of resources, patients providing incentives for change); and 4) 'Collaboration within the organisation' (e.g., mutual communication, multidisciplinary co-design). Main barriers mentioned by patients were duration of first activation and necessity for up-to-date content. In addition, the most facilitating factor for patients was user-friendliness.

There were several common factors among stakeholders (e.g., user friendliness, lack of resources and rigidity of the organisation). For example, all stakeholders agreed that more resources are needed for sustainable implementation. However, what resources needed depended on the stakeholder (e.g. funds, time, workforce). It was also expressed that this funding should be made available by the central board.

Nilsson et al. also stated that it is recommended to have sufficient support from the Board of Directors and align the organisation from the initial stage of the development and implementation of an innovation to embed the innovation well in the organisation. in line with that, the Board of Directors should facilitate sufficient capacity and resources (40). These findings imply that it is vital to invest in sufficient resources from the start of such a project (3). Previous literature has also shown that *resistance to change* was not only found among HCPs, but also among the broader stakeholders group (41). Since resistance to change could cause an implementation to fail, the impact of this perceived barrier should be minimised (42). Explaining what the precise changes are for stakeholders, including end-users, emphasising

the added value, and involving different stakeholder groups, including patients, during the design from an early stage can help alleviate resistance (32, 42-49).

The perception of *rigidity of the organisation*, mainly due to the size of the organisation, was also mentioned by different stakeholders. This rigidity negatively influenced the decision-making speed and action taking. This was also experienced in the collaboration by the external supplier. Granja et al stated that this rigidity is typical for a healthcare organisation and adapting and adjusting to eHealth interventions is not suited for these kind of organisations (50). Our findings nuanced this, as there was a sense of urgency that created the first steps of organisational readiness and willingness of HCPs to implement this innovation, since the added value was certainly recognised and acknowledged by almost all stakeholders. However, as also mentioned by Threapleton et al., implementing a change in an organisation can take several years (15). Therefore, transformation requires *organisational readiness* for change among healthcare professionals, including cultural change (51-54). There were also remarkable differences between stakeholders, for example, regarding the impact of the *ongoing merger.* Some stakeholders perceived this as an opportunity for change, while others, due to the merger, sometimes felt it was too much change at once. These differences were also reflected in terms of the facilities required.

Strengths and limitations

A major strength of this study is that we incorporated the perspectives of all stakeholders, including the non-medical (supporting) staff. We collected views and opinions of those directly involved in implementation from an organisational perspective, and those of external stakeholders (patients and supplier). The authors chose to include the patient's perspective through the verification of findings with data from existing patient interviews, since these

interviews had already been conducted within the same scope. Other recent studies only focused on the organisational perspective or just on the experiences with eHealth implementation and adoption among healthcare professionals and patients. The inclusion of all perspectives contributed to the representativeness of this study, which took place in the complexity of a large organisation (3, 55-57).

Other strengths related to the fact that this study adds to the limited implementation studies by providing insight into the development and the subsequent implementation process in daily practice (58). The use of co-design in this project enhanced successful implementation as it ensured input and feedback by stakeholders and end-users and created commitment for further implementation. Furthermore, the data was conducted according to the framework of CFIR for examining the numerous influences during the implementation of complex innovations, making comparison with other studies possible (59). The final strength of this study is that investigator triangulation was assured, since the interviews were conducted by multiple researchers (60).

This study also has some limitations. Firstly, participants were recruited using snowball sampling techniques, which could have resulted in selection bias (61). However, this effect was minimised by including stakeholders both familiar and unfamiliar with the PDCP tool. Secondly, analyses of qualitative data relies on the subjective interpretation of researchers. To reduce this bias, two researchers independently analysed the data which positively affected the validity (62). Thirdly, due to the COVID-19 pandemic, the interviews were conducted both by video call and face-to-face, which may have led to differences in understanding and data interpretation between the interviews. Lastly, CFIR's model included the relevant domains intervention, outer setting, inner setting, individuals involved and the implementation, but does

not include the patients' perspectives as a separate domain, which is an identified gap in CFIR (59). To include this domain, Flottorp's model could for implementation factors could be considered in future comparable studies (63). In this study, the authors aspired to add this perspective by using data from patient interviews.

Practical implications

Based on the results of this study, we have formulated three practical implications to improve and enhance implementation of a PDCP. Firstly, it is essential to translate the facilitating aspects into evidence-based implementation strategies (64). For example, the added value and effectiveness of the PDCP for HCPs and patients should be made clear to every stakeholder involved, in a manner tailored to stakeholder. Secondly, it is vital to establish a multidisciplinary team comprising a wide selection of stakeholders (e.g., patients, technicians, HCPs and communication experts) right from the start of the project. This facilitates effective collaboration in the subsequent adoption and implementation phase. In addition, it is recommended to create change readiness and take advantage of momentum if change readiness has already been created. This may take the form, for instance, of implementing innovations in parallel or as part of ongoing organisational changes, such as the hospital's merger.

Future research

At the time of data collection, the PDCP was implemented as a pilot phase in three departments. The results of this research contributed to the further co-creation and implementation process and were used to formulate appropriate implementation strategies. Subsequent process and effect evaluation research is planned to assess the full implementation of the PDCP. In addition, conducting research on comparable implementation

processes in other departments or organisations to elaborate on the generalisability of our findings is also recommended. This research showed the importance of a tool being user-friendly and useful. However, more research is needed on usability for a diverse range of users.

CONCLUSION

In conclusion, this qualitative study has identified factors facilitating or hindering the implementation of a PDCP in a large Dutch academic hospital. There were several similarities between the experienced facilitators or barriers among all stakeholders (e.g., user friendliness, lack of resources and rigidity of the organisation). Influential factors were related to the perceived usefulness of PCDP, yet need for keeping the content up to date. Resistance to change and expected time investment hindered implementation, whilst possibility of incorporation in daily practice worked as facilitator. Organisational readiness worked both as facilitator and barrier, and clear process agreements and communication are needed in place for strong collaboration. In our case, the co-creation process during adaptive development facilitated this collaboration. Findings were echoed by patients, and their main barriers were duration of first activation and necessity for up-to-date content. Our findings emphasise the importance of gaining insight into the various perspectives of stakeholder groups, including patients. It is recommended to tailor implementation strategies for each stakeholder group, adjusted to their perceived facilitators and barriers. Our findings can be used to improve and enhance PDCP implementation and tailor the development and improvement of other digital patient communication tools.

APPENDIX

1. Topic list and interview guide
2. Final codebook

ETHICAL APPROVAL

The need for approval for this study was waived by the Medical Ethical Committee at Amsterdam UMC, Vrije Universiteit Amsterdam (2019.651). Participation was voluntarily and all respondents gave verbal and written informed consent before taking part in our project.

ABBREVIATIONS

SDM: shared decision-making

VBHC: value based healthcare

PCC: patient centred care

PDCP: personalised digital care pathway

CFIR: Consolidated Framework for Implementation Research

EHR: electronic health record

EvA-SC: EvA Service Center, electronic health record service centre

eHealth: electronic health

Amsterdam UMC: Amsterdam University Centres

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AUTHOR CONTRIBUTION

Each author made substantial contributions to the work and writing of this manuscript: FH, FvN, MM, MB and MdB participated in the design of the study; FH and JS were responsible for data collection; FH, JS, and FvN participated in the analysis of the interviews; writing the initial draft, FH and JS; review and editing, FH, FvN, MM, MB and MdB. All team members

approved the version of the manuscript submitted for publishing and have agreed to be accountable for all aspects of the work.

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COMPETING INTERESTS

None declared. All authors had full access to all the study data and take responsibility for the integrity of the data and accuracy of the data analysis.

DATA SHARING STATEMENT

The character and identifiability of the qualitative data does not allow for distribution. All data relevant to the study are included in the article or uploaded as supplementary information.

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FIGURE LEGEND

Figure 1. An example of Personalised Digital Care Pathway (web- and mobile version) in Amsterdam UMC.

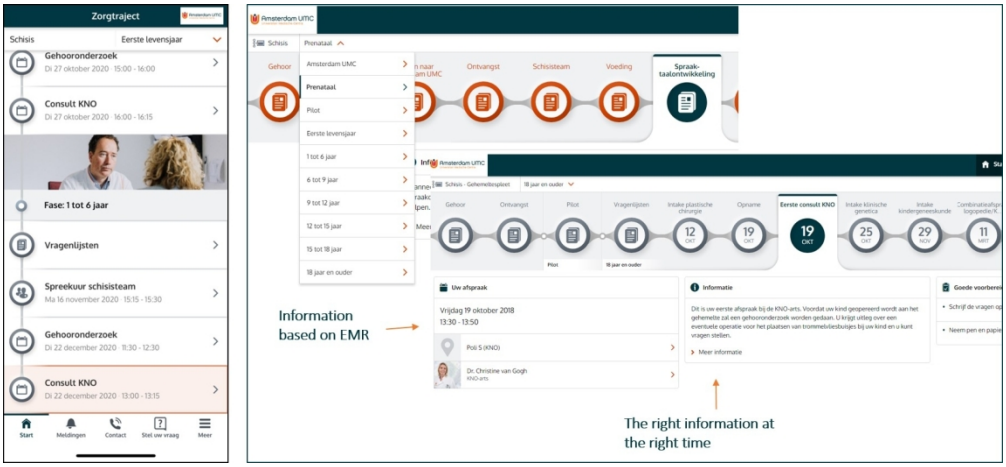

Figure 1. An example of Personalised Digital Care Pathway (web- and mobile version) in Amsterdam UMC.

154x70mm (300 x 300 DPI)

APPENDIX 1. TOPIC LIST AND INTERVIEW GUIDE

Introductie:
Hartelijk dank voor uw deelname aan dit interview. <introductie van mezelf en doel van onderzoek>
Het interview zal ongeveer drie kwartier tot een uur duren.

Heeft u nog vragen voor we beginnen?
Mag ik dit interview opnemen? Dan kunnen we nu starten met het interview en de opname.
<recorder aanzetten>
<nogmaals bevestiging vragen op recording voor opnemen>

Om u een idee te geven hoe het interview eruit gaat zien zijn dit de onderwerpen die we gaan behandelen: informatievoorziening huidige situatie, de gewenste situatie en MediMapp en wat uw verwachtingen zijn van MediMapp

Ik zou graag willen beginnen met de vraag of u kunt vertellen wie u bent en wat u doet?
(geslacht, welke afdeling, functie: hoe lang en eindverantwoordelijke, patiëntgroep)

Omdat dit interview over een digitale tool gaat, namelijk MediMapp, ben ik benieuwd of u affiniteit heeft met het gebruik van eHealth? Kunt u dit scoren van 1-5?

- En hoe kijkt u aan tegen het digitaliseren van informatievoorziening voor patiënten?
- Bent u al eens in aanraking geweest met MediMapp?
    - In hoeverre bent u betrokken geweest bij de ontwikkeling van MediMapp?

Informatievoorziening huidige situatie
Kunt u kort beschrijven hoe de informatievoorziening er op dit moment uit ziet? Wij definiëren informatievoorziening als het faciliteren van informatie voor patiënten, met de beschikbare middelen, zowel mondeling als schriftelijk.

- Wat vindt u hier goed gaan? En wat kan nog verbeterd worden?
- Wat denkt u dat patiënten zouden willen veranderen?

Gewenste situatie
- Als u nu de informatievoorziening *opnieuw* zou mogen *inrichten*, hoe ziet dit er dan voor u uit? *(vorm, proces, hoeveelheid, kwaliteit, begrijpelijkheid, toegankelijkheid, personalisatie)*
- Wat hoopt/denkt u dat goede informatievoorziening kan *opleveren*? *(vertrouwen, gesprek, arts-patiëntrelatie, overzicht, verwachtingen, voorbereiding)*
- Wat ziet u als de belangrijkste risico's in deze gewenste situatie?

Kan MediMapp de oplossing zijn?
<korte uitleg MediMapp, digitaal patiëntpad waar nodig>

Verwachting MediMapp
- Wat verwacht u dat MediMapp kan bijdragen aan uw dagelijkse werkzaamheden?
    - Voor u om informatie makkelijker te voorzien? *(kennis, vaardigheden, motivatie, tijd, ondersteuning, patiënt kenmerken)*
    - Voor patiënt? *(vertrouwen, gesprek, arts-patiëntrelatie, overzicht, verwachtingen, voorbereiding)*
    - Wat zou voor u de meerwaarde zijn? *(En voor verpleegkundige / baliemedewerker / overig)*
- Verwacht u MediMapp te gaan gebruiken?
    - *Hoe? Geloof in MediMapp?*
- Als u MediMapp wilt gaan gebruiken, wat heeft u dan nodig in de praktijk?
  Voordeel** t.o.v. huidige situatie / **aanpasbaarheid, veranderbaar, verfijndheid etc. / complexiteit
- Verwacht u dat er veel gaat veranderen aan uw dagelijkse werkzaamheden als u MediMapp gaat gebruiken?
    - Hoe kijkt u aan tegen zo'n verandering?
- Hoe verwacht u dat uw collega's zullen reageren op het gebruik van MediMapp?

kennis en geloof *in innovatie / Mening over MediMapp / Kijk tegenover* ***verandering*** */* ***verhouding*** *met organisatie / Andere persoonlijke kenmerken (motivatie, capaciteit, leiderschap stijl)*

- Denkt u dat MediMapp kan landen binnen uw afdeling?
    - *Waarom? Hoe?*
      Netwerk en communicatie */* ***bereidwilligheid*** *van afdeling t.o.v. implementatie (cultuur, normen, waardes en aannames) /* ***implementatie klimaat*** *van afdeling*
- Is MediMapp **passend** bij het Amsterdam UMC? (normen, waardes, werksystemen en stromen)
  Bereidwilligheid van Amsterdam UMC t.o.v. implementatie / verbintenis van medewerkers / informatie en kennis beschikbaar

Implementatie:

- Hoe denkt u dat MediMapp het best geïmplementeerd kan worden? En waarom?
    - Wat heeft uw afdeling hiervoor nodig?

  Netwerk en communicatie / cultuur, normen, waardes en aannames / implementatie klimaat / kijk tegen verandering / actieve implementatie
    - Waar gaan we tegenaan lopen tijdens de implementatie?
    - Wat gaat ons helpen tijdens de implementatie?
    - Waar ging het mis bij de implementatie van vorige projecten / oplossingen?
      Klinische formulieren in Epic
    - Tijdens een implementatieproces is het belangrijk dat er actieve betrokkenheid is van de organisatie. Hoe ervaart u dat dit wordt gedaan bij het Amsterdam UMC?
      Planning / *(actief)* ***meedoen*** */ (actief)* ***meegenomen worden*** *(door manager, leider, collega) /* ***uitvoering*** */* ***terugkijken en evalueren***
- Zijn er nog factoren in het Amsterdam UMC die de implementatie van MediMapp makkelijker maken of moeilijker maken?
  (beleid, draagvlak, expertise, samenwerking andere afdelingen, financiën, EPD, etc).
- Zijn er nog andere factoren in de *bredere context* die invloed hebben op de implementatie van MediMapp?
  l(everancier, zorgverzekeraar, betaalbaarheid voor organisatie etc.)
- DUS Wat zijn bevorderende factoren voor de implementatie van MediMapp? En wat zijn belemmerende factoren?
  Op de afdeling, gehele organisatie en bredere context

Afsluiting

Dit was mijn laatste vraag. Zijn er nog dingen die we niet besproken hebben, maar waarvan u denkt dat deze wel relevant zijn voor dit project?

Vervolg uitleggen: verdere interviews doen en het verwerken van deze interviews, bevorderende en belemmerende factoren in kaart brengen. Hierop ga ik dan een advies uitbrengen voor implementatie strategieën die we kunnen toepassen.

Mochten we nog meer deelnemers nodig hebben, mag ik u dan benaderen voor contactlegging met andere collega's?

APPENDIX 2. FINAL CODEBOOK

Appendix 2: Final codebook with domains, sub-domains and definitions (in Dutch).

Domain	*Sub-domain*	*Code Atlas.ti*	*Definition*
1. Inner setting	*1.1 Afdeling*	1.1.1 + Draagvlak voor PDCP	Alles wat er gezegd wordt over de aanwezigheid van draagvlak op afdelingen (werknemers op afdeling zijn enthousiast over PDCP)
		1.1.2 - Draagvlak voor PDCP	Alles wat er gezegd wordt over afwezigheid van draagvlak op afdelingen (werknemers op afdeling zijn niet enthousiast over PDCP)
		1.1.3 + Teamsamenwerking afdeling	Alles wat gezegd wordt over factoren die een positieve invloed hebben op samenwerking binnen Amsterdam UMC
		1.1.4 - Inspanning door afdeling	Alles wat gezegd wordt over de inspanning die een afdeling levert met negatief effect
		1.1.5 + Inspanning door afdeling	Alles wat gezegd wordt over de inspanning die een afdeling levert
		1.1.7 + Kijk tegen verandering	Alles wat wordt gezegd over veranderingen binnen een afdeling met een bevorderende effect
		1.1.8 - Kijk tegen verandering	Alles wat wordt gezegd over veranderingen binnen een afdeling met een belemmerend effect
		1.1.9 - Medewerkers moeilijk te bereiken	Alles wat wordt gezegd over de bereikbaarheid van medewerkers
		1.1.10 - Resultaat van fuseren op samenwerking	Alles wat gezegd wordt over de nadelige invloed van de fusie op samenwerking binnen een team / afdeling
		1.1.11 - Verandering moe	Alles wat gezegd wordt over veranderingen wat aanduidt dat medewerkers klaar zijn met de veranderingen
		1.1.12 - Onbekendheid van medewerkers over zorgproces en informatie binnen aandoening	Alles wat gezegd wordt over de onbekendheid die medewerkers ervaren over wat er binnen een aandoening precies gebeurt in het zorgproces

	1.2 Ziekenhuis-breed	1.2.1 - Amsterdam UMC loopt achter qua innovatie	Alles wat gezegd wordt over het innovatieve karakter van Amsterdam UMC t.o.v. andere organisaties en de samenleving
		1.2.2 + Capaciteit om te innoveren	Alles wat gezegd wordt over het hebben van voldoende capaciteit van afdelingen om te innoveren
		1.2.3 - Capaciteit om te innoveren	Alles wat gezegd wordt over de capaciteit van afdelingen om te innoveren
		1.2.4 - Cultuur Amsterdam UMC	Alles wat gezegd wordt over de cultuur van Amsterdam UMC
		1.2.5 - Dingen opleggen werkt niet	Alles wat gezegd wordt over dat medewerkers het idee krijgen dat ze iets wordt opgelegd door besturende organen (RvB, managers etc.), waar ze zelf geen mening over hebben kunnen geven
		1.2.6 + Draagvlak nodig voor uitvoering	Alles wat gezegd wordt over het draagvlak wat nodig is voor het gebruik van een innovatie
		1.2.7 - Draagvlak nodig voor uitvoering	Alles wat gezegd wordt over het draagvlak wat nodig is voor het gebruik van een innovatie
		1.2.8 + Eerdere ervaringen met innovaties beïnvloeden adoptie	Alles wat gezegd wordt over eerdere ervaringen met soortgelijke innovaties, wat adoptie van innovatie positief kan beïnvloeden
		1.2.9 - Eerdere ervaringen met innovaties beïnvloeden adoptie	Alles wat gezegd wordt over eerdere ervaringen met soortgelijke innovaties, wat adoptie van innovatie negatief kan beïnvloeden
		1.2.10 + Financieren innovaties	Alles wat er gezegd wordt over het financieren van innovaties en de invloed hiervan op adoptie
		1.2.11 - Financieren innovaties	Alles wat er gezegd wordt over het financieren van innovaties en de invloed hiervan op adoptie
		1.2.12 - Fuseren twee huizen	Alles wat gezegd wordt over het fuseren van het VUmc en AMC (op organisatieniveau)

		1.2.13 + Helderheid in verdeling van rollen	Alles wat er gezegd wordt over dat het voor stakeholders duidelijk is wat de rolverdeling is
		1.2.14 - Helderheid in verdeling van rollen	Alles wat er gezegd wordt over dat het voor stakeholders duidelijk is wat de rolverdeling is
		1.2.15 + Informatie voorziening voor patiënten	Alles wat wordt gezegd over de informatie dat wordt aangeboden aan patiënten
		1.2.16 - Informatie voorziening voor patiënten	Alles wat wordt gezegd over de informatie dat wordt aangeboden aan patiënten
		1.2.17 + PDCP past binnen beleid Amsterdam UMC	Alles wat gezegd wordt over het passen van PDCP bij het beleid van Amsterdam UMC
		1.2.18 - PDCP past binnen beleid Amsterdam UMC	Alles wat gezegd wordt over het passen van PDCP bij het beleid van Amsterdam UMC
		1.2.19 - Onbekendheid ziekenhuis breed	Alles wat er gezegd wordt over de onbekendheid die medewerkers ervaren over processen en beleid keuzes
		1.2.20 - Teamsamenwerking ziekenhuis	Alles wat gezegd wordt over factoren die een negatieve invloed hebben op samenwerking (ook onderlinge communicatie bijv.) binnen Amsterdam UMC
2. Outer setting		2.1 Landelijk uitwisseling	Alles wat gezegd wordt over de uitwisseling tussen verschillende ziekenhuizen (van patiënt informatie, van informatie, filmpjes etc.)
		2.2 Landelijke druk eHealth	Alles wat gezegd wordt over de druk die de overheid uitoefent op het innoveren in eHealth
		2.3 Leverancier	Alles wat gezegd worden over samenwerking met een externe leverancier
3. Intervention	*3.1 Geen meerwaarde PDCP zorgverlener*	3.1 - Geen meerwaarde PDCP zorgverlener	Alles wat gezegd wordt over de meerwaarde van PDCP voor zorgverleners(groepen)

	3.2 Meerwaarde PDCP	3.2.1 + Goede informatievoorziening voor patiënt	Alles wat gezegd wordt over de toegankelijke en betrouwbare infovoorziening (voor patiënt) met kwaliteit en de juiste hoeveelheid, door PDCP verzorgt
		3.2.2 + Maatwerk voor patiënt	Alles wat gezegd wordt over de mogelijkheid die PDCP biedt om maatwerk te leveren aan de patiënt
		3.2.3 + Meerwaarde zorgverlener	Alles wat gezegd wordt over de meerwaarde van PDCP voor zorgverleners(groepen)
		3.2.4 + PDCP draagt bij aan andere doelen	Alles wat gezegd wordt over andere doelen die bereikt kunnen worden door PDCP (SDM, koppeling PROMs, meer grip zorgtraject voor patiënten)
		3.2.5 + Tijdbesparing / efficiënter werken	Alles wat gezegd wordt over dat PDCP efficiëntie stimuleert
		3.2.6 + PDCP past in huidige werkwijze	Alles wat gezegd wordt over de passendheid van PDCP in de huidige werkwijze
		3.2.7 - PDCP past in huidige werkwijze	Alles wat gezegd wordt over de passendheid van PDCP in de huidige werkwijze
		3.2.8 - Patiënt- arts relatie	Alles wat gezegd wordt over de invloed van PDCP op de arts-patiënt relatie
	3.3 Gebruiks-vriendelijkheid	3.3.1 + Aansluiten behoeftes patiënt	Alles wat gezegd wordt over de behoefte van de patiënt aan PDCP
		3.3.2 - Aansluiten behoeftes patiënt	Alles wat gezegd wordt over de behoefte van de patiënt aan PDCP
		3.3.3 + Aansluiten informatiebehoefte patiënt	Alles wat gezegd wordt over de informatiebehoefte van de patiënt
		3.3.4 - Geschiktheid voor iedereen	Alles wat gezegd wordt over de geschiktheid van PDCP bij ieder type patiënt (zoals laaggeletterden, andere talen)
	3.4 Beheer	3.4.1 - Beheer PDCP	Alles wat gezegd wordt over het beheer van PDCP
		3.4.2 + Koppeling met Epic	Alles wat gezegd wordt over de koppeling tussen EPIC en PDCP

		3.4.3 - Koppeling met Epic	Alles wat gezegd wordt over de koppeling tussen EPIC en PDCP
		3.4.4 + Kosten	Alles wat gezegd wordt over de kosten van PDCP
		3.4.5 - Kosten	Alles wat gezegd wordt over de kosten van PDCP
		3.4.6 - Meerdere apps nodig	Alles wat gezegd wordt over dat er meerdere apps nodig zijn voor patiënten om meer te weten over hun zorg en zorgtraject
		3.4.7 + Gebruik van PDCP	Alles wat er gezegd wordt over hoe PDCP te gebruiken is
		3.4.8 - Gebruik van PDCP	Alles wat er gezegd wordt over hoe PDCP te gebruiken is
		3.4.9 + Uiterlijk PDCP	Alles wat gezegd wordt over de ervaring van hoe PDCP eruit ziet
	3.5 Risico's	3.5.1 + Effect en risico	Alles wat gezegd wordt over risico's van informatie digitaliseren (wat invloed kan hebben op de implementatie van PDCP)
		3.5.2 – Effect en risico	Alles wat gezegd wordt over risico's van informatie digitaliseren (wat invloed kan hebben op de implementatie van PDCP)
4. Individuals		4.1 + Attitude eindgebruikers t.o.v. PDCP	Alles wat gezegd wordt over hoe eindgebruikers tegenover PDCP staan
		4.2 - Attitude eindgebruikers t.o.v. PDCP	Alles wat gezegd wordt over hoe eindgebruikers tegenover PDCP staan
		4.3 + Betrokkenheid van eindgebruikers	Alles wat gezegd wordt over de invloed van de betrokkenheid van eindgebruikers op de implementatie
		4.4 - Betrokkenheid van eindgebruikers	Alles wat gezegd wordt over de invloed van de betrokkenheid van eindgebruikers op de implementatie
		4.5 + Karakteristieken eindgebruikers	Alles wat gezegd wordt over de eigenschappen van eindgebruikers, zoals leeftijd, skills met omgaan eHealth
		4.6 - Karakteristieken eindgebruikers	Alles wat gezegd wordt over de eigenschappen van eindgebruikers, zoals leeftijd, skills met omgaan eHealth

		4.7 + Ervaringen delen motiveert	Alles wat gezegd wordt over ervaringen delen (van eindgebruikers) met de ondersteunende diensten, wat als motiverend wordt ervaren
		4.8 + Motivatie om te veranderen	Alles wat gezegd wordt over de motivatie van medewerkers om hun dagelijkse werkzaamheden te veranderen
		4.9 - Motivatie om te veranderen	Alles wat gezegd wordt over de motivatie van medewerkers om hun dagelijkse werkzaamheden te veranderen
		4.10 + Herinnering voor PDCP nodig	Alles wat gezegd wordt over het herinneren van eindgebruikers aan PDCP
		4.11 - Herinnering voor PDCP nodig	Alles wat gezegd wordt over het herinneren van eindgebruikers aan PDCP
5. Process	*5.1 Bevorderend*	5.1.1 + Randvoorwaarden gebruik	Alles wat gezegd wordt over wat nodig is voor eindgebruikers om PDCP (praktisch) te gebruiken in dagelijkse werkzaamheden
		5.1.2 + Suggesties voor implementatie en gebruik	Suggesties hoe de implementatie en gebruik het best vormgegeven kan worden
		5.1.3 + Suggesties voor verbetering inhoud / ontwikkeling	Suggesties hoe verbeteringen het best aangepakt kunnen worden (feedbackloops)
		5.1.4 + Sense of urgency nodig voor succes	Alles wat gezegd wordt over het gevoel van urgentie, wat een organisatie nodig heeft om een innovatie te laten slagen
	5.2 Belemmerend	5.2.1 - Onduidelijkheid rondom proces PDCP	Alles wat gezegd wordt over onduidelijkheid rondom gebruikers proces van PDCP
		5.2.2 - Randvoorwaarden gebruik	Alles wat gezegd wordt over wat nodig is voor eindgebruikers om PDCP te gebruiken in dagelijkse werkzaamheden
		5.2.3 - Selectie maken is moeilijk	Alles wat wordt gezegd over de selectie welke afdelingen mee mogen doen met gebruik PDCP
		5.2.4 - Uitvoering moeizaam	Alles wat gezegd wordt over hoe de uitvoering van PDCP gaat

	5.2.5 - Verschil in definities	Alles wat gezegd wordt over definities en termen rondom het proces van implementeren van PDCP

COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	
Sample size	12	How many participants were in the study?	
Non-participation	13	How many people refused to participate or dropped out? Reasons?	
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	
Field notes	20	Were field notes made during and/or after the inter view or focus group?	
Duration	21	What was the duration of the inter views or focus group?	
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	
Description of the coding tree	25	Did authors provide a description of the coding tree?	
Derivation of themes	26	Were themes identified in advance or derived from the data?	
Software	27	What software, if applicable, was used to manage the data?	
Participant checking	28	Did participants provide feedback on the findings?	
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	
Clarity of major themes	31	Were major themes clearly presented in the findings?	
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.