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EMPIRICAL RESEARCH ARTICLES



## Implementation of interprofessional digital communication tools in primary care for frail older adults: An interview study

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### ABSTRACT

Communication and coordination between primary healthcare professionals and informal caregivers involved in the care for frail older adults is suboptimal and could benefit from interprofessional digital communication tools. Implementation in daily practice however frequently fails. We aim to identify generic barriers and facilitators experienced by healthcare professionals and informal caregivers during implementation of interprofessional communication tools to improve their long-term use. Qualitative content analysis using individual semi-structured interviews was used for evaluating three different digital communication tools used by interprofessional primary care networks for frail older adults by 28 professionals and 10 caregivers. After transcription and open coding, categories and themes were identified. Barriers and facilitators were related to: tool characteristics, context of use, involvement of professionals and caregivers. The tool improved availability, approachability and users' involvement. The large number of digital systems professionals simultaneously use, and different work agreements hampered tool use. The tools facilitated care coordination, and professionals declared to be better informed about patients' current situations. Overall, interprofessional digital communication tools can facilitate communication in networks for primary elderly care. However, integration between digital systems is needed to reduce the number of tools. Organizations and policy makers have an important role in realizing the tools' long-term use.

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## Introduction

Due to population aging, the number of frail older adults with complex care needs is globally increasing. In the Netherlands, frail older adults with complex conditions (e.g., dementia) remain living at home, as a result of policy changes focused on prolonging domestic living and restricted access to residential long-term care (Kroneman et al., 2016; Maarse & Jeurissen, 2016). Multiple primary healthcare professionals are involved in the care for this population and they tend to focus on their own field of expertise (Stange & Ferrer, 2009). Coordination of care and communication among professionals involved is often suboptimal (Bodenheimer, 2008; Stange, 2009), resulting in fragmented care (Bodenheimer, 2008; Nieuwboer et al., 2018) and a high caregiver burden (Kroneman et al., 2016). Interprofessional collaboration and communication are therefore promising strategies to improve the quality of care for frail older adults (Bodenheimer, 2008; Stange, 2009; Stille et al., 2005). In this study we focus on interprofessional collaboration, by stimulating an integrated care approach where professionals, informal caregiver and patient are all involved in the care planning and coordination (Kaats & Opheij, 2013; Nieuwboer et al., 2017).

## Background

Interprofessional communication could be supported by digital communication tools (Fathi et al., 2016; Radhakrishnan et al., 2015), as they enable more frequent and less time-consuming interactions between healthcare professionals. These tools can therefore improve interprofessional coordination of care in various ways by: clearly dividing tasks and defining each professional's responsibility (Finney Rutten et al., 2014); enabling more efficient and safer transfer of clinical information (Stille et al., 2005); and partly replacing time- and resource consuming face-to-face multidisciplinary meetings (Munro & Swartzman, 2013). Moreover, digital communication tools have the potential to improve caregiver involvement. They allow for easier and more approachable interactions between caregivers and professionals, which could thereby reduce the individual caregivers' burden (Madara Marasinghe, 2016).

Even though interprofessional digital communication tools have promising advantages, realizing a successful implementation phase has proven to be very difficult (Matthew-Maich et al., 2016; Svensson, 2019). Many information and communications technology (ICT) tools for interprofessional settings

are still too fragmented in their functionalities or complex to use (Matthew-Maich et al., 2016; Svensson, 2019). Studies on the use and effects of interprofessional tools are still scarce and refer to tools that were not frequently used (de Jong et al., 2017; Makai et al., 2014; Robben et al., 2012). Moreover, these tools were only individually evaluated and an overview of common implementation facilitators and barriers is missing. Identification of these factors is needed to improve interprofessional collaboration and healthcare services (Eldh et al., 2020; Svensson, 2019).

Thus, research is needed to identify these generic factors that facilitate successful implementation of interprofessional communication tools to eventually establish long-term use in everyday practice. Therefore, we aim to identify generic barriers and facilitators experienced by healthcare professionals and informal caregivers during implementation of three interprofessional communication tools in care for frail older adults to further improve their implementation.

## Methods

### Study design

In a qualitative study, content analysis using semi-structured interviews with professionals and caregivers was used to explore views and experiences on interprofessional digital communication tools use in the primary care for frail older adults. We hereby focused on generic implementation facilitators and barriers relevant to all three tools, rather than on differences in specific functionalities or user experiences of the three different tools. The Consolidated Criteria for Reporting Qualitative Research (COREQ) were applied to ensure high reporting quality of this study (Tong et al., 2007).

### Setting and participants

The tools that were evaluated are used in the network-based setting of DementiaNet (Nieuwboer et al., 2017). Within the DementiaNet program, networks of primary care professionals were formed from 2015 onwards aimed at improving the quality of care for people with dementia and their caregivers by improving their networks' care integration (Oostra et al., 2021). These local networks of primary care professionals also care for the same caseload of frail older adults (Nieuwboer et al., 2017; Richters et al., 2017).

Four DementiaNet networks, all located in the East of the Netherlands, with an already formed collaboration were invited to participate in this study. They recently implemented an interprofessional communication tool, initiated by the local general practitioner (GP) practices, and explicitly expressed improving digital interprofessional communication as one of their network-goals. Networks were purposefully selected based on 1) their setting (urban, urbanized countryside and rural) and 2) the digital communication tool they already used. Professionals and caregivers of the networks were invited verbally or via e-mail by the network leader to participate. Convenience sampling was used for professionals from two networks, due to the large network size. All professionals active

in the smaller two networks were invited to participate. Convenience sampling was used for informal caregivers of patients receiving care from the networks. Exclusion criterion was the inability to speak Dutch. Inclusion of new participants ended when data saturation occurred.

### Tools

Three different tools frequently used in the DementiaNet setting were evaluated in the participating networks to identify generic (non-tool specific) barriers and facilitators. These tools, VIPLive (Topicus, 2021), OZOverbindzorg (OZOverbindzorg, 2021), and Doktr.nl are largely similar in their functionalities. Their main functionality is a chat function, to be used for mutual communication by professionals or between a professional and an informal caregiver. Furthermore, VIPLive and OZOverbindzorg allow professionals to start a group chat conversation about a patient. All tools are available through a web portal, VIPLive and OZOverbindzorg can be used with a smartphone application as well. Additional functionalities differed between the tools (see, Table 1).

### Data collection

The individual semi-structured interviews took place between February 2020 and July 2020. The interview guide was based on implementation frameworks suitable for digital communication tools (G. F. Moore et al., 2015; Fleuren et al., 2014; Greenhalgh et al., 2020; Keith et al., 2017), and evolved from the data collected. Topics of the interview included usability of the tool, barriers and facilitators of the tool and added value. The interview guide is available upon request. Background variables including gender, age, discipline and frequency of use were collected for each participant. Interviews were conducted by trained research interns (CF and MA) who did not support implementation or had no other personal connection to the participants. Interviews were performed face-to-face or via videocall or telephone due to COVID-19 pandemic regulations and depending on the preference of the participant. All interviews were audio recorded and lasted 40 minutes on average (range 25 to 60 minutes). Before the start of the interview, participants' written consent was obtained by the interviewer.

**Table 1.** Overview of functionalities of the digital communication tools.

Functions:	VIPLive	OZOverbindzorg	Doktr.nl
Web portal or app	Both	Both	Web portal
One to one chat function	X	X	X
Group conversation	X	X	
Participation of informal caregiver	X	X	X
Multidisciplinary care planning support	X	X	
Store results of medical investigations	X		
Order drug prescription		X	
Send questionnaires and documents			X

X = functionality present

**Table 2.** Characteristics of primary healthcare professionals using one of the three interprofessional digital communication tools.

	Professionals, n = 28
<b>Dominant profession, n (%)</b>	
General practitioner	4 (14%)
Practice nurse	4 (14%)
Community nurse	10 (36%)
Case manager	7 (25%)
Geriatric specialist	1 (4%)
Dietician	1 (4%)
Physiotherapist	1 (4%)
<b>Woman, n (%)</b>	25 (89%)
<b>Work experience in current profession in years, n (%)</b>	5 (18%)
≤5	
5–10	14 (50%)
>10–20	9 (32%)
<b>Tool, n (%)</b>	
VIPLive	19 (68%)
OZOverbindzorg	6 (21%)
Doktr.nl	3 (11%)
<b>Number of patients for whom the tool is/was used, median (min-max)</b>	6 (1–30)
<b>Number of healthcare professionals available to contact, median (min-max)</b>	4 (1–8)
<b>Number of conversations with an informal caregiver, median (min-max)</b>	5 (1–30)
<b>Mean frequency of use, n (%)</b>	
Once per day or more	6 (21%)
1–2 times per week	13 (46%)
1–2 times per month	6 (21%)
Less than once a month	3 (11%)

## Data analysis

The interview recordings were transcribed verbatim. ATLAS.ti (version 8.4.20) was used to support the content analysis method (Elo & Kyngäs, 2008; Moser & Korstjens, 2018). Data collection and analyses were performed simultaneously to improve quality of future interviews and facilitate data saturation. Focus was the identification of common rather than different themes and patterns between the tools. Open coding was applied to the transcripts (CF or MA) in consultation with two trained researchers (DO and MN). Codes were subsequently categorized in code groups and categories and themes were identified by reaching consensus within the research team (CF, MA, DO, MN, MP).

## Ethical considerations

The study was conducted according to the principles of the Declaration of Helsinki (2013). The research ethics committee of the Radboud university medical center stated that the study did not fall within the remit of the Medical Research Involving Human Subjects Act (WMO).

## Results

### Participant characteristics

Twenty-eight professionals and ten caregivers of the four networks participated. Two networks used VIPLive, one network OZOverbindzorg and one network Doktr.nl. The digital tools were implemented between a half year and three years prior to the interview.

**Table 3.** Characteristics of informal caregivers using one of the three interprofessional digital communication tools.

	Informal caregivers, n = 10
<b>Informal caregiver (IC) for, n (%)</b>	1 (10%)
Spouse	9 (90%)
Parents (in law)	
<b>Age, median (min-max)</b>	59 (50–71)
<b>Woman, n (%)</b>	7 (70%)
<b>Tool, n (%)</b>	8 (80%)
VIPLive	2 (20%)
OZOverbindzorg	
Doktr.nl	
<b>Number of healthcare professionals available to contact, median (min-max)</b>	3 (1–7)

Participating professionals were diverse regarding background and 89% were female. The majority, 79%, used the tool at least once a week. Tool use varied greatly from daily to less than once a month, depending on the current health situation of the older adult. Professionals used the tool on average for six patients, some had several conversations per patient. On average in five group conversations an informal caregiver was included.

Caregivers used the tool for their parents (in law) or spouse. Caregiver mean age was 59 years and 70% were female. Tool use varied greatly, depending on the current situation of their relative, ranging from almost daily to less than once a month when the situation was stable. Professionals' and caregivers' characteristics are summarized in Tables 2 and 3.

### Barriers and facilitators

From content analysis, 15 categories and four themes were derived related to barriers and facilitators for implementation of interprofessional digital tools. Themes and categories are displayed in Table 4 and quotes for each theme are displayed in Table 5.

### Tool characteristics

Professionals generally experienced the introductory training of the tool as helpful. Training was perceived as easier by digitally skilled healthcare professionals. Some experienced

**Table 4.** Themes and categories related to the barriers and facilitators of implementation of interprofessional digital communication tools experienced by professionals and caregivers.

Themes	Categories
Tool characteristics	Training Ease of use Functionalities Sharing information
Context of use	Attitudes toward the tool Work agreements Overload communication tools Situations for application Remote care Availability
Involvement of professionals	Interdisciplinary involvement GP Involvement
Involvement of caregivers	Increased caregiver involvement Approachability of professionals Professional jargon

**Table 5.** Quotes on the experienced barriers and facilitators of interprofessional digital communication tools by healthcare professionals and informal caregivers.

Category	Participant	Quote
Tool characteristics	IC 1	(1) It (the tool) is self-explanatory, it is not that difficult at all. It is very user-friendly.
	GP 1	(2) You need to use it (the tool) in practice, otherwise you forget how it works.
	CM 1	(3) I frequently do house visits, then I use it (the app) in between visits.
	CN 1	(4) I do not exactly know the possibilities of the tool, I neither have gotten around or confronted with it.
Context of use	GP 1	(5) We have used a digital interprofessional tool. I was therefore also enthusiastic about this new tool. Although I also thought, another way of information sharing, we already use many applications.
	IC 10	(6) Everything went via phone.
	CM 2	(7) I hope for uniformity, we already work with a lot of GP practices, and it (work agreements) cannot differ between them. Then it does not work, and you cannot remember it.
	PN 1	(8) During the start of the project we talked about work agreements with our team. No urgent problems via the tool.
	CN 8	(9) Including more professionals would be nice, they can be contacted more easily then, but it is difficult that they can see all information. You would like to hide some information.
	GP 2	(10) Once I counted all lines of communication, I came to fifteen or so. Which you all use at least once a week, that is just too much.
	CN 2	(11) The first person where we implemented the tool was for someone where a lot was happening in a short time with many different professionals involved.
	CN 4	(12) Because of the COVID-19 pandemic we decided to include more and a broader range of patients in the tool to enable easier communication and to lower the number of GP home visits.
	IC 1	(13) We all work of course. So sometimes you want to ask a question in the evening ... I like this flexibility.
	CM 1	(14) The tool works really well, but you really need involvement of professionals, especially the GP. Otherwise, you will never get anywhere.
Involvement of professionals	PT 1	(15) It is nice to sit together at a virtual table and let each other know what you are working on, if it is progressing or if you need help from someone. I think this is a great advantage.
	PN 2	(16) We know how to find each other sooner and ask questions, then you can immediately adapt things. The communication lines are just much shorter.
	CN 3	(17) Adding other professionals to a conversation was something the GP was reluctant about. The GP wanted to keep it rather small, but I thought for some patients it is quite important that other professionals can read along, but that made the GP uncomfortable.
	IC 8	(18) With shorter communication lines problems can be solved instantly.
Involvement of caregivers	CM 1	(19) We talk in a completely different way when caregivers are not present.
	CM 1	(20) Now I have to think very carefully, do I have the right chatgroup.

GP = general practitioner; PN = practice nurse; CN = community nurse; CM = case manager; PT = physiotherapist; IC: informal caregiver.

the large training groups and the difference in knowledge level about the tool as a disadvantage. Caregivers perceived their training by the practice nurse or GP as sufficient.

Most professionals and caregivers experienced the tool as user-friendly, self-explanatory, and very similar to a normal chat function. *"It [the tool] is self-explanatory, it is not that difficult at all. It is very user-friendly"* [IC 1]. Some experienced difficulties getting used to the tool, because of limited digital skills and sporadic use. *"You need to use it [the tool] in practice, otherwise you forget how it works"* [GP 1]. Additionally, a few participants experienced annoying and time-consuming technical problems such as difficulties with registering or logging in, which decreased their usage of the tool.

Most professionals and caregivers indicated it was an advantage that the tool could be used on a smartphone as well (quote 3). Professionals and caregivers mainly used the (group) chat function of the tools. Professionals hardly used the care plan function, because they believed it generated extra work. Nevertheless, professionals expressed interest in trying the care plan function in the future (quote 4).

Professionals and caregivers think it is a great advantage that the tool is well-secured, especially for sharing case-sensitive personal information. Professionals appreciated the functionality of measurement outcomes (e.g., blood glucose level) and messages that are registered and directly copied into the user's own registration system, which prevents errors. For GPs and practice nurses there was a direct link to the GPs information system, which they thought worked fine. Other professionals

(e.g., community nurses, case managers) were not able to easily link this interprofessional tool with their own discipline-specific registration system, which they experienced as a disadvantage.

### Context of use

Most professionals and caregivers were enthusiastic about this new approachable way of communicating, while some were more neutral or even reluctant. Some professionals mentioned prior unsuccessful use of other digital tools, which decreased their enthusiasm to start using yet another tool. Other barriers mentioned were lack of knowledge about why the tool was implemented, unclear added value of the tool, and personal preferences for alternative forms of communication (quote 5). For most caregivers digital communication with professionals was a new phenomenon (quote 6).

Some professionals indicated the need of clear and uniform agreements for the use of the tool to achieve broad implementation. Work agreements, including content of messages, required response time and who to add to a conversation, were issues that were not always discussed within the network or known by all participants. Moreover, professionals working with patients of various GPs indicated the need for uniform regional agreements, because it is difficult to remember specific work agreements per GP practice. *"I hope for uniformity, we already work with a lot of GP practices, and it [work agreements] cannot differ between them. Then it does not work, and you cannot remember it"* [CM 2].



Most professionals and caregivers agreed that the tool should be used for non-urgent matters. Telephone contact was preferred for urgent matters or when more explanation or context was needed (quote 8).

Professionals indicated it was difficult to determine who should be included in a conversation. Several conversations per patient existed within the tool with a different combination of professionals, which sometimes caused confusion. There were different views on which professionals may read along group chats, and if caregivers should be informed about everything. Some professionals and caregivers indicated that they preferred a small group of professionals and caregivers within a conversation due to privacy issues (quote 9). Professionals experienced difficulties in daily practice because they often had to switch between different communication methods because professionals from other healthcare organizations did not have access to the tool and they also have their discipline-specific digital systems with varying functionalities. As a result, they experienced an overload of different tools and ways of communication, which sometimes made them use general forms of communication (e.g., phone or e-mail) (quote 10).

Professionals and caregivers found the tool to be helpful to keep each other well informed about the current situation of a patient, discuss practical issues, and sometimes to provide feedback to the caregiver after a home visit. *“The first person where we implemented the tool was for someone where a lot was happening in a short time with many different professionals involved”* [CN 2]. Some professionals and caregivers mentioned the tool was very useful as a registration system for chronological listing of past events, whereas others did not prefer to use the tool in this way.

The possibility to provide remote care was generally considered as a relevant added value of the tools. During the COVID-19 pandemic participants experienced that some physical appointments could be replaced by using the tool (quote 12). Moreover, the tool facilitated use by a larger group of professionals and caregivers, as it enabled them to communicate, coordinate and provide support from a distance.

Professionals and informal caregivers frequently mentioned the improved availability and time saved as an advantage of using the tool. Due to the limited availability of both professionals and caregivers, they frequently missed each other when they tried to call. Professionals felt they could let go of patient-related issues more easily as they could directly share questions and concerns in a message to the care team. Caregivers mentioned that the possibility to send messages in the evening was an advantage, because it prevented disruption from their work. *“We all work of course. So sometimes you want to ask a question in the evening . . . I like this flexibility”* [IC 1].

### **Involvement of professionals**

Professionals and caregivers mentioned that the involvement of healthcare professionals in using the tool was generally good, though not everyone was equally active. Some professionals and caregivers had expected more involvement of GPs, paramedics or specific home care organizations. Participants mentioned that a tool must be regularly used by most professionals for implementation to become a success.

Professionals mentioned large differences in the involvement of GPs; some GPs were very enthusiastic about the tool while others preferred other ways of communication (e.g., by phone). Professionals expected the GP to take the lead in the implementation of the tool because of their gatekeeper function for their patients (quote 14).

Professionals and informal caregivers expressed that the tool led to better communication and coordination between all healthcare professionals involved, because it enables alignment of services. *“It is nice to sit together at a virtual table and let each other know what you are working on, if it is progressing or if you need help from someone. I think this is a great advantage”* [PT 1]. By using the tool everyone was informed about the current situation at the same time, and the team of professionals involved was clearly defined.

Professionals and caregivers frequently mentioned that other professionals or caregivers could be contacted easier than before (quote 16). Some professionals experienced a lower threshold in sending a message to a GP compared to making a phone call when in doubt of certain minor issues.

Some GPs indicated that they thought it was rather disturbing to receive messages on a regular basis that (they perceived) were not relevant to them. Partly because of this, one network decided the GP was left out of the group conversations. *“Adding other professionals to a conversation was something the GP was reluctant about. The GP wanted to keep it rather small, but I thought for some patients it is quite important that other professionals can read along, but that made the GP uncomfortable”* [CN 3].

### **Involvement of caregivers**

Caregivers experienced an increased involvement in the care for their relative; they were easily kept up to date by professionals. Professionals also indicated it was an advantage that the tool clarified which of the informal caregivers was the (first) contact person.

Caregivers considered the improved approachability of professionals one of the main advantages of the tool. It enabled easy and quick contact about their relative, they could ask questions and express their anxiety via the tool. They also asked minor questions they would previously not have asked, because they thought it was too unimportant, but were actually very helpful for them as caregiver. Professionals confirmed that the tool lowered the threshold for caregivers to contact them, which increased the caregivers' involvement in the care for the patient. *“With shorter communication lines problems can be solved instantly”* [IC 8]. Some professionals had negative experiences with adding a caregiver, as they were flooded with questions and information.

A barrier mentioned by professionals to include a caregiver in the group message was the use of professional jargon, which caregivers sometimes did not understand (quote 19). Several professionals mentioned they adapted their language once a caregiver was present. Professionals often chose to have different chat conversations with and without an informal caregiver, which sometimes led to confusion among professionals. *“Now I have to think very carefully, do I have the right chatgroup”* [CM 1].

## Discussion

Overall, interprofessional digital communication facilitated easier and more frequent contact between professionals and caregivers, due to their improved accessibility and approachability resulting in more coordination of care. All identified barriers and facilitators were related to tool characteristics, context of use, and involvement of the professionals and caregivers within the tool. Professionals and caregivers mentioned the advantage of the tools' well-secured (group) message function and options for safely sharing information. Related to the context, improved accessibility to and for professionals and caregivers was a frequently mentioned advantage. Lack of working agreements hampered efficient use of the tools and resulted in frequent use of alternative methods of communication. Professional and caregiver involvement and approachability seemed to improve by using the tool, while a disadvantage was that not all relevant professionals were yet included in the tool. The tool facilitated better coordination of care, because professionals and caregivers in the tool were better informed and informed at the same time about patient's situation.

The benefits of interprofessional communication tools were confirmed in this study, including the potential to divide tasks, enabling more efficient and safer information exchange, replacing some less important face-to-face meetings or telephone calls, and improving caregiver involvement (Finney Rutten et al., 2014; Madara Marasinghe, 2016; Munro & Swartzman, 2013; Stille et al., 2005). In our study, we found great variety in frequency of use, which is common in using digital tools (de Jong et al., 2018). Several caregivers and professionals indicated that use was mainly dependent on the current health situation of the older adult. The tools in our study were not yet available for all relevant caregivers and disciplines, which was one of the major barriers to successful implementation. This concept is confirmed in previous research where they found that, especially for interprofessional tools, a large scale roll-out is extremely important (Peek et al., 2016) and that a higher number of involved disciplines resulted in more tool use (de Jong et al., 2016). This study also confirmed the importance of GP involvement because due to their gatekeeper function, other professionals expected the GP to take charge during implementation of these tools (A. Moore et al., 2018; Villars et al., 2010).

A major barrier mentioned by participants was the large number of tools they had to use, which was confusing. Due to digitalization, all disciplines already have their own discipline-specific tools with varying functionalities. This lack of interoperability of systems was identified as major barrier before (Svensson, 2019; Wherton et al., 2015), and sometimes resulted in the use of "old-fashioned" forms of communication (e.g., phone or e-mail).

The necessary facilitator to overcome this lack of interoperability of systems, organizational involvement and commitment, was absent within this study setting because tool implementation was initiated by the local GP practices (Greenhalgh et al., 2020; Matthew-Maich et al., 2016). This approach prevented uniformity of communication, which is considered essential (Sligo et al., 2017). Digital tools alone cannot be blamed for absent or inefficient communication as

long as healthcare organizations lack a view on how to improve or support interprofessional collaboration (Svensson, 2019). In previous literature, this was mentioned as a prerequisite for successful implementation of digital communication tools, as it indicates organizational and system readiness (Matthew-Maich et al., 2016) and integration among the micro, meso and macro level (Valentijn et al., 2013). Our study supports previous research advocating implementation of interprofessional tools in networks in which collaboration is already established.

## Implications for research and practice

Implementing an interprofessional communication tool will be more successful if established collaboration already exists. In the participating networks of this study, an established collaboration already existed (Richters et al., 2018), and the tool was merely a new way of communication. Implementing these tools was especially important to facilitate communication (Douglas et al., 2017) and should therefore not be considered as a goal, but meant to support a transfer toward more highly coordinated care (Tang et al., 2019). Digital tools are mentioned as important facilitators in frameworks for integrated care and should be part of integrated care implementation programs (Melchiorre et al., 2018; Valentijn et al., 2013).

We still think there are important steps to take to achieve long-term use of these tools. Our study highlighted the importance of overarching work agreements regarding the use of a tool, and the need for suitable training especially for less digitally skilled users. It is important to engage the entire interprofessional team to participate and actively use the tool (Brown et al., 2009; Matthew-Maich et al., 2016). It is also essential to evaluate these innovations regularly to identify unexpected barriers to establish long-term use (Douglas et al., 2017; Sligo et al., 2017). These tools could be useful for various target groups, which could contribute to wide-scale implementation.

Interoperability is still lacking resulting in a large number of tools professionals have to use. Integrated systems are recommended, which could be realized by reducing the number of tools or increasing interoperability between tools. Integration is frequently lacking because tools are developed and implemented by individual ICT-parties as part of a pilot or project grant, resulting in a large variety of tools with limited functionalities. Healthcare organizations and funders should focus on these aspects and make sure that ICT systems are better aligned in our digital future (Melchiorre et al., 2018; Samal et al., 2016; Steele Gray et al., 2018; Svensson, 2019; Wherton et al., 2015). Commitment at all levels is needed and strategies at the organizational level are crucial.

## Strengths and weaknesses

A major strength of this study is the broad perspective; we included three different tools and focused on the overarching themes important for successful implementation and long-term use instead of tool-specific factors. Evaluation studies regarding interprofessional communication tools are scarce. But since interprofessional communication tools are highly

promoted, with this research we contribute to this current knowledge gap, which is essential for the digitalization in healthcare settings.

Additional methodological strengths were the following. Coding was regularly checked by independent researchers and results were interpreted by a group of authors with different research and healthcare discipline backgrounds, which enhanced the validity of the results (Pope et al., 2002). We generated rich data by interviewing a large sample of professionals with varying backgrounds and from different organizations, including both non-users and early adopters. This contributed to data saturation and a heterogeneous perspective. A limitation is that the caregiver sample was less multiform including mainly adult children caring for their parents, because spouses often lacked digital skills. Moreover, this study took place within an interprofessional network-based setting, in which professionals were already collaborating with each other: the tool thus fell on fertile ground. This context should be taken into account when transferring these barriers and facilitators to other care settings, where the collaborative context is still to be developed.

## Conclusions

This study shows the barriers and facilitators to the use of interprofessional digital communication tools in local primary care networks for frail older adults. For most professionals and informal caregivers, the tools facilitated easier communication, mainly due to improved accessibility of both professionals and informal caregivers which also resulted in easier approachability of professionals. Everyone was informed about a patient's situation at the same moment, which improved coordination of care. To establish long-term use, broader implementation of these tools in a catchment area is necessary. And, more importantly, the number of tools should be reduced or interoperability between tools should be increased. Organizations or policy makers should facilitate the availability of tools and related work agreements. Further research is warranted to identify requirements for sufficient organizational support for the implementation of interprofessional digital communication tools.

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## Authors' contributions

Dorien Oostra, Marieke Perry and Minke Nieuwboer conceptualized the study. Dorien Oostra wrote the first version of the manuscript. Carlien Fierkens and Marloes Alewijnse conducted the interviews. Dorien Oostra,

Carlien Fierkens and Marloes Alewijnse initially coded the interviews and all authors contributed to the interpretation of the study results. All the authors critically reviewed and contributed to the final draft of the manuscript. Dorien Oostra submitted the paper.

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## Data availability statement

Data consists of qualitative interviews in Dutch. Data is available upon reasonable request from the corresponding author.

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